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Understanding the Attributes of Audiovisual Devices as Predictors of User Satisfaction: A Study of Educational Technology

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Abstract **Original Research Article**

Educational technology has long been integrated into the education system. Both hardware and software have been utilized to enhance teaching and learning. Academic institutions have provided audiovisual devices for classroom instruction to help teachers and students adopt this technology to enhance the quality of content delivery and presentation. However, some factors need to be considered before adopting this technology fully, one of which is the satisfaction of the users. It was in this context that the study was conducted; it aimed to determine which attributes, namely, the functionality, reliability, and adequacy of the audiovisual devices, influence user satisfaction with educational technology. A descriptive and quantitative statistical approach was used to determine the predictors of satisfaction. A self-developed questionnaire was designed to collect the data. Only users of the audiovisual devices were considered in the study, where the purposive random sampling technique was used. To identify the respondents' differences in assessment of the three attributes, the data was treated using the t-test. The linear regression was used to determine the predictors of user satisfaction. The findings showed that the functionality of the TV and the reliability of the LCD projectors are the strongest predictors of user satisfaction. These results can help allocate audiovisual devices to enhance the satisfaction level of teachers and students and eventually improve the quality of teaching and learning.

Keywords: Audiovisual, Functionality, Reliability, Adequacy

INTRODUCTION

Educational technologies play a vital role in effectively delivering instruction to learners and efficiently converting static instructional materials into dynamically engaging content. Teachers use audiovisual devices to replace traditional technology like chalk and board to encourage passive students to get involved and be engaged in classroom activities. Students also use audiovisual devices to enhance their learning experience. Also, the utilization of these audiovisual devices will help build the students' digital literacy skills, preparing them for a technology-driven world.

In an educational environment, the integration of technology, such as audiovisual devices, has transformed the teaching and learning process. It enhanced the accessibility, engagement, and efficiency of instructional content (Scherer et al., 2019). The quality and availability of audiovisual devices like LCD projectors, laptops, and cameras are important in delivering various instructional activities (Fathema et al., 2013). However, the fulfillment of using these devices does not depend solely on the availability but also on the attribute of being functional, reliable, and adequate - factors that can significantly influence the level of satisfaction of users (Holden & Rada, 2011). It is important for educational institutions to understand how the attributes of devices affect the level of user satisfaction to have critical insights to improve resource allocation and optimize the benefits of technology in education (Teo, 2011).

Research on the user's level of satisfaction with educational technology has often been based on the Technology Acceptance Model (TAM) and Expectation Confirmation Theory (ECT) to determine the relationship between user satisfaction and characteristics of technology (Davis, 1989; Bhattacherjee, 2001).

The current study about the user satisfaction level for audiovisual devices referenced the Technology Acceptance Model. The model emphasizes that perceived usefulness and ease of use of educational technology influence user satisfaction and attitude. This can be applied to assess how

attributes of audiovisual devices influence satisfaction in the educational context (Davis, 1989).

Similarly, according to the Expectation Confirmation Theory (ECT), users' expectations are confirmed or disproved, emphasizing how crucial equipment adequacy and dependability are to fulfilling users' expectations for successful educational support (Bhattacherjee, 2001).

Recent studies emphasize the importance and significance of looking into various factors affecting the user satisfaction with educational technology, such as functionality, reliability, and adequacy (Davis et al., 2007; Teo, 2011).

Research indicates that the significance of these attributes may differ based on the role of the users. Teachers and students typically have different needs, requirements, and expectations for the use of educational technology in the teaching and learning process (Holden et al., 2011).

It is in this context that the researchers conducted the study. They seek to identify which factors greatly influence the satisfaction of the users. The results of this study will contribute to a better understanding of how educational institutions optimize technology resources to enhance the teaching and learning process in the university.

REVIEW OF RELATED LITERATURE

The following provides a review of literature relevant to the current study. It explores how the attributes of various devices, specifically functionality, reliability, and adequacy, influence user satisfaction in educational technology. The review is organized thematically to highlight the interrelatedness of these attributes, especially in the context of teaching and learning.

Functionality and User Satisfaction

In most of the research studies conducted about educational technology, one of the critical factors that influence user satisfaction is the functionality of a device. Functionality, which is defined as the ability of a device to perform its intended task effectively, directly influences the users' engagement and perceived usefulness of the technology (Teo, 2011). Studies that used the Technology Acceptance Model demonstrated that functionality enhances the perceived usefulness and perceived ease of use, thereby resulting in greater satisfaction. It was found that when educational technology functions effectively, it better supports instructional goals, which is a crucial factor in influencing teacher satisfaction (Teo, 2011). Likewise, educators' satisfaction increases when technology offers easy-to-navigate interfaces and comprehensive features that align with their pedagogical needs (Scherer et al., 2019). As functionality directly influences users' ability to utilize educational technology effectively, it remains the basis of user satisfaction in an academic setting.

Reliability and Its Effect on Satisfaction

Reliability, defined as the consistency of equipment performance, is another significant attribute influencing user satisfaction with educational technology. Consistent, dependable technology reduces educational disruptions, positively affecting user teaching and learning experiences (Fathema et al., 2013). The Expectation Confirmation Theory offers a framework for understanding the role of reliability. Based on the ECT framework, user satisfaction increases when expectations of performance consistency are met or exceeded (Bhattacherjee, 2001).

Reliability is particularly crucial in educational settings since unpredictable failures can undermine both the teaching process and the student's engagement. Furthermore, reliable equipment fosters confidence in technology, which in turn contributes to a higher level of satisfaction among users. When technology consistently meets user expectations, it minimizes frustration and enhances satisfaction.

Adequacy of Equipment and Resource Allocation

Adequacy, or the extent to which equipment meets the needs of the users, is closely attached to satisfaction, specifically in resource-constrained educational environments. Adequacy goes beyond basic functionality and reliability by addressing whether the available equipment truly supports the intended learning outcomes and operational requirements of a classroom or institution (Davis et al., 2007). Research studies indicate that user satisfaction increases when equipment is perceived as adequate, as this ensures that teachers and students have the equipment necessary to achieve educational goals. Adequate instructional resources also enable educational institutions to maximize the utilization of technology, which positively affects both the quality of teaching and enhances student engagement. This factor often interacts with functionality and reliability, as inadequacy, on the other hand, such as outdated software, can limit functionality and reduce the level of satisfaction.

Understanding adequacy can guide resource allocation decisions, as institutions can focus on providing equipment that meets both basic and advanced instructional needs.

Integrated Impact of Equipment Attributes on User Satisfaction

While functionality, reliability, and adequacy each independently contribute to user satisfaction, they are also interrelated, influencing satisfaction in a cumulative manner. Research suggests that the interplay of these characteristics often determines the overall user experience (Scherer et al., 2019). For instance, even highly functional equipment may fail to achieve user satisfaction if it lacks reliability, as users are

unlikely to feel positive about technology that frequently malfunctions, regardless of its advanced features (Holden et al., 2011). Similarly, functionality and reliability alone may not suffice if the equipment is inadequate for specific educational contexts, as seen when equipment lacks the necessary features or compatibility for a classroom's instructional needs (Davis et al., 2007). Studies emphasize that a holistic approach to technology adoption, one that includes these three factors, can provide a fuller understanding of how educational technology impacts user satisfaction (Scherer et al., 2019).

Role of Theoretical Frameworks in Understanding Satisfaction

Theoretical frameworks such as TAM and ECT are instrumental in contextualizing these audiovisual devices. TAM, with its focus on perceived usefulness and ease of use, has been extensively applied to understand how technology's functionality drives acceptance and satisfaction among educators (Davis, 1989). Similarly, ECT highlights the importance of expectations and confirmation in satisfaction, offering insights into how reliability and adequacy influence user perceptions (Bhattacherjee, 2001). By combining these theoretical perspectives, research can better capture the multi-dimensional nature of satisfaction with educational technology (Teo, 2011).

A comprehensive view of audiovisual devices, explained by frameworks like TAM and ECT, is essential for understanding user satisfaction with educational technology. This perspective not only highlights the individual impact of functionality, reliability, and adequacy but also emphasizes their combined influence in shaping positive or negative user experiences.

IMPORTANCE OF THE STUDY

The utilization of audiovisual devices is one of the major factors in making the teaching and learning process effective and efficient. The integration of these devices enhances how the teachers deliver the instructional content to their students, while the integration of these devices helps the students to be more engaged with the content. It is in this context that the researchers conducted this study; they would like to find the predictors for the satisfaction of the users, specifically, the function, reliability, and adequacy of the devices.

The researchers sought answers to the following specific problems:

1. What is the profile of the respondents in terms of gender and role?
2. How frequently do the respondents use multimedia equipment in teaching and learning?
3. How do the respondents assess the functionality, reliability, and adequacy of the multimedia equipment?
4. How do the assessments compare in terms of respondents?
5. What attributes influence the satisfaction level of the respondents?

MATERIALS AND METHODS

The study used the descriptive and quantitative design to examine the frequency of use, the assessment of the functionality, reliability, and adequacy of the audiovisual devices, and the predictors influencing user satisfaction with educational technology. Using a purposive random sampling technique, data was collected from teachers and students, particularly those using audiovisual devices in their teaching and learning at Centro Escolar University. The survey was conducted in the second semester of the school year 2023-2024 with a target sample size of 492.

A survey questionnaire was developed to assess the attitudes toward the audiovisual devices and to identify the predictors of user satisfaction. The questionnaire was divided into four parts:

Part 1: Respondent's Profile—respondents were asked about their role, teacher or student, age, and frequency of audiovisual device use.

Part 2: Functionality Assessment—respondents rated the functionality of the audiovisual devices on a Likert scale from 1 (very poor) to 5 (very good), reflecting how well the device performed in the educational setting.

Part 3: Reliability Assessment—respondents rate the reliability of the same devices on a Likert scale from 1 (very unreliable) to 5 (very reliable), assessing the consistency in performance.

Part 4: Adequacy and Satisfaction—respondents rated their perception of the device's adequacy and overall user satisfaction. The ratings were similarly collected, using 1 (very inadequate) to 5 (very adequate) and 1 (very dissatisfied) to 5 (very satisfied), respectively.

To check the reliability of the self-developed questionnaire, it was given to 15 respondents, which allowed for adjustments to ensure clarity, face validity, and internal consistency. The different sections of the questionnaire underwent Cronbach's alpha reliability test and resulted in 0.82, which is interpreted with good internal consistency.

The collected data from the respondents underwent statistical analysis; descriptive statistics were used for the frequencies, means, and standard deviations for the respondents' profiles and the ratings for functionality, reliability, adequacy, and satisfaction. The linear regression was used to determine the extent to which functionality, reliability, and adequacy

predicted user satisfaction. This process enabled an understanding of how each of the attributes of the audiovisual devices independently and collectively predicted user satisfaction. Lastly, the t-test was used to compare any differences between the perception of the teacher and student of attributes of the audiovisual devices and satisfaction level.

All analyses were conducted at a significance level of 0.05, with results presented in tables and interpreted based on the statistical output.

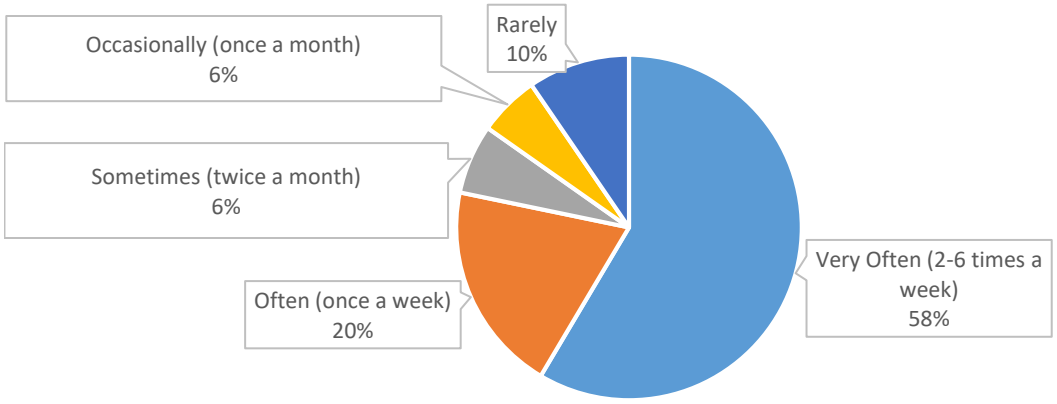
RESULTS AND DISCUSSION

The respondents of the study are users of audiovisual devices in teaching and learning. Both teachers and students from all branches of the Centro Escolar University – Manila, Makati, and Malolos were considered for this research. The survey was conducted during the second semester of school year 2023-2024. A total of 492 respondents answered the survey, from which, 81 or 16.50% were teachers and 411 or 83.50% were students. The study also showed that the majority, or 70.7% or 348, were female, while the remaining 29.30% or 144 were male. The survey was conducted on all campuses of Centro Escolar University, but the location was not considered in the study, as the researchers would like to get general results from the university.

The researchers looked at the frequency of use of the audiovisual and multimedia equipment. The descriptive analysis showed that the computed mean frequency of use was 4.12 with a standard deviation of 1.31. The mean value indicated that most respondents reported a relatively high frequency of use closer to “Often and “Very Often.”

Chart 1 shows the details of the frequency of use of the audiovisual devices. The results showed that a significant majority of the respondents, 58.5% or 288 very often (2-6 times a week), followed by 19.70% or 97 often (once a week), use the equipment. These two results indicate that the utilization of audiovisual devices is already part of their delivery of instruction for teachers and instructional support for students. On the other hand, there were fewer respondents: 6.5%, or 32, sometimes or twice-a-month use; 5.7%, or 28, occasionally or once a month use; and lastly, 9.6%, or 47, rarely use the equipment. These respondents may have their own devices that need not be borrowed from the Teaching and Learning Technology Department or Section.

Chart 1
Frequency of Use of Audiovisual Devices



The combined moderate to low frequency of use makes up only 21.8% of the response. This suggests a low number of respondents engage with the devices infrequently. The results show a clear pattern of very high utilization or engagement, with most of the respondents interacting with the devices multiple times a week.

Table 1 shows the respondents' assessments of the audiovisual devices' functionality. The LCD projector was assessed to have a high mean of 3.64 and a low standard deviation of 1.25, indicating its functionality consistently performs well. The TV also showed a high mean of 3.5 and a moderate standard deviation of 1.37, suggesting that it generally has good functionality with some variability. The LCD projector and the TV stand out as the best-rated items; they suggest consistent positive experiences among most users. The laptop, microphone, and portable speaker were assessed to have a moderate mean of 3.35, 3.28, and 3.05, respectively. This implied inconsistent functionality, sometimes good, sometimes neutral.

Table 1. Assessment of Functionality of Audiovisual Devices

Devices	Mean	Std Dev	Descriptor
Laptop	3.35	1.62	Neutral to Good
LCD Projector	3.64	1.25	Good
TV	3.5	1.37	Good
Karaoke	2.2	1.81	Poor
Portable Speaker	3.05	1.70	Neutral to Good
Microphone	3.28	1.57	Neutral to Good
CD MP4 Player	2.4	1.83	Poor to Neutral
Document Camera	2.8	1.83	Neutral
Webcam	2.66	1.84	Poor to Neutral
Digital Video Camera	2.73	1.84	Poor to Neutral

The remaining equipment, namely: document camera (x=2.8), digital video camera (x=2.73), Webcam (x=2.66), CD MP4 Player (x=2.4), and Karaoke (x=2.2) resulted in poor to neutral functionality. These items show a high standard deviation, indicating that the users assessed the equipment differently. The users' knowledge of how to operate these devices may have contributed to the poor to neutral results.

Table 2 provides the assessment of the reliability of various audiovisual equipment. By analyzing the mean and the standard deviation, we gain valuable insights into the reliability of this equipment in supporting instruction inside the classroom. The LCD projector resulted in a high mean of 3.77, indicating reliable to very reliable performance, and a low standard deviation of 1.22, showing that the users have similar equipment assessments. The TV also showed a high mean of 3.62 but resulted in a moderate standard deviation of 1.34, suggesting a reliable performance but with some variability from the assessment of the users. Equipment that was assessed as neutral to reliable were the laptop (x=3.45, SD=1.56) and microphone (x=3.35, SD=1.52), which have a moderate mean and a moderate standard deviation, respectively—indicating that the equipment is sometimes reliable and sometimes neutral, with some variability in the assessment of the users. The karaoke, CD mp4 player, document camera, webcam, digital video camera, and portable speaker were assessed to be unreliable to neutral equipment. These equipment showed low mean and high standard deviation, implying inconsistent performance and significant variability. This suggests that the users have widely varying experiences with these devices, resulting in inconsistent reliability. Several factors may be attributed to this, namely the frequency of use, the age of the equipment, maintenance, and user proficiency of use.

Table 2. Assessment of Reliability of Audiovisual Devices

Device	Mean	Std Dev	Descriptor
Laptop	3.45	1.56	Neutral to Reliable
LCD Projector	3.77	1.22	Reliable to Very reliable
TV	3.62	1.34	Reliable
Karaoke	2.3	1.81	Unreliable
Portable Speaker	3.12	1.67	Neutral
Microphone	3.35	1.52	Neutral to Reliable
CD MP4 Player	2.45	1.82	Unreliable to Neutral
Document Camera	2.82	1.79	Neutral
Webcam	2.75	1.82	Neutral
Digital Video Camera	2.79	1.81	Unreliable

Table 3 presents the adequacy ratings of various audiovisual equipment based on the respondents' assessments. The LCD projector again rated the highest among all the equipment, with a mean score of 3.83. The respondents found the number of available LCD projectors adequate.

While equipment like laptops (x = 3.55), TVs (x = 3.65), portable speakers (x = 3.16), and microphones (x = 3.4) have neutral ratings, suggesting the feedback of the respondents may come from different experiences with the use of this equipment. Equipment like karaoke (x=2.42), CD mp4 players (x=2.56), document cameras, (x=2.84), webcams (x=2.81), and digital video cameras (x=2.87) were generally inadequate. This may be attributed to the fact that respondents do not commonly use this in the teaching and learning process.

Table 3. Assessment of Adequacy of Audiovisual Devices

Equipment	Mean	Std Dev	Descriptor
Laptop	3.55	1.57	Neutral
LCD Projector	3.83	1.23	Adequate
TV	3.65	1.39	Neutral
Karaoke	2.42	1.83	Inadequate
Portable Speaker	3.16	1.68	Neutral
Microphone	3.4	1.53	Neutral
CD MP4 Player	2.56	1.86	Inadequate
Document Camera	2.84	1.81	Inadequate
Webcam	2.81	1.83	Inadequate
Digital Video Camera	2.87	1.83	Inadequate

Overall, the data provides a comprehensive view of the various audiovisual equipment in terms of the attributes, namely functionality, reliability, and adequacy. Among the equipment, the LCD projector stands out across the three attributes. It has the best combination of high mean for functionality (x=3.64) and adequacy (x=3.83), suggesting that from these two attributes, they meet the respondents' expectations and perform reliably. The TV is another piece of equipment that fares well regarding functionality and adequacy, with mean scores of 3.5 and 3.65, respectively. Contributing to this result is the fact that almost all the rooms have TVs installed. The laptop was rated as neutral to good for functionality and adequacy; this may be because of the inconsistency of laptop models that contributed to respondents' expectations not being fully met. The remaining pieces of equipment, which were rated low, may suggest a variety of factors contributing to the respondents' feedback: age of equipment, maintenance, and respondents do not know how to use them.

Table 4 shows the comparison of the three attributes—functionality, reliability, and adequacy in terms of teachers and students. The functionality attribute showed no significant difference between the teachers and students. Both groups perceived functionality as similar, with no significant variation in their ratings. In contrast, the reliability attribute showed significant differences between the two groups.

Table 4. Comparison of the Attributes of Audiovisual Devices in terms of Respondents

Attribute	Group	N	Mean	Std. Deviation	t-test	p-value	Remark
Functionality	Teacher	81	2.42	2.07	-2.01	0.076	NS
	Student	411	2.86	1.75			
Reliability	Teacher	81	2.49	2.06	-2.24	0.049	Sig.
	Student	411	2.98	1.73			
Adequacy	Teacher	81	2.36	2.01	-3.7	0.001	Sig.
	Student	411	3.16	1.73			

The students perceived the audiovisual devices to be reliable compared to teachers. It may be because teachers often use the devices in teaching and may encounter problems while using them, unlike students, who borrow when they need to present activities and not all the time. Similarly, the adequacy attribute showed significant differences between the two groups. Teachers perceived the audiovisual devices to be inadequate. They tend to perceive this may be because there are times when no more devices are available.

Table 5 presents the results of the current study investigating the attributes influencing user satisfaction with audiovisual devices at the higher education level, focusing on these three attributes: functionality, reliability, and adequacy. The linear regression analysis revealed several noteworthy findings, providing insights into the predictors of user satisfaction.

The attributes that resulted as significant predictors of user satisfaction are, first, the functionality of TV (beta=0.28, sig=0 <.001), which has the largest positive impact on user satisfaction among all predictors. This can be attributed to the frequent use of the device, which is the primary device used for the teaching and learning process. The functionality (beta=0.14 and sig.=0.037 <0.05) and reliability (beta=0.19 and sig.=0.035 <.05) attributes of LCD projectors showed a small but statistically significant positive impact on satisfaction. This result showed that visual devices play a significant role in shaping user experience due to their function of delivering instruction and multimedia presentation.

Table 5. Attributes of Audiovisual Devices Predicting the User Satisfaction

	Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.	Remark
Functionality – LCD Projector	0.09	0.05	0.14	2.09	0.037	Sig.
Functionality - TV	0.17	0.04	0.28	3.8	0	Sig.
Functionality – Portable Speaker	0.1	0.06	0.21	1.88	0.061	Not Sig. but near sig.
Reliability – LCD Projector	0.13	0.06	0.19	2.12	0.035	Sig.

The device that resulted as a borderline or near-significant predictor is the functionality of the portable speakers (beta=0.21 and sig.=0.061>.05). This attribute of the device may have little influence on the satisfaction but did not meet the threshold of less than 0.05 for statistical significance. This can be attributed to users not frequently using the device, as reflected in the mean result of the device, which resulted in neutrality for the three attributed users. Most other predictors, including adequacy and reliability of less utilized devices, did not demonstrate a significant relationship with user satisfaction.

FINDINGS

1. Both teachers and students use audiovisual devices 2 to 6 times a week, which is very often used to enhance teaching and learning.
2. The respondents perceived that the functionality of LCD projectors and TVs is good, reliable, and adequate.
3. Comparing the assessments of both respondents, their perceptions of the devices' functionality are the same. However, when it comes to reliability, students see the devices as more reliable, and they hold a more favorable view of their adequacy than teachers do.
4. The functionality of the TV is the strongest predictor of user satisfaction, followed by the reliability of LCD projectors. At the same time, it also showed a near-significant effect on user satisfaction with the functionality of a portable speaker.

CONCLUSION

Based on the findings, the following conclusions were drawn:

1. Across all device attributes, students had a higher mean score than teachers.
2. Differences in perception of the functionality and reliability attributes are statistically significant, suggesting different user experiences and expectations on the devices of the two groups.
3. The TV and the LCD projector have critical roles in enhancing the overall user experience since these devices have a significant influence on the satisfaction of teachers and students.

RECOMMENDATIONS

Based on the findings, the following recommendations are offered:

1. As TVs and LCD projectors are the strongest predictors of user satisfaction, prioritize their deployment in classrooms or venues requiring frequent visual presentations and interactive sessions.
2. Ensure a balanced distribution of devices based on usage demands and user population in each branch to optimize accessibility.
3. Develop accessible, easy-to-follow guides and video tutorials for users on the proper setup of audiovisual devices.
4. Establish clear guidelines and policies for device allocation based on usage needs to ensure the most effective and reliable devices are available in high-demand areas.

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