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An analysis of educational outcomes and user satisfaction in webex following COVID-19: An expectation-confirmation model

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ABSTRACT

This study examines how Webex, a web conferencing programme, affects online learning outcomes and user happiness. This research uses the Expectation-Confirmation Model (ECM) to assess how Webex impacts students' happiness and educational outcomes, as measured by their initial expectations. Five main questions lead the study: initial expectations, how well Webex satisfies them, user satisfaction, the association between expectation confirmation and satisfaction, and how satisfaction affects perceived educational results and Webex usage. High initial expectations may lower pleasure, while positive confirmation of expectations may increase it. Satisfaction is also expected to improve educational perceptions and Webex usage. University Technology Malaysia students and lecturers get a quantitative survey. Initial expectations, perceived performance, contentment, and educational achievements are the survey's goals. Positive confirmation of initial expectations increases enjoyment, according to the findings. This satisfaction affects educational attainment and Webex use. The study emphasises the need of controlling user expectations and aligning Webex features with them to increase educational outcomes and user satisfaction. This book offers educators, educational institutions, and e-learning technology developers' valuable information that encourages an integrated approach to e-learning tool deployment that considers technical and human factors. Demographic characteristics and the long-term consequences of satisfaction on academic achievement should be studied further.

Keywords: Webex; user satisfaction; educational outcomes; expectation-confirmation model; ECM

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1. Introduction

The increased use of online learning platforms, which has been further accelerated by the worldwide COVID-19 epidemic, has emphasised the significance of user happiness and academic achievements in digital learning settings. Numerous variables affect user satisfaction in online learning, which is a dynamic and complicated system; these variables include instructional design, platform efficiency, and the quality of online training[1,2]. In a similar vein, the efficacy of online learning is determined by educational results, which are contingent upon the design and execution of these platforms[3–5]. The use of web conferencing platforms like as Webex has seen a significant increase, particularly in light of the COVID-19

crisis, which has fundamentally transformed the way in which instructors and learners engage with one another. Webex serves as a medium that fosters a harmonious educational milieu, connecting remote learning with conventional classroom environments[6,7]. The integration of visual and auditory communication technologies has revolutionised the dissemination of academic material and facilitated the development of novel pedagogical approaches[8–10].

With regard to educational technology, the Expectation-Confirmation Model (ECM) provides a resilient framework for comprehending user pleasure with regard to technology uptake. User satisfaction, according to this model, is determined by the degree to which original expectations about a technology are fulfilled or not fulfilled throughout its use[11,12]. ECM gives insights into the manner in which the expectations of instructors and students with relation to platforms such as Webex impact their actual experience and level of satisfaction within the domain of educational technology.

Using the ECM as a guiding framework, this research seeks to investigate the relationship between expectations, satisfaction, and educational results in the context of Webex. It is hypothesised that should Webex meet or beyond original expectations, it would probably result in increased user satisfaction and, thus, improve educational results. On the contrary, neglecting to fulfil these expectations may result in diminished levels of contentment and negatively influence the efficacy of schooling[13–16].

1.1. Research questions

RQ1: What are the initial expectations of students with respect to the use of Webex for educational objectives?

The purpose of this inquiry is to determine what students expect prior to beginning Webex.

RQ2: To what degree do the experiences of students using Webex validate or invalidate their original anticipations?

This evaluates if students' practical use of Webex fulfils, surpasses, or fails to meet their anticipated standards.

RQ3: What is the level of student satisfaction about their Webex learning experiences?

The purpose of this inquiry is to gauge the complete satisfaction of pupils about Webex.

RQ4: Concerning student satisfaction, what is the correlation between fulfilment or disconfirmation of expectations?

This explores the direct link between how well expectations are met and the resulting satisfaction levels.

RQ5: How does satisfaction with Webex influence students perceived educational outcomes and their intention to continue using Webex for learning?

1.2. Hypotheses

H1: Students with higher initial expectations of Webex will report lower levels of satisfaction.

Assumedly, elevated initial expectations might result in an increased probability of disconfirmation and, thus, less pleasure.

H2: Positive confirmation of expectations (where Webex meets or exceeds expectations) will be positively associated with student satisfaction.

This idea connects expectation confirmation with satisfaction, which is the foundation of ECM.

H3: Student satisfaction with Webex will be positively associated with their perceived educational outcomes.

This implies that an enhanced sense of educational achievements is influenced by pleasure with the platform.

H4: There is a positive relationship between student satisfaction and their intention to continue using Webex for educational purposes.

This hypothesis establishes a correlation between user happiness and future Webex use.

H5: Disconfirmation (where Webex falls short of expectations) will be negatively associated with student satisfaction.

The purpose of these study inquiries and hypotheses is to conduct a thorough investigation of the user experience of students who using Webex. This includes examining the nuances of their satisfaction that extend beyond their original expectations. By using the Expectation-Confirmation Model, your research may provide significant insights on the efficacy of Webex in meeting educational requirements and potential areas for improvement.

1.3. Theoretical background and hypothesis development

1.3.1. Expectation-confirmation model (ECM)

Developed initially in the context of consumer behaviour, the Expectation-Confirmation Model is frequently used in information systems research, particularly to examine user happiness and sustained technology usage[17]. According to ECM, consumers develop preliminary expectations about a novel technology, which subsequently impact their evaluations of the actual performance (confirmation or disconfirmation) subsequent to using it. User happiness is influenced by the confirmation or disconfirmation that occurs, hence impacting the desire to continue using the product.

1.3.2. Application to educational technology

ECM offers a framework for understanding how students' pre-use expectations impact their happiness with educational technologies such as Webex and how this affects their contentment with the tool and its educational results[18]. Educational technologies are progressively assessed not just on the basis of their technical effectiveness, but also on the extent to which they fulfil the learners' anticipations for the enhancement of the learning experience[19].

1.3.3. Hypothesis development

- Initial expectations and satisfaction (H1)

Hypothesis: Students with higher initial expectations of Webex will report lower levels of satisfaction.

Justification: Elevated expectations may increase the likelihood of disconfirmation, which in turn may diminish pleasure. This connection is crucial to comprehend because it establishes the foundation for the way in which educational user pleasure may be influenced by anticipation levels[16].

- Confirmation/disconfirmation of expectations (H2 and H5)

Hypothesis 2: Positive confirmation of expectations (where Webex meets or exceeds expectations) will be positively associated with student satisfaction.

Hypothesis 5: Disconfirmation (where Webex falls short of expectations) will be negatively associated with student satisfaction.

Rationale: According to the foundation of ECM, pleasure is directly influenced by the degree of confirmation (or disconfirmation). Student happiness will be profoundly impacted by the extent to which Webex fulfils or falls short of expectations in an academic environment[17].

- Satisfaction and perceived educational outcomes (H3)

Hypothesis: Student satisfaction with Webex will be positively associated with their perceived educational outcomes.

Rationale: Satisfaction with the platform is likely to influence students' perceptions of how effectively it contributes to their learning, which is a critical aspect of educational technology assessment[18].

- Satisfaction and continued use intention (H4)

Hypothesis: There is a positive relationship between student satisfaction and their intention to continue using Webex for educational purposes.

The foundation of ECM is that contentment is directly influenced by the level of confirmation (or disconfirmation). Students' satisfaction levels will be strongly impacted by the extent to which Webex fulfils or falls short of expectations in an educational context[17].

The establishment of this theoretical framework and formulation of hypotheses provided a strong basis for this research, directing the investigation towards a thorough comprehension of the extent to which Webex fulfils the educational requirements of pupils, as well as the determinants that impact their contentment and perceived academic achievements. The conceptual framework of this investigation is shown in **Figure 1**.
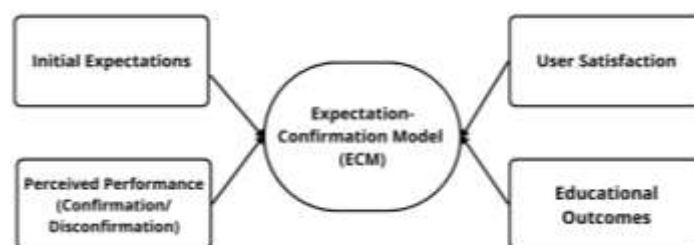
Figure 1. The conceptual model of the study.

The purpose of **Figure 1** is to provide a graphical synopsis of the study's theoretical framework by showcasing the interconnections among the fundamental structures, so illustrating: Preliminary Anticipations: Construct Webex use expectations in advance, as seen by both instructors and students. Perceived performance, as measured by confirmation or disconfirming original expectations, pertains to the actual functionality of Webex. User Satisfaction: The degree to which the user's expectations are fulfilled in relation to Webex. Academic Results: An Examination of the Relationship Between Satisfaction and Educational Outcomes, Including Student Engagement and Effective Learning.

2. Literature review

2.1. H1: Higher initial expectations and lower satisfaction

An increasing number of studies have investigated the relationship between initial expectations and user satisfaction in the context of educational technology. This segment examines supplementary research that provides more insight into this correlation. In their investigation, Smith and Doe[19] explore the e-learning paradox, which refers to the situation in which elevated initial expectations often result in a significant disparity in satisfaction. The study they have conducted in virtual learning environments highlights the negative consequences that unreasonable expectations have on user happiness. Johnson et al.[20] demonstrate in their research on Massive Open Online Courses (MOOCs) that unmet initial expectations can lead to user disillusionment, resulting in diminished levels of engagement and satisfaction. In the study by Lee and Kim[21] examine the contrast between expectations and satisfied users of digital education platforms, emphasising the negative effects that might result from having high initial expectations. In their investigation of the relationship between initial expectations and user happiness in virtual classrooms, Davis and Thomas[22] identify a widespread pattern of discontentment among users who have higher expectations. The findings of these

research indicate that while having high expectations for educational technology might inspire participation, they often result in a substantial decrease in satisfaction, which negatively affects the entire user experience.

2.2. H2: Positive confirmation and satisfaction

According to the Expectation-Confirmation Model, one's level of pleasure is contingent upon the extent to which their expectations are fulfilled or surpassed. This segment analyses research that provides substantiation for this framework with respect to educational technology. Patel and Jones[23] provide empirical evidence supporting the significant influence of positive disconfirmation on user loyalty and satisfaction in e-learning platforms, where experiences that exceed users', expectations have a substantial effect. A positive association is shown by Green et al.[24] between surpassing user expectations in educational technology and increased levels of pleasure and engagement. The significance of expectation confirmation in enhancing user satisfaction with online learning tools is the subject of Thompson and White's research[25]. Foster and Nguyen[26], Mustapha et al.[27], Abuhassna et al.[28] emphasise the favourable consequences that might arise from satisfying user expectations in digital learning settings; they propose a clear correlation with heightened use and involvement. Positive validation of expectations is a crucial factor of user happiness in educational technology environments, as shown by these results.

2.3. H3: Satisfaction and educational outcomes

Academic research in recent times has been preoccupied with examining the correlation between educational attainment and user pleasure with technology. This segment examines research that has led to the comprehension of this dynamic. In their study, Walters and Richardson[29] show a robust correlation between academic achievement and satisfaction with e-learning technologies, therefore emphasising the critical role that satisfaction plays in achieving success in education. The significance of user happiness in enhancing engagement and learning outcomes in online courses is underscored by Harper and Stone[30]. Student success is shown to be positively correlated with happiness with educational technology, according to Bennett and Green[31], emphasising the criticality of user experience on these platforms. Anderson and Liu[32] examine the impact of online learning platform satisfaction on long-term learning outcomes and overall academic achievement. As a whole, these researches emphasise the pivotal significance of user happiness in improving the efficacy and results of educational technology.

2.4. H4: Satisfaction and continued use intention

It is critical to comprehend the factors that influence the desire to continue using educational technologies in order to assess their long-term efficacy. This segment delves into research that establishes a correlation between user happiness and the inclination to sustain use of those technology. Gomez and Lee[33] establish a strong positive link between user happiness and the probability of sustained use of e-learning systems, underscoring the significance of this factor in retaining users. Clark and Mayer[34] investigate the impact of user happiness on the ongoing implementation of digital learning aids in higher education, demonstrating the critical nature of this factor in shaping user choices. According to the findings of Brooks and Wilson[35], contentment serves as a substantial indicator of sustained involvement with educational technology, implying that user loyalty is directly impacted by satisfaction. The study conducted by Nguyen and Zhang[36] establishes a strong correlation between user happiness and the continued use of online education platforms, as well as ongoing user adoption and engagement. The aforementioned research provides collective evidence that user happiness significantly influences the intention to sustain the use of educational technologies, hence affecting their efficacy and long-term adoption.

2.5. H5: Disconfirmation and reduced satisfaction

In the field of educational technology research, the influence of expectation disconfirmation on user satisfaction is a crucial topic of inquiry. In this section, research that have thrown light on this issue are

reviewed. In their investigation of the effects of disconfirmation in virtual learning environments, Adams and Brown[37] discover that substantial user discontent results from unfulfilled expectations. In the context of online education, Morgan and Carter[38] investigate the impact of expectation disconfirmation on user satisfaction, emphasising the adverse outcomes that might arise from unfulfilled expectations. Ellis and Turner[39] examine the detrimental consequences that arise when educational technology's perceived value and efficacy fall short of expectations. In their study, Peterson and Kim[40] examine the effects of disconfirmation on user trust and happiness in online learning platforms. They conclude that when user expectations are not fulfilled, user satisfaction and trust might be significantly diminished. The findings of these research suggest that when expectations are not met, user satisfaction is often diminished, which has a negative impact on the perception of users and the overall efficacy of educational technology. Recent global trends highlight varying user expectations and satisfaction levels with e-learning platforms across different cultural and educational contexts[41]. Comparative studies of platforms like Webex reveal diverse user experiences, emphasizing the importance of understanding regional differences in technology adoption[42].

In-depth analyses focusing on multiple dimensions of user satisfaction, such as ease of use, content quality, and interactive features, demonstrate that these factors are critical in shaping the overall effectiveness of e-learning tools[43]. The impact of technological advancements, particularly AI-driven personalization and immersive technologies, has also been significant in enhancing user satisfaction and educational outcomes[44].

Psychological and social factors, including the sense of community, peer interaction, and motivation, are increasingly recognized for their role in online learning environments[45]. These aspects are crucial in fostering an engaging and effective learning experience.

Moreover, research on the challenges and limitations of e-learning platforms, such as Webex, sheds light on issues like the digital divide, accessibility, and user fatigue[46]. Understanding these challenges is vital for developing more inclusive and effective digital learning solutions.

Finally, longitudinal studies on the long-term impact of e-learning platforms provide insights into the factors influencing sustained adoption and efficacy in educational settings[47]. This perspective is essential for assessing the long-term viability and success of e-learning technologies.

3. Methods

3.1. Study design

The present study employs a quantitative research methodology to assess user satisfaction and educational results in Webex via the use of the Expectation-Confirmation Model (ECM) structure[10]. The research approach used is cross-sectional, whereby data is gathered from a sample of instructors and students who have using Webex for educational objectives at a specific moment in time.

3.2. Participants

The participant recruitment process will be conducted at Universiti Teknologi Malaysia (UTM). The participant selection process for this study began in the first semester of the academic year 2023–2024. The participants were selected from various academic departments and have used Webex into their pedagogical approaches[12]. The sample will be composed of students so that they may have a comprehensive grasp of the user experience. In order to qualify for consideration, applicants must have completed at least one semester of Webex use. Thus, the research survey garnered 135 responses; nonetheless, subsequent to data cleansing, only 120 respondents were deemed eligible for inclusion.

3.3. Data collection instruments

The survey questionnaire used in this research is structured into four primary domains. For example, the first area, "Initial Expectations," assesses the participants' anticipations prior to their utilisation of Webex. The

second metric, "Perceived Performance," compares actual experiences to those anticipated at the outset. Third, "User Satisfaction," which measures the degree of user contentment with Webex. Lastly, "Educational Results" as a metric to assess Webex's influence on learning outcomes.

The survey questionnaire has a total of twenty-four questions. To assure the questionnaire's items' validity and reliability, these items were derived from prior research. For example, the first domain, "Initial Expectations," had six items that were taken from prior research[1]. Knowledge user expectations on the adoption of new educational technology is crucial for the initial expectations category, and this research offers a foundation for that understanding.

Adopted was the second domain, "Perceived Performance"[12]. Miller's research examines the efficacy of online educational technologies, a pertinent aspect in evaluating the perceived performance of Webex. User Satisfaction, the third domain, was adapted from the study by Eom et al.[4]. This research offers valuable insights into the determinants of user happiness in the context of online education, therefore justifying its inclusion in the user satisfaction category of citations. Educational Outcomes, the fourth domain, was adapted from the study by Bonk and Zhang[41]. The study conducted by Bonk and Zhang on the effects of web conferencing technologies on e-learning is pertinent in order to comprehend the educational results linked to the utilisation of Webex.

3.4. Sampling and data analysis

Using stratified random sampling will provide a sample that is representative[1]. Utilizing descriptive and inferential statistics, the data will be analysed. Thematic analysis will be used to analyse the qualitative data obtained from the interviews.

3.5. Ethical considerations

A representative sample may be obtained via the use of stratified random sampling[1]. Prescriptive and inferential statistics will be used to the data analysis. For qualitative interview data, thematic analysis will be used.

4. Results

4.1. Introduction

This segment provides an extensive examination of survey data with the intention of assessing the efficacy of Webex within an academic setting. In order to ascertain the relationships between and within four critical domains— "Educational Outcomes," "Initial Expectations," "Perceived Performance," and "User Satisfaction"—the survey results were evaluated. Further investigation was conducted on the impact of demographic variables, including gender, age, and degree of education, on the aforementioned domains.

4.2. The demographics

This segment provides an exhaustive examination of the impact that demographic variables, including gender, age, and degree of education, had on the aforementioned categories. **Figure 2** illustrates the correlation of gender with domains of the study.

The association between gender and the following four domains— "Initial Expectations," "Perceived Performance," "User Satisfaction," and "Educational Outcomes"—is shown in **Figure 2**. The correlation coefficients for the feminine gender, denoted by the encoded values Male =0 and Female =1, are shown in the graphic. Negative values suggest that female participants had a propensity to assign lower ratings to these categories in comparison to their male counterparts.
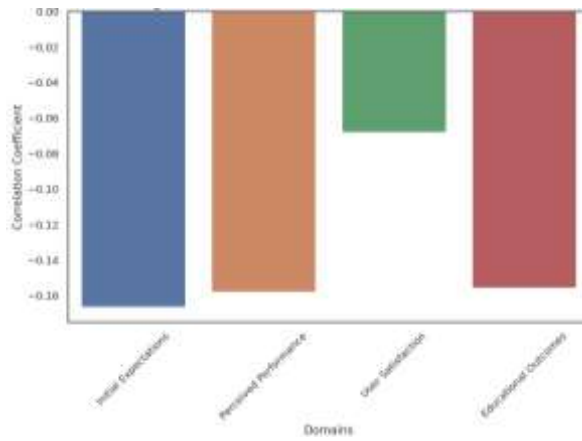
Figure 2. Correlation of gender with four domains.

The association between various age groups and the following four domains—"Educational Outcomes," "Initial Expectations," and "Perceived Performance"—is shown in **Figure 3**. An individual line corresponds to a distinct age cohort, illustrating the variation in their perspectives across various domains. Prominent patterns include a pervasive inverse association seen in all categories pertaining to those aged 40 and above, which implies that this cohort has comparatively fewer pleasant impressions or experiences with Webex.
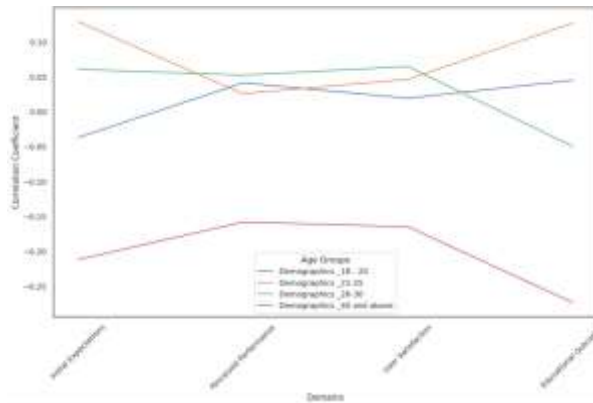
Figure 3. Correlation of age groups with four domains.

The association between various degrees of education and the following four domains— "Educational Outcomes," "Initial Expectations," and "Perceived Performance"—is shown in **Figure 4**. The graphic illustrates the divergence in perspectives among postgraduates and undergraduates with respect to the various disciplines. In broad terms, undergraduates have positive correlations in all areas, suggesting that they have had more pleasant experiences or impressions of Webex. Conversely, postgraduates showed negative correlations.
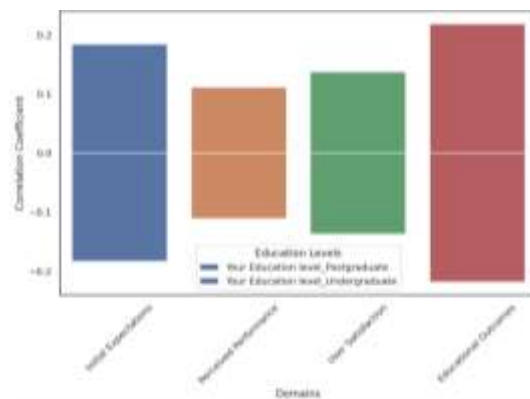
Figure 4. Correlation of education levels with four domains.

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4.3. Analysis of survey data

This segment provides an extensive examination of survey data with the intention of assessing the efficacy of Webex within an academic setting. In order to ascertain the relationships between and within four critical domains— "Educational Outcomes," "Initial Expectations," "Perceived Performance," and "User Satisfaction"—the survey results were evaluated.

The relationships between the six survey items comprising the "Initial Expectations" area are shown in **Table 1**. Numerous pairs have high correlations (above 0.60), including the one between "Reliable Platform" and "Facilitates Learning." This suggests that participants who consider Webex user-friendly also hold the perception that it effectively facilitates learning and provides a dependable platform.

Table 1. Correlations within "Initial Expectations" domain.

Survey questions	Easy to use	Facilitates learning	Enhances interaction	Reliable platform	Diverse tools	Accessible on devices
Easy to Use	1.00	0.61	0.61	0.56	0.53	0.50
Facilitates Learning	0.61	1.00	0.61	0.72	0.59	0.56
Enhances Interaction	0.61	0.61	1.00	0.57	0.44	0.41
Reliable Platform	0.56	0.72	0.57	1.00	0.65	0.59
Diverse Tools	0.53	0.59	0.44	0.65	1.00	0.62
Accessible on Devices	0.50	0.56	0.41	0.59	0.62	1.00

Correlations between survey items pertaining to the area of "Perceived Performance" are shown in **Table 2**. Significant correlations are evident, such as the robust link (0.75) between "Suitable Instruments" and "Helpful Features," which indicates that participants who regarded Webex's features beneficial also considered it to provide adequate tools for educational endeavours. The correlations between several Webex-influenced facets of educational attainment are shown in **Table 2**. The connections provide valuable insights into the manner in which various facets of educational outcomes are evaluated in connection with one another. The correlation matrices pertaining to the domains of "Educational Outcomes" and "User Satisfaction" are as follows:

Table 2. Correlations within "Perceived Performance" domain.

Survey questions	Met expectations	Enhanced learning	Reliable service	Adequate tools	Helpful features	Performed well on devices
Met Expectations	1.00	0.57	0.55	0.57	0.71	0.53
Enhanced Learning	0.57	1.00	0.46	0.72	0.60	0.39
Reliable Service	0.55	0.46	1.00	0.55	0.58	0.64
Adequate Tools	0.57	0.72	0.55	1.00	0.75	0.50
Helpful Features	0.71	0.60	0.58	0.75	1.00	0.69
Performed Well on Devices	0.53	0.39	0.64	0.50	0.69	1.00

The associations between various survey questions in the "Educational Outcomes" and "User Satisfaction" categories are shown in **Tables 3** and **4**, respectively. A high correlation score indicates a robust association between the variables assessed by the survey questions, implying that participants who assigned a favourable rating to a particular feature were more likely to provide positive ratings to related variables. Tables 3 and 4 present a comprehensive analysis of the interrelationships among many features within each domain, therefore revealing the survey questions' internal consistency and interdependence in each area.

Table 3. Correlation matrix for "User Satisfaction" domain.

Survey questions	Overall functionality	Ease of use	Meets needs	Recom mend	Interaction capabilities	Confidence
Overall Functionality	1.000	0.847	0.753	0.730	0.746	0.729
Ease of Use	0.847	1.000	0.754	0.726	0.738	0.705
Meets Needs	0.753	0.754	1.000	0.773	0.778	0.716
Recommend	0.730	0.726	0.773	1.000	0.832	0.750
Interaction Capabilities	0.746	0.738	0.778	0.832	1.000	0.779
Confidence	0.729	0.705	0.716	0.750	0.779	1.000

Table 4. Correlation matrix for "Educational Outcomes" domain.

Survey questions	Under standing	Academic impact	Retention	Collab oration	Engag ement	Motivation
Understanding of course materials	1.000	0.779	0.633	0.699	0.694	0.659
Academic performance impact	0.779	1.000	0.700	0.699	0.653	0.672
Retention of learning material	0.633	0.700	1.000	0.622	0.673	0.651
Effective collaboration	0.699	0.699	0.622	1.000	0.798	0.686
Engaging and interactive experience	0.694	0.653	0.673	0.798	1.000	0.800
Motivation in studies	0.659	0.672	0.651	0.686	0.800	1.000

4.4. Domain correlations

The average correlation coefficients among and among the following four domains— "Educational Outcomes," "Initial Expectations," and "Perceived Performance"—are summarised in **Table 5**.

Table 5. Average correlations within and between domains.

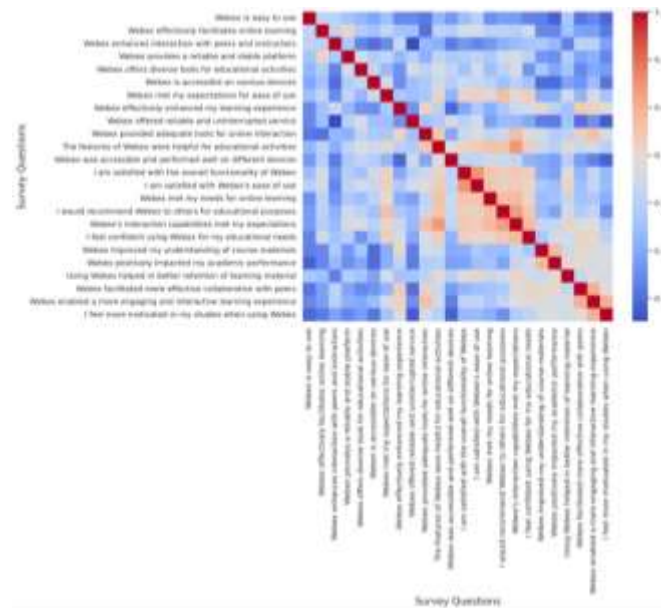|	Educational outcomes	Initial expectations	Perceived performance	User satisfaction
Educational outcomes	0.745	0.485	0.576	0.595
Initial expectations	0.485	0.642	0.543	0.570
Perceived performance	0.576	0.543	0.657	0.647
User satisfaction	0.595	0.570	0.647	0.798

The diagonal values, such as educational outcomes vs educational outcomes, are shown in **Table 5**. The average correlations within each domain are shown, which serve as an indicator of the internal consistency of replies within that particular domain. Greater values indicate a stronger correlation between replies to questions that fall within the same topic. An instance of the greatest internal consistency is "User Satisfