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Leveraging AI for Enhanced Support: Satisfaction Levels of Users Utilizing Virtual Assistant in Open Education

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Abstract: This study explores users' perceptions of the Virtual Assistant application facilitated by the Anadolu University Open Education System. It assesses the application's effectiveness and user satisfaction by analyzing opinions regarding its importance and the experience it delivers. The research delineates its population as learners engaging with the Virtual Assistant within the Anadolu University Open Education Framework. Employing a sequential explanatory design within mixed-method research methodologies, the investigation commenced with an online Virtual Assistant Satisfaction Survey involving 374 participants as the sample-subsequent focus group discussions with 18 users aimed to delve deeper into satisfaction levels vis-à-vis user expectations. Findings indicate a moderate level of satisfaction among users with the Virtual Assistant application, reflecting a congruence with anticipated outcomes. Moreover, the analysis across various dimensions revealed a comprehensive satisfaction in alignment with user expectations, particularly highlighting approval for the application's adherence to the Open Education website's design language. Conversely, dissatisfaction was noted concerning the specificity and utility of the information provided. The study identifies a disparity in satisfaction levels, with high marks in design aspects and lower evaluations in usability. Recommendations are extended towards enhancing the Virtual Assistant and similar tools through user-centric development and encouraging further research predicated on the insights garnered from this study.

Keywords: higher education, open education, open and distance learning, student support service, artificial intelligence, virtual assistant, chatbot, human-machine interaction, service quality, user satisfaction.

Highlights

What is already known about this topic:

- Learners in open education need support for different reasons. Institutions can provide support services through other tools. Artificial intelligence-based support tools are one of them.
- The services provided must be satisfactory to use support tools effectively in open education institutions. Users' opinions and suggestions are essential for improving the services.

What this paper contributes:

- This study addresses the gap in research regarding user perceptions of the limited number of AI-based support systems.
- It reveals the satisfaction levels among learners at a mass open online education institution concerning the significance and experience of an AI-based support application,

Implications for theory, practice, and policy:

- The research contributes to the literature for developing Artificial Intelligence (AI)-based applications in open education institutions based on user opinions.
- The findings from the study emphasize the importance of integrating AI-based support systems for learners and all employees within the open education institution.

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Introduction

Globally, learners unable to enroll in traditional higher education programs for various reasons increasingly access resources and services provided by institutions offering open and distance learning, thanks to technological advancements. This trend has become a significant component of the educational process for many (Öztürk, 2018). In the context of Türkiye, Anadolu University has been the nationwide leader in delivering higher education through an open education system since 1982, holding the central authority for such education today. Providing systematic administrative support to learners post-enrollment is a cornerstone of open and distance education institutions. These institutions sustain support services until learners fulfill their course requirements (Şen, 2021). Anadolu University's Open Education System facilitates face-to-face services through regional offices and online support platforms. In an environment with extensive staff and operations across different locations, the timeliness and accessibility of information are paramount for both users and employees. "AOSDESTEK" is a brand used by Anadolu University, which combines the abbreviation of the Open Education System (OES) with the term "Support". The AOSDESTEK system at Anadolu University, including call center services branded as AOSDESTEK Communication and Solution Desk, offers non-IVR (Interactive Voice Response) telephone support to over a million individuals annually. Between 2020 and 2022, 84% of incoming calls were addressed, resulting in a 16% missed call rate. However, given Anadolu University's status as a mega-university, a significant number of learners, alumni, or prospective students still struggle to receive support services via telephone.

The AI-based Virtual Assistant application provides 24/7 response capabilities to user inquiries, aiming to satisfy the substantial demand for support through telephone and a Question-Answer system. According to Roberts and Dunworth (2012), integrating evolving technologies into support services should be a collaborative process involving technical staff and service design in a learner-centered approach, prioritizing the speed and accuracy of information over the delivery medium. However, a lack of such an approach can lead to communication issues internally among employees and externally with users (Aytekin, 2007). Particularly in open and distance learning environments, learners needing help to access support centers via telephone or those doubting the accuracy of received information often seek answers through alternative channels. Prospective university students may need help contacting knowledgeable staff about the online or offline registration process and programs. The vast amount of information can lead them to spend additional time seeking answers on institutional websites (Wijaya et al., 2020). In higher education settings, providing accurate or complete information or delays in communication can improve learner satisfaction and motivation, potentially leading to dropout. The Internet's rapid and unstructured growth exacerbates the challenge of accessing reliable information, with millions of new pages added daily (Süral, 2012). Sahusilawane et al. (2016) found a positive correlation between learners' satisfaction with their institution's website and their overall satisfaction with the higher education institution. In large learner systems like open education, there is an imperative need for AI-based support systems that offer uninterrupted, accurate, immediate, and up-to-date information independent of staff numbers. Thus, collecting feedback from users of Anadolu University's Open Education System's Virtual Assistant application is vital for refining AI-based support systems and understanding user expectations, which is crucial for system designers and managers. Users seeking digital or in-person services outside regular working hours underscore the demand for technology-driven solutions enabling quick online access to reliable information. Given the exponential information growth, higher education institutions must embrace digital transformation cohesively with ongoing changes (Bozkurt et al., 2021). Considering the volume of learners in open education programs, the interaction between learners and staff, the quantity and quality of personnel, and learner satisfaction with support services designing an AI-based support system that ensures instant, fast, and precise information delivery is essential. Evaluating service quality is critical for measuring user satisfaction and enhancing system performance. Beyond the technical and infrastructural aspects, user perception and satisfaction with the service significantly influence the system's future viability and user loyalty. Aligning user expectations with service quality is imperative for sustaining system usage and fostering user loyalty.

Literature

Kayabaş (2010) aimed to determine the usability of an artificial intelligence-based virtual assistant, named Cabbar Support, as a learner support system in Anadolu University's Open Education System through his research on learners. Kayabaş noted that users might have expressed negative opinions due to the limited information in the Cabbar Support database. Khallabi (2020) conducted a case study to investigate user opinions on the design and management dimensions of an AI-based virtual assistant, MiFbot, designed for the student affairs office. According to the study results, an AI-based application's inability to answer all questions negatively affects user satisfaction. Mouhcine (2021) explored the intention to continue using a chatbot application among users who experienced it within the scope of the Technology Acceptance Model based on their satisfaction. The data obtained from the study indicate that perceived ease of use and user satisfaction in chatbot usage have a significant impact. The service quality of the chatbot, in fulfilling the requests of users who do not have advanced technical knowledge, generates high satisfaction and continues the user's intention to use the application. Han and Lee (2022) conducted a study comparing the satisfaction levels of learners using an AI-equipped chatbot with those using a Frequently Asked Questions (FAQ) page within the MOOCs (Massive Open Online Courses) system. The study results show that users' intentions to use a chatbot are lower compared to an FAQ web page. When the content of both applications is the same, service quality and satisfaction levels are identical. However, according to the qualitative aspect of the study, learners are initially reluctant to use a chatbot. This is due to the lack of a comprehensive question-answer pool for the chatbot, resulting in learners not getting complete answers to their questions. Pesonen (2021) investigated trust in a chatbot application that offers academic and non-academic support opportunities to learners in higher education programs. According to the study's results, the chatbot's trustworthiness was satisfactory.

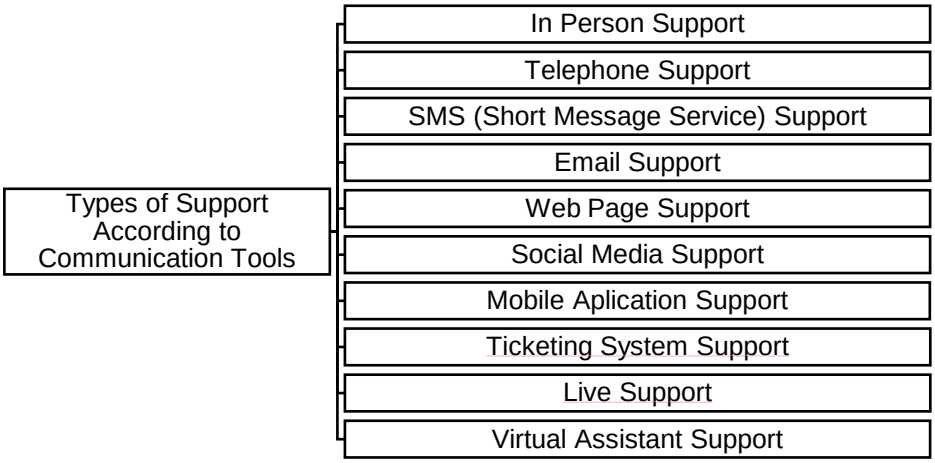
Theoretical Background

Through the open education system, higher education institutions offering instruction to many learners provide various support models based on their experiences. Most institutions can identify support needs through trial and error (Lee, 2003). For higher education institutions serving over a million learners, offering dual education, and providing support services from different centers, the definition and classification of support services can vary depending on the institution's dynamics. Berge (1996) categorized support systems into pedagogical, social, administrative (managerial), and technical support. Pedagogical support refers to the interaction between learners and instructors regarding course contents; social support enables learners to share learning experiences with all learners; managerial support allows learners to communicate with administrators about issues such as enrollment, financial matters, and student rights; technical support refers to assistance with technical problems throughout the learning process. Thorpe (2002) differentiated learner support systems into pre-, during, and post-learning. Pre-learning support involves introducing the education system and programs before enrollment; support during learning includes all services related to the education system, programs, and courses provided after enrollment until withdrawal; post-learning support encompasses services provided for certification after graduation. Keast (1997) classified learner support services into academic, administrative, technical, and counseling. Academic support is provided by instructors responsible for programs and courses regarding content; administrative support is related to enrollment processes and student services; technical support is for computer technologies required during the learning period; counseling involves guidance related to the learner's educational life.

Tait (2000) highlights the importance of support services in establishing solid relationships with learners, both at the entry point to the system and after, to reduce their workload. Tait classifies learner support services holistically according to their cognitive, emotional, and systematic functions. Cognitive support is defined as supporting learning with course materials; emotional support as providing conditions that enhance learning commitment and motivation; systematic support as conducting learner-centered administrative information management processes. Simpson (2012) classifies learner support according to a holistic model into academic and non-academic support. Similarly, Das and Biswas (2018) describe

support models as academic and administrative support. In this context, academic and non-academic (administrative) supports are commonly used definitions in learner support models. The types of support according to Anadolu University's communication tools are illustrated in Figure 1.

Figure 1. Types of Support According to Communication Tools



Technology, particularly in educational support services, is an ever-evolving concept, increasingly characterized by integrating systems underpinned by artificial intelligence (Canbek & Mutlu, 2016). Predominantly, chatbot systems employed in this domain are structured on rule-based algorithms, a process depicted in Figure 2

Figure 2. Rule-based Chatbot Workflow

The term "chatbot" is derived from the combination of "chat" and "bot" (robot), representing an application that facilitates human-machine interaction (Bacaksız, 2020). Anadolu University's Virtual Assistant application is characterized as keyword-based. Candidates wishing to enroll in Anadolu University's Open Education System and enrolled learners, graduates, and those whose registrations have been deleted can obtain information about the system through the AI-based Virtual Assistant application. Users have accessed the Beta version of the application since November 11, 2022, through the AOSDESTEK Page, the Open Education Faculty Website, and the Anadolum mobile application. The purpose of this research is to determine the satisfaction levels of users based on their expectations towards the Virtual Assistant application in terms of importance and experience perceptions, to evaluate these levels in terms of various variables, and to examine users' opinions on the Virtual Assistant application. In this context, the following questions are being investigated for users of the Anadolu University Open Education System's Virtual Assistant application:

1. What are the participants' levels of importance and experience regarding the Virtual Assistant application?
2. How do participants who use the Virtual Assistant application evaluate the:
    a. Usability of the application
    b. Accuracy and reliability of the information provided
    c. Design

In terms of importance and experience?
3. What are the expectation levels of participants according to their demographic characteristics?
4. What are the satisfaction levels of participants according to their application expectations?
5. What are the opinions of participants regarding the Virtual Assistant application?

Methodology

Research Model/Design

The research was conducted using the sequential explanatory design, one of the mixed methods research approaches. Mixed methods research involves the combination of quantitative and qualitative data. In mixed methods research, one database can be used to check the accuracy of information in the other database and to support explanations. Data collection tools are used to determine the suitability of the sample for the population (Creswell & Creswell, 2021). Using both quantitative and qualitative approaches allows the examination of confirmatory and exploratory questions simultaneously, enables strong inferences, and facilitates a diversity of perspectives (Teddlie & Tashakkori, 2011). This research with a sequential explanatory design uses quantitative methods in the first phase and qualitative methods (QUANT → qual) in the second phase. Both phases include the steps of data collection, data analysis, and data interpretation. Data related to participants' experiences with the Virtual Assistant application will be collected in the first phase of the research.

In the first phase of the research, demographic information of the participants was collected through a personal information questionnaire, along with data on the satisfaction levels of those using the Virtual Assistant application. Subsequently, statistical data related to the Virtual Assistant application was gathered. After these stages, all findings were compiled. In the second phase, interview participants were selected based on the findings of the first phase. After determining the participants, in-depth interviews were conducted. Once all conclusions of the second phase were compiled, they were analyzed in conjunction with the findings from the first phase.

The study population was defined as learners using the Virtual Assistant application in Anadolu University's Open Education System. The Virtual Assistant application, launched on November 11, 2022, has been used by 294,370 users. The research sample included 374 users who experienced the Virtual Assistant application during the 2022-2023 academic year and participated in the survey. Necessary permissions were obtained to implement the scale used to collect the required data in the first phase of the research. The online survey form used as the data collection tool in the first phase was published on the Anadolu University AOSDESTEK Page and the Open Education System Student Automation. The first phase of the research was conducted with users who had experienced the Virtual Assistant application during the 2022-2023 academic year and voluntarily completed the online survey form. Out of 411 participants who filled out the survey form in the first phase, the outlier responses of 37 randomly responding participants were removed from the study, and 374 participants were used in the research.

For the first phase of the research, the E-QUAL Scale developed by Barnes and Vidgen (2002) and adapted to Turkish by Soydal (2008) was used as the application satisfaction scale to measure user satisfaction. The scale, consisting of 22 questions, is on a five-point Likert-type scale. According to the research, 22 questions were asked separately to inquire about users' expectations and experiences. As a result, a total of 44 questions and answers were collected, with 22 focusing on expectations and 22 on experiences. The reliability of the questionnaire used in this research was determined using Cronbach's Alpha coefficient. The reliability level of the 22 scale items was found to be high (αImportance= 0.969, αExperience=0.976). The data distribution obtained for the section was evaluated according to the scale of importance and experience and was examined according to Shapiro-Wilk's test. The statistical significance threshold in the study was set at 0.05. The test results showed that the

significance value (Assyp. Sig) differed significantly from a normal distribution in terms of importance and experience ($p<0.05$). According to this conclusion, it has been determined that the data in the study is not normally distributed. Therefore, non-parametric tests were used in the study.

The dimensions of the research can vary according to the perception of the users of the application (Soydal, 2008). Factor analysis was conducted to determine the dimensions based on the responses of the 374 participants who used the Virtual Assistant application and participated in the online survey. Initially, the Kaiser-Meyer Olkin (KMO) and Bartlett's tests were conducted to group how the Virtual Assistant application was perceived. According to the test, the data sets were suitable for analysis ($KMO=0.960$, $p<0.05$). The Principal Component Analysis (PCA) method and Varimax Rotation were used in factor analysis (Eigenvalue=1). According to the participants' answers to the survey questions, the total variance explained by the three factors after rotation was 73.951%. These factors are usability, quality, security of information, and design.

Descriptive statistics and quantitative analysis techniques were used to analyze the data obtained from the surveys in the first phase. The analysis processes were carried out using SPSS and Google Sheets applications. The data obtained from the personal information form were analyzed to determine the satisfaction level according to expectations.

In the second phase of the research, a study group was formed, data collection tools were used, data were collected, and the data were analyzed. The participants who voluntarily participated in the survey in the first part of the study were selected for the second phase based on the satisfaction levels calculated from the scores provided by users in the first phase. Subsequently, interviews with voluntary participants were conducted in different sessions. The second phase involved focus group discussions and in-depth interviews with voluntary participants to uncover their opinions about the Virtual Assistant application. For this purpose, questions related to the research were prepared in advance. During the interviews, related follow-up questions were asked to the participants neutrally. The Focus group interview is a structured technique to elicit detailed views of selected participant groups to collect qualitative information related to the research questions (Creswell & Plano Clark, 2020).

The interviews considered the survey results from the first phase. Based on the expectations towards the Virtual Assistant application, interviews were conducted in three different sessions with participants categorized as "satisfied," "somewhat satisfied," and "dissatisfied." The descriptive analysis method was used to analyze the data obtained from the focus group discussions. After reviewing the focus group recordings and in-depth interviews, which totaled 4.5 hours, transcripts were produced. The names of all participants in the interviews were kept confidential in the analysis process, and code names (e.g., CODEx) were used. The coding process for the qualitative data collected in the study was conducted using QSR-Nvivo 12. The codings obtained from the focus group discussions and in-depth interviews were examined by experts according to their dimensions and themes, with necessary adjustments made in areas of consensus and disagreement. The reliability calculation of the research used the agreement percentage (Miles & Huberman, 1994). Consensus was reached on the interview themes, with a difference occurring in one theme between the researcher and an expert. Miles & Huberman's reliability percentage was calculated as .83. Since the results are higher than .70, it can be stated that there is agreement among experts. After analyzing the data from the second phase, these were combined with those surveyed in the first phase to work on the findings. In the sequential explanatory design, combining data involves integrating the data during the explanation process. In this type of integration, qualitative data are used to explain quantitative research results.

This study is limited to users who have experienced the Virtual Assistant application. It is based on the competencies possessed by the Virtual Assistant application. The research encompasses user opinions about the specific limited period in which the study was conducted.

Findings and Discussions

In the evaluation phase of the findings, the analysis commenced with the presentation of overarching conclusions drawn from demographic characteristics. This was succeeded by an examination of the results from the factor analysis, which aimed to delineate the dimensions of satisfaction with the application. The insights gleaned from surveys, focus group discussions, and in-depth interviews were then contextualized within the framework of the research questions.

Table 1. Participant Information

Category	Group	Frequency	Percentage
Gender	Male	194	51.9
	Female	180	48.1
Age	18-29	148	39.6
	30-39	111	29.7
	40-49	72	19.3
	50-59	32	8.6
	60+	11	2.9
Occupation	Employed in public sector	117	31.3
	Employed in private sector	115	30.7
	Student	71	19.0
	Unemployed	52	13.9
	Retired	19	5.1
Registration Information	Registered	287	76.7
	Not registered	87	23.3
Registration Status	Active (Enrolled)	161	56.1
	Graduate	83	28.9
	Inactive (Not Re-enrolled)	37	12.9
	Deregistered	6	2.1
Type of Enrollment	Open Admission Second University	131	456
	Higher Education Institutions Exam	89	31.0
	Vertical Transfer/Completion of Degree	57	19.9
	Lateral Transfer	10	3.5
Degree Level	Bachelor’s degree	165	57.5
	Associate degree	122	42.5
Faculty	Open Education	181	63.1
	Economics	54	18.8
	Business Administration	52	18.1

Table 1 presents the distribution of participants in terms of frequency and percentage, detailing the demographic and academic profiles of the users involved in the study. This includes a systematic breakdown of the participants' attributes, such as gender, age, occupation, and detailed registration information within the Open Education System (OES). Specifically, the table addresses registration status, type of registration, degree pursued, and faculty affiliation sequentially.

1. Findings Related to Participants' Importance and Experience Levels

Initially, the objective of the research was to assess the significance of participants assigned to the Virtual Assistant application and gauge their experiences with its use. Within this framework, Table 2 elucidates the findings derived from participants' responses during the initial phase of the survey.

Table 2. Data Related to Responses to Research Questions

Context	n	x̄	Median	%	SD
Importance	374	4.03	4.23	80.54	0.8363
Experience	374	3.04	3.14	60.78	1.1007

According to the research conducted on the importance attributed to the Virtual Assistant application and the experience levels of its usage among 374 participants, considering the average scores for all items, the importance of the Virtual Assistant is 80.54% (x̄ = 4.03), Median = 4.23, SD = 0.8363) while the rate in terms of user experience is 60.78% (x̄ = 3.04), Median = 3.14, SD = 1.1007). These results indicate that users who stated the topics covered in 22 items are essential to experience lower levels of experience. The distribution of users' average importance and experience score scales is as follows in Table 3. This table separately addresses the average scores for importance and experience in terms of responses given to all items included in the survey by participants.

Table 3. Number of Users According to Importance and Experience Score Ranges

	Importance		Experience	
Range	**n**	**%**	**n**	**%**
1.00-1.99	11	2.9	73	19.5
2.00-2.99	32	8.6	86	23.0
3.00-3.99	95	2.4	132	35.3
4.00-5.00	236	63.1	83	22.2
Total	**374**	**100**	**374**	**100**

2. Findings on Participants' Levels of Importance and Experience According to Usability, Design, Quality of Information, and Security Dimensions

In this section, the levels of importance attributed to users and their experience levels are examined according to the dimensions of the research. The dimensions of "usability," "design," "quality of information, and security" have been considered in terms of levels of importance and experience. The findings are presented in Table 4.

Table 4. Importance and Experience Values by Dimensions

	Importance			Experience		
Dimension	**x̄**	**%**	**SD**	**x̄**	**%**	**SD**
Usability	4.14	82.8	0.88	3.07	61.4	1.16
Quality of information	3.92	78.4	0.89	2.89	57.8	1.14
Design	3.84	76.8	1.02	3.28	65.6	1.21

According to Table 4, for users, the importance ranks as follows: usability (x̄ = 4.14), quality of information and security (x̄ = 3.92), and design (x̄ = 3.84). Among the users, design (x̄= 3.28), usability (x̄= 3.07), and quality of information and security (x̄ = 2.89) have been experienced well. When considering the average scores for importance and experience together, the highest value is the average importance score in the usability dimension (x̄ = 4.14). The lowest value is the average experience score in the quality of information and security dimension (x̄ = 2.89).

When dimensions are examined according to items; regarding the usability dimension, the most important aspect for users is the Virtual Assistant providing timely information (x̄ = 4.36), while the least important aspect for users is the application creating a sense of positive experience (x̄ = 3.95). In terms of user experience in the usability dimension, users have the highest experience regarding the

application providing timely information ($\bar{x}$ = 3.53), while they have the lowest experience regarding the application providing information in appropriate detail ($\bar{x}$ = 2.67). In terms of the quality and security of information dimension, the most important aspect for users is the Virtual Assistant providing a sense of security for personal information ($\bar{x}$ = 4.20), while the least important aspect for users is the application providing a sense of belonging to a community ($\bar{x}$ = 3.54). In terms of user experience in the quality and security of information dimension, users have the highest experience in facilitating communication with the institution ($\bar{x}$ = 3.03), while they have the lowest experience regarding the application evoking a personalized service ($\bar{x}$ = 2.79). In the design dimension, the most important aspect for users is the Virtual Assistant being developed by experts ($\bar{x}$ = 4.04), while the least important aspect for users is the attractiveness of the application's design ($\bar{x}$ = 3.70). In terms of user experience in the design dimension, users have the highest experience in the site's design being consistent with the design language ($\bar{x}$ = 3.55), while they have the lowest experience regarding the attractiveness of the application's design ($\bar{x}$ = 3.03).

3. Findings on Participants' Expectation Levels According to Their Demographic Characteristics

The difference in the importance attributed and the experience had, as determined by the E-QUAL scale used to gauge user satisfaction based on their expectations towards the Virtual Assistant Application, has been calculated as the expectation score (Expectation = Importance - Experience). In this context, a low expectation score indicates a high level of satisfaction relative to expectations; conversely, a high expectation score suggests a low level of satisfaction. In this section, a comparison in terms of users' demographic characteristics has been made based on the average expectation scores calculated from the difference between the average importance scores and the average experience scores. Mann Whitney U tests have been applied to compare demographic characteristics in Table 5.

Table 5. Median Expectation Values According to Demographic Characteristics

Category	Group	Frequency	Median	Difference Status (p)	Effectiveness Level (r)
Gender	Male	194	13.50	No significant difference p>0.05	Extensively effective r=0.930
	Female	180	18.50		
Age	Over 35+	178	6.00	Significant difference exist p<0.05	Low level of effectiveness r=0.212
	Below 35	196	23.00		
Occupation	Employed	232	8.00	Significant difference exist p<0.05	Low level of effectiveness 0.148
	Unemployed	142	23.00		
Registration Information	Registered	287	16.00	No significant difference p>0.05	Low level of effectiveness 0.050
	Unregistered	87	17.00		
Registration Status	Deregistered	89	6.00	Significant difference exist p<0.05	Low level of effectiveness 0.129
	Enrolled	198	20.00		
Type of Enrollment	Point-Based	156	15.50	Significant difference exist p<0.05	Moderate level of effectiveness 0.470
	Non-Point based	131	18.00		
Degree Level	Bachelor's degree	165	14.00	No significant difference p>0.05	Moderate level of effectiveness 0.380
	Associate degree	122	19.50		

Given the use of the Mann Whitney U test in the study, median values have been prioritized as a basis for analysis. Alongside these median values, the table also presents "Difference Status (p)" and "Effectiveness Level (r)" values, offering a multifaceted view of the data's implications. Upon examination of the "Difference Status" values, the results elucidate several key findings: No significant difference was found in the level of expectations being met from the Virtual Assistant application according to gender ($p>0.05$, $r=0.930$). When categorized by age, users under 35 and those 35 and older showed significant differences in the level of expectations being met by the Virtual Assistant application ($p<0.05$, $r=0.212$). Based on occupation, users working in the public and private sectors were grouped as "employed," whereas students, retirees, and those not working were grouped as "unemployed." A significant difference was found in the level of expectations being met from the Virtual Assistant application according to the occupation ($p<0.05$, $r=0.148$). Regarding registration information, no significant difference was found in the level of expectations being met from the Virtual Assistant application ($p>0.05$, $r=0.050$). In terms of registration status, active (registered) and inactive (not renewed registration) users were grouped as "registered"; graduates and those who have canceled their registration were grouped as "disassociated." A significant difference was found in the level of expectations being met from the Virtual Assistant application according to registration status ($p<0.05$, $r=0.129$). For the registration type, groups were formed as "score-based registration" for users registered under YKS, Vertical Transfer/Undergraduate Completion, and Lateral Transfer, and as "non-score-based registration" for users registered under the Second University without examination program. A significant difference was found in the level of expectations being met from the Virtual Assistant application according to the type of registration ($p<0.05$, $r=0.47$). No significant difference was found in the level of expectations being met from the Virtual Assistant application according to degree ($p>0.05$, $r=0.38$).

4. Findings on Participants' Satisfaction Levels According to Their Application Expectations

As delineated in prior discussions, user satisfaction, in relation to expectations or simply satisfaction, is quantified through the discrepancy between perceived importance and reported experience. Echoing the methodology employed by Glenn and Weaver (1982), this discrepancy allows for the categorization of satisfaction levels into four distinct quartiles based on users' expectation scores. Utilizing the E-QUAL scale, a five-point Likert-type measure, scores range from a minimum of one to a maximum of five. Thus, the differential between importance and experience scores spans from -4 to +4. This range is instrumental in classifying users into varying levels of satisfaction concerning their expectations, as systematically illustrated in Table 6.

Table 6. Satisfaction Levels According to Expectation Score Ranges

Range	**Satisfaction**
Between -4.00 and -2.00	Very Satisfied According to Expectations
Between -1.99 and 0	Satisfied According to Expectations
Between 0 and 1.99	Somewhat Satisfied According to Expectations
Between 2.00 and 4.00	Not Satisfied According to Expectations

Users' satisfaction levels based on their expectations are shown according to the expectation score calculated from the difference between importance and experience. A higher experience score than the importance score indicates that the user's satisfaction relative to their expectations is high. The satisfaction levels based on expectation were determined using the following formula, taking into account the differences between the importance and experience levels obtained in the first part of the research, where the highest score is 5 and the lowest score is 1 in the five-point Likert scale:

Average Score of Satisfaction on Expectation = Average Score of Importance - Average Score of Experience

Table 7. Average Scores for the Expectation Levels of Dimensions

Dimension	Number of Items	$\bar{x}$
Usability	12	1.07
Quality of information	7	1.03
Design	3	0.56

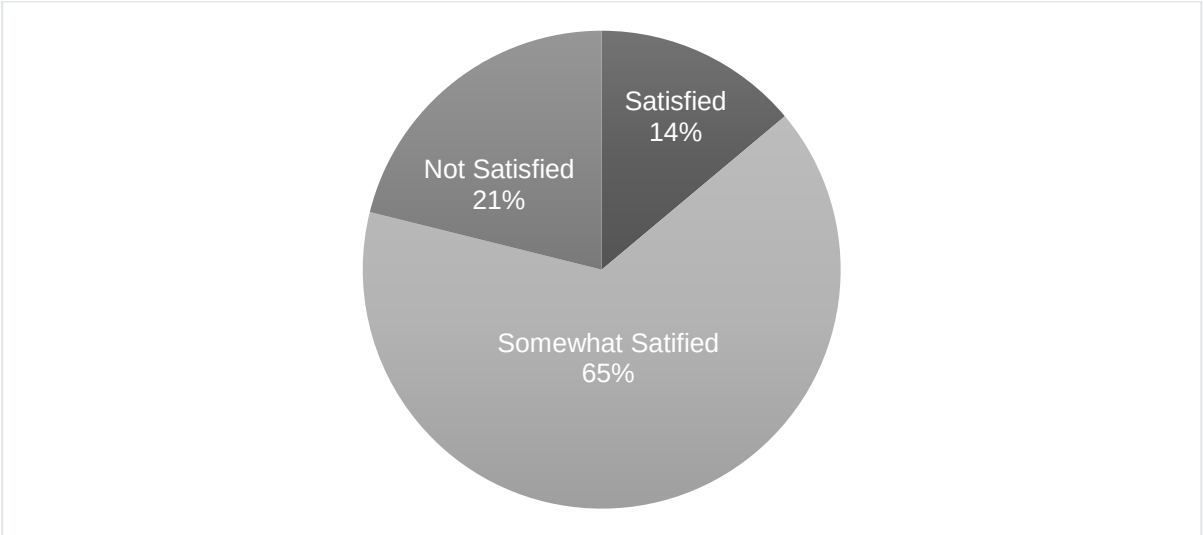
According to Table 7, it is observed that the expectation score in all dimensions falls within the range of 0 to 1.99. It has been concluded that users are somewhat satisfied relative to their expectations in the design dimension ($\bar{x}$ = 0.5), the quality of information and security dimension ($\bar{x}$ = 1.03), and the usability dimension ($\bar{x}$ = 1.07).

Table 8. Satisfaction Levels Based on Users' Expectations in Terms of Scores

Expectation Score	Satisfaction	Frequency	Percent
Between -4.00 and -2.00	Very Satisfied	0	0
Between -1.99 and 0	Satisfied	52	14
Between 0 and 1.99	Somewhat Satisfied	243	65
Between 2.00 and 4.00	Not Satisfied	79	21
Total		**374**	**100**

Table 8 delineates the average scores for expectations and the corresponding satisfaction levels relative to these expectations among all research survey respondents. This analysis shows that regarding their satisfaction with the Virtual Assistant application, 65% of participants fall into the 'somewhat satisfied' category, 21% into the 'not satisfied' category, and 14% express satisfaction. This distribution of participants across different satisfaction levels, based on their expectation scores, is visually represented in Figure 3.

Figure 3. Users' Satisfaction Levels According to Expectations



5. Findings on Participants' Views Regarding the Virtual Assistant Application

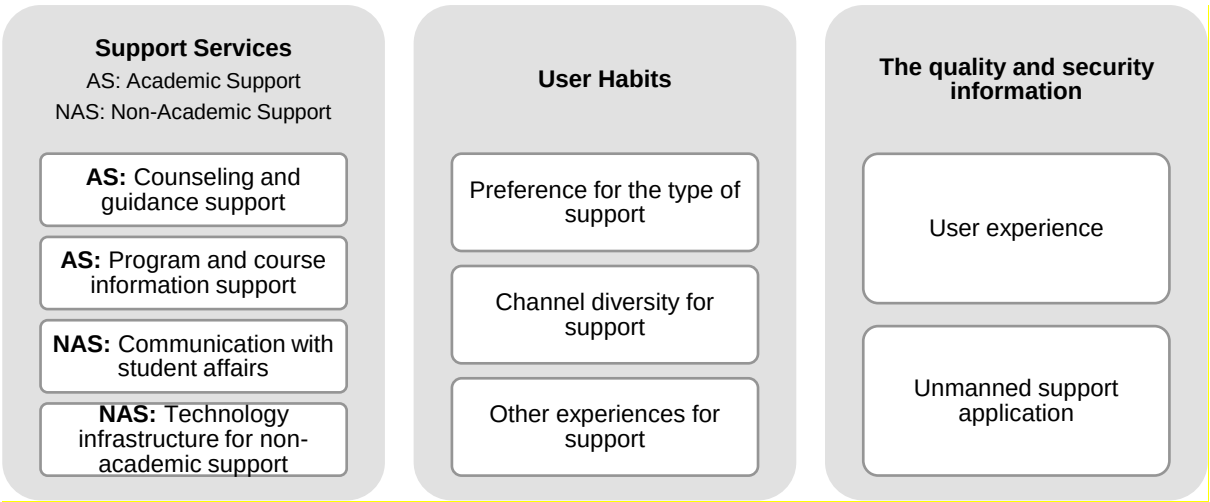
In the second stage of the research, focus group discussions were conducted to determine the satisfaction levels of users who participated in the survey during the first stage according to their expectations, as shown in Table 9.

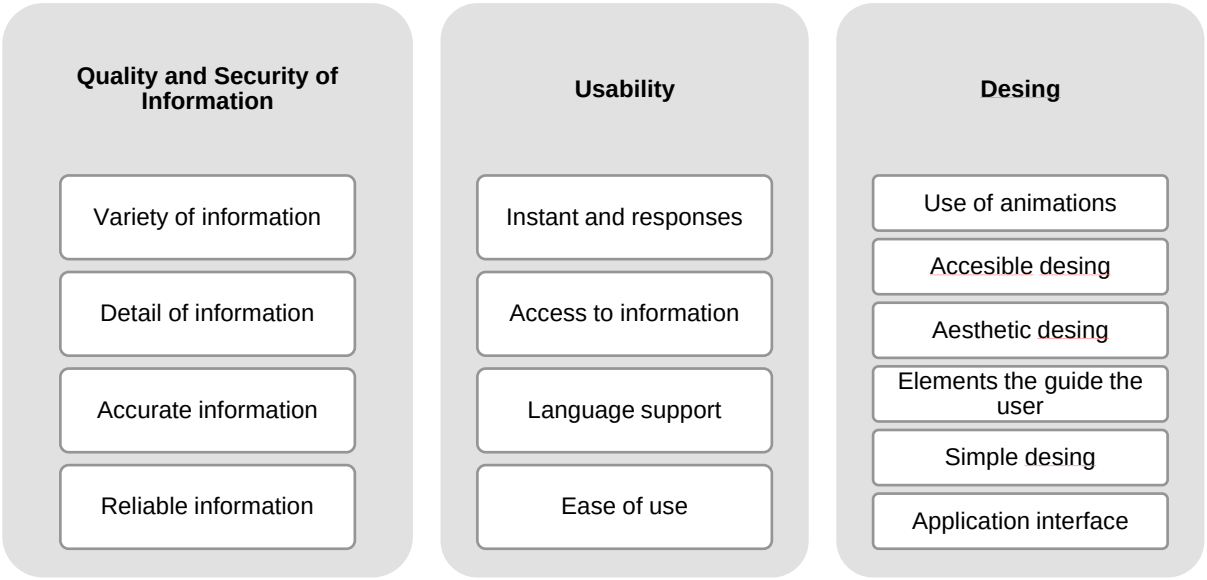
Table 9. Focus Group Information

Satisfaction Level	Session Number	Participant Number	Gender	Age	Occupation
Satisfied	1	K1	Female	42	Private
		K2	Female	36	Public
		K3	Female	27	Student
		K4	Female	45	Public
		K5	Male	32	Private
		K6	Male	35	Public
Somewhat Satisfied	2	K7	Female	36	Public
		K8	Female	41	Public
		K9	Male	45	Private
		K10	Male	50	Public
		K11	Female	21	Student
		K12	Male	28	Private
Not Satisfied	3	K13	Male	31	Public
		K14	Female	24	Public
		K15	Female	29	Public
		K16	Male	32	Private
		K17	Male	38	Unemployed
		K18	Male	46	Retired

In the research's second phase, the perspectives of volunteer participants on the Virtual Assistant application were scrutinized through a thematic analysis. This examination was guided by a conceptual framework and dimensions derived from data collected via focus groups and in-depth interviews. Key themes explored during these discussions encompassed Support Services, User Habits, Application Evaluation, Quality and Security of Information, Usability, and Design. The detailed breakdown of these themes into sub-themes and categories is visually represented in Figure 4.

Figure 4. Themes





The statement from participants expressing their opinions in the second phase of the research, along with some example statements organized by theme, is provided below.

- Support Services - K8: "I believe the e-campus system is more appropriate under current conditions than academic advisory classes. However, when considering the academic aspect from a student's perspective, for instance, if I want to register for a program, I would like to learn about the program's content, its courses, and the details of those courses. I think there are some deficiencies in this area."
- User Habits - K15: "I use the application on Anadolu mobile more often. As you know, since the mobile phone is more convenient, I tend to access it more through Anadolu mobile."
- Application Evaluation - K4: "In general, it is usable if there is a problem, but it is not successful when it comes to specifics."
- Quality and Security of Information - K1: "I was curious about the registration fees. When I accessed it during the registration period, I tried to find information about the fees but could not find any related data. It just redirects to the registration guide."
- Usability - K8: "I noticed that it is swift. If there is a precise answer to the question we asked, it responds very quickly. This is a positive aspect."
- Design - K17: "The design could be further improved. Sometimes, it does not attract attention because it is at the bottom. Since the Anadolu University page is also in blue, it sometimes becomes invisible. I think it could be improved in this respect."

The themes and sub-themes developed based on participants' opinions are presented below.

a. Findings related to support services

I. Findings related to academic support services

- Counseling and guidance support: Participants have expressed that while counseling and guidance support are necessary, they need to be provided at a sufficient level and need development. Academic support could also be offered through artificial intelligence-supported virtual assistants or chatbots.
- Program and course information support: Participants indicate that the e-Campus application provides access to courses and materials within the Anadolu University Open Education System and has an academically advanced structure. However, it is also mentioned that there are deficiencies related to some courses.

II. Findings related to non-academic support services

- Communication with student affairs: Participants find the communication established with student affairs adequate and state that offering different types of support is also essential.
- Technology infrastructure for non-academic support: Participants stating that non-academic support is offered over a wide range, including from the office to the Virtual Assistant application, indicate that the technological infrastructure is not sufficient and that the integration of specific technologies, such as artificial intelligence support systems, is necessary. Participants mention encountering various problems in the beta version of the Virtual Assistant, attributing most of these issues to the artificial intelligence's lack of capacity to understand written inputs fully.

b. Findings related to user habits

- Preference for the type of support: Preferences for the kind of support among participants vary from using AOSDESTEK's question-answer feature, Call Center, and Virtual Assistant application, with most users indicating they no longer prefer to seek support from offices. Participants mentioned they would use unmanned support systems like Virtual Assistant more frequently if developed due to the inability to find information on the official website. Users currently using the beta version of the Virtual Assistant prefer calling the Call Center for issues the Virtual Assistant cannot answer and seeking answers through AOSDESTEK's question-answer feature.
- Channel diversity for support: Participants' habit of using the Virtual Assistant via the website and mobile application varies. Those who use computers in their daily lives prefer to use the Virtual Assistant via the web page, whereas those who find using a mobile phone more convenient prefer using the mobile application. Depending on their situation, some users prefer using both the website and mobile application.
- Other experiences for support: Participants generally use assistant and chatbot services similar to Virtual Assistants in the banking and commerce sectors.

c. Findings related to application evaluation

- User experience: Participants report that the Virtual Assistant application cannot answer detailed questions and usually redirects to a link when it does provide an answer, indicating that the application meets basic needs.
- Unmanned support application: Participants mention that communicating with the Virtual Assistant does not give them the feeling of communicating with a human.

d. Findings related to the quality and security of information

- Variety of information: Participants state they need help finding information on various topics such as registration, exemption, graduation, and overseas programs. They also believe that when the Virtual Assistant does not fully understand the keyword, it fails to provide an answer to their question.
- Detail of information: Participants expressed dissatisfaction with the superficial information provided by the Virtual Assistant and the need for more details on some topics.
- Accurate information: When the Virtual Assistant understands the question, participants say it provides correct information, albeit superficial.
- Reliable information: The consistency in responses from the Virtual Assistant is deemed reliable, with participants noting they do not encounter different answers for the same questions due to human factors.
- Personal information security: Opinions vary among participants regarding personal information security. Some are uncomfortable with the personal information requested upon logging into the Virtual Assistant application, while others consider it normal. Some users mention that not asking for sensitive information like the Turkish Republic Identification Number and not performing email verification do not pose a risk to personal information security.

- Personalized information: Participants state that the Virtual Assistant does not provide customized answers to asked questions. Particularly for learners with disabilities, the lack of personalized information poses usage difficulties.

e. Findings related to usability

- Instant and fast responses: Users mention they can receive instant and quick responses to their questions about the Virtual Assistant application, indicating that the application does not make them wait.
- Access to information: Although users state the Virtual Assistant facilitates access to information, it generally redirects to a link instead of providing an answer and explanation for the sought information. However, users who need help finding information on official websites consider the Virtual Assistant a convenient way to access information.
- Language support: The lack of language options other than Turkish in the Virtual Assistant application is seen as a shortfall, suggesting that expanding it to include other languages would benefit academic and non-academic support.
- Ease of use: Users who need clarification about which questions the Virtual Assistant can answer and which keywords to use express difficulties formulating appropriate questions but otherwise do not experience problems.

f. Findings related to design

- Use of animations: Participants indicate they have difficulty finding the Virtual Assistant application due to the design of websites, leading some to expect improvements in animation use.
- Accessible design: Participants mention that the Virtual Assistant application lacks an accessible design for visually impaired users and needs development in this area.
- Aesthetic design: While some participants find the design aesthetic, others believe it could be made more aesthetic.
- Elements that guide the user: Participants identify deficiencies in categorizing scenarios designed in the Virtual Assistant application and suggest that different directions could be provided for topics the Virtual Assistant cannot answer.
- Simple design: Participants appreciate the simplicity of the Virtual Assistant's design.
- Application interface: Participants have varied opinions on the interface of the Virtual Assistant application. Some are uncomfortable requesting information in multiple steps upon entry and believe the interface needs improvement. In contrast, others are satisfied with the dialog-style presentation of responses in the application interface.

Data Integration

In the first phase of the study, users' satisfaction levels with the Virtual Assistant application were calculated based on expectation by subtracting the experience score from the importance score given to the application. Therefore, a lower satisfaction score in terms of expectation implies a higher level of satisfaction compared to the expectation. In other words, as the difference between importance and experience decreases, users experience higher satisfaction according to their expectations. When the quantitative data obtained in the first phase of the research is interpreted together with the qualitative data obtained in the second phase, the following results emerge:

Upon examining the results obtained in the first phase of the research, it is observed that the highest satisfaction level based on expectation is in the design dimension ($\bar{x}$= 0.56). This can be attributed to users not considering the design to be excessively important ($\bar{x}$= 3.84). The average experience score, on the other hand, is at the highest level ($\bar{x}$= 3.28). The user opinions gathered in the second phase of the research support this result. Users perceive design as not crucial, with the primary concern being the smooth functioning of the application. However, despite being content with a simple design, users express an expectation for the application interface to provide a better experience. In this context, although the average experience level in the design dimension is at its highest in the first phase of the research, users are hopeful that they could have a better experience.

The satisfaction level based on expectation in the dimension of information security and quality in the first phase of the research is at an average level ($\bar{x}$= 1.03). According to the first phase of the research, users have experienced the lowest level of satisfaction in the dimension of information security and quality ($\bar{x}$= 2.89). The user comments in the second phase of the research draw attention to the reasons behind these results. Despite the application providing instant and prompt responses, users express negative experiences due to the lack of diversity and detail in information, leading to misunderstandings or inconsistent responses. Additionally, although the initial stage assures users of the confidentiality of personal data, the request for information from users still leads to a negative experience. When the two phases of the research are considered together, it can be said that users desire the Virtual Assistant application to possess features similar to other artificial intelligence-based systems, providing better interaction, understanding messages more accurately, and offering more detailed and accurate responses.

The satisfaction level based on expectation in the usability dimension in the first phase is at the lowest level ($\bar{x}$= 1.07). Despite users attaching importance to the usability of the application ($\bar{x}$= 4.14), the lower level of experience ($\bar{x}$= 3.07) significantly impacts this result. The conclusion that the usability of the application is very important for users is supported by the user opinions in the second phase of the research. Users often find themselves redirected to the website with a single link, despite the application providing quick responses. Consequently, users believe that the application's tendency to redirect rather than directly answering questions reduces the level of satisfaction in meeting expectations. Due to the keyword-based nature of the application, users frequently report that the questions are not understood, requiring the Virtual Assistant to make efforts to understand users' queries rather than users making efforts to understand the Virtual Assistant's responses. Unless messages are composed using words found in the FAQ database, the application cannot answer users' questions, resulting in a lower satisfaction level based on expectation. Additionally, users express dissatisfaction with the application being available only in the Turkish language, further reducing their satisfaction level.

Furthermore, in the second phase of the research, user opinions regarding the Virtual Assistant application were obtained on aspects such as support services (academic support services and non-academic support services), user habits, and application evaluation. Regarding support services, users express satisfaction with non-academic support services, from student affairs to the call center of the Open Education Faculty. However, they find academic support services insufficient. Users expressing dissatisfaction mention the absence of academic counseling in the artificial intelligence-based Virtual Assistant application. Regarding user habits, participants express an interest in artificial intelligence-based support systems but currently resort to using systems such as call centers due to their underdevelopment and insufficient human-machine interaction. Concerning application evaluation, users state that the Virtual Assistant application fails to create a human-like feeling, providing responses that are more robotic than expected.

When the data from the first and second phases of the research are combined, it can be concluded that the Virtual Assistant application, which can only provide support related to student affairs and lacks academic support, is a detailed and diverse application capable of providing fast and instant responses but struggles to comprehend messages due to limited natural language processing capabilities. Users who are not expecting much from the design and are satisfied enough still lack adequate satisfaction in terms of information quality and security. The dimension where users have the lowest satisfaction level based on expectation is the usability dimension. While users are eager to see the application developed in line with their expectations, especially during the beta stage, they expect improvements to make it more user-friendly.

Conclusion and Suggestions

The analysis reveals that users' perceived importance of the Virtual Assistant application surpasses their actual experiences, suggesting that the application still needs to meet the high expectations users hold for it. Providing timely, accurate, and reliable information by the Virtual Assistant is deemed crucial for users. Furthermore, the design's compatibility with the AOSDESTEK site has contributed positively to user experience.

Across all examined dimensions—namely, "usability," "quality and security of information," and "design"—the attributed level of importance consistently exceeds the experienced level. Usability emerges as the dimension users ascribe the most significant importance, whereas the design dimension records the highest experienced satisfaction. The research findings indicate a variance in the ranking of importance and satisfaction across different dimensions.

Demographic comparisons suggest that male users' expectations are more likely to be met compared to female users—Age-wise, users aged 35 and over report higher satisfaction in meeting expectations than those under 35. Employed users experience a higher fulfillment of expectations compared to unemployed users. When analyzing by registration status, the satisfaction levels between users registered in the OES and those not are remarkably similar. However, users no longer associated with OES report higher satisfaction than currently registered users. Among users registered in OES, those enrolled based on scores expressed higher satisfaction than those who registered without scores. Degree-wise, undergraduate program users report higher satisfaction compared to those in associate degree programs. Faculty comparisons reveal that users in the Open Education Faculty experience lower satisfaction compared to those in the Economics and Business Faculties, with no marked difference in satisfaction levels between the latter two faculties.

The dimensional analysis concludes that users are "somewhat satisfied" across all dimensions, with the highest expectations and satisfaction noted in the design dimension, followed by the quality and security of the information dimension. The usability dimension ranks lowest in terms of satisfaction relative to user expectations.

The results obtained from the participants' opinions regarding the Virtual Assistant application are provided below.

- Participants find the e-Campus system, which includes electronic books and materials offered in the Anadolu University Open Education System, adequate but believe they need more academic support.
- In the non-academic support dimension, participants mention they can communicate with the institution regarding student affairs issues.
- Participants who no longer frequently visit the office obtain support services according to their questions or problems through the Call Center, AOSDESTEK Question-Answer system, and the Virtual Assistant application.
- Depending on their technology usage preferences, participants use the Virtual Assistant application through websites and mobile applications.
- Participants generally use applications similar to The Virtual Assistant in the banking and commerce sectors.
- According to participants, the Virtual Assistant needs to provide detailed answers, and the responses must be more superficial.
- Participants note that the Virtual Assistant often redirects to a link instead of answering questions.
- For participants who need help finding the information they seek on the institution's website, the Virtual Assistant facilitates access to information despite often providing links instead of answering most questions.
- Participants believe the information provided by the Virtual Assistant is accurate and reliable.
- While some participants have doubts about the security of personal information in the Virtual Assistant application, others have no such concerns.
- According to participants, the Virtual Assistant application lacks the feature to provide personalized answers.
- For participants, the Virtual Assistant delivers instant and fast responses.
- Participants expect the Virtual Assistant application to include multiple languages.

- Users who generally do not struggle with the application face difficulties formulating questions so the Virtual Assistant can respond.
- Some participants say the Virtual Assistant application is inaccessible for visually impaired students.
- Participants found the design of the Virtual Assistant application to be aesthetic and straightforward.
- Some participants need help to obtain information on specific topics due to the absence of elements that guide them in the Virtual Assistant application.
- Participants with differing views on the interface of the Virtual Assistant application express discomfort with the requested information needing to be collected in a single step upon entry. Some are satisfied with the display of responses in a dialog format.

The study aimed to assess user satisfaction with the Virtual Assistant application, juxtaposed against their expectations. Since its Beta release on November 11, 2022, there has been a notable uptick in user engagement and system interactions. Despite this, satisfaction levels, as inferred from user data, suggest that the application's performance, particularly its comprehension of user inputs and response adequacy, remains to be fully aligned with user expectations. The feedback underscores a potential for enhancing user satisfaction through targeted improvements, particularly in understanding and responding to user queries more effectively.

The landscape of AI-supported virtual assistants within Türkiye's open education systems is developing, with limited research in the domain. Kayabaş (2010) explored the Cabbar Support application in Anadolu University's Open Education System, identifying user preferences for accessibility, continuous service, and prompt responses, alongside criticisms about the knowledge base and lack of academic counseling capabilities. This study's findings resonate with those observations, underscoring a continuous demand for accurate and timely information.

Pulist (2022) and Xie et al. (2022) contribute to the discourse by emphasizing AI chatbots' potential in open education and the critical role of user-centered design and personalization in achieving user satisfaction. Similarly, Tian et al. (2024) and Hou et al. (2024) highlight the significance of aligning user expectations with experiences, noting that clear communication enhances AI-based application effectiveness. Boubker ((2024) and Kingchang et al. (2024) further corroborate the positive impact of perceived benefits and satisfaction on users' willingness to engage with AI chatbots, pointing to the broader applicability of AI in educational contexts.

This synthesis of findings across studies reveals a consistent theme: the critical importance of meeting user expectations through improved interaction quality, personalized services, and a user-centered approach in AI-supported educational tools. The comparative analysis underscores the need to continuously develop and adapt AI-based support systems to enrich user experience and satisfaction.

Anadolu University operates within a dual-mode educational framework, offering both open education and formal system programs. Despite being registered learners, individuals encounter challenges in locating pertinent information related to the Open Education System while navigating the university's website. Consequently, they may inadvertently conflate such information with details concerning formal academic programs. Furthermore, the website's navigation structure poses difficulties for learners and prospective students, potentially resulting in confusion or disorientation, notwithstanding the inclusion of comprehensive information. Given the independent nature of open and distance learning, learners require remote support during enrollment and throughout their educational journey. However, due to the large volume of learners and limited staff resources, providing personalized one-on-one support appears unfeasible. Hence, the integration of artificial intelligence-driven support systems emerges as crucial in the realm of open and distance education.

Suggestions for practitioners and researchers regarding this study are listed below.

Suggestions for Practitioners

- Investigating learners' expectations for technology could be beneficial if the Virtual Assistant application, with AI support, could provide voice responses for users who prefer to get support by speaking to a Call Center.
- Efforts can be made to ensure users experience high levels of engagement in line with the importance they place on the application.
- The application could offer users alternative answers. If this process is frequently executed for the same question, alternative answers could replace the primary answer.
- Identifying topics where the Virtual Assistant provides incorrect or incomplete information can increase user satisfaction.
- The Virtual Assistant application could be enhanced to offer user-specific content.
- According to learners ' needs, academic support services could be integrated into the Virtual Assistant application, which currently offers non-academic support services.
- Based on learners' needs for academic success, courses, books, and materials on the e-Campus page could be integrated into the Virtual Assistant application.
- The Virtual Assistant could evolve from an application that only responds when a learner asks a question to one that proactively provides information based on the learner's status, reminds essential dates, and alerts related to academic success.
- Higher education institutions with a mass open education system and complex administrative structures could conduct studies to investigate the views of academic and administrative staff on application design before launching applications that affect millions of learners.

Suggestions for Researchers

- Reasons learners choose to use or not use an AI-supported application could be explored.
- A study could compare the views on the Virtual Assistant application and other support services for learners in the Open Education System.
- Studies could be undertaken to determine satisfaction levels according to different parameters.
- Research comparing views on academic versus non-academic support could be conducted.
- The opinions of employees on AI-based support services could be explored.

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Ethics Statement

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Conflict of Interest

The authors do not declare any conflict of interest.

Data Availability Statement

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

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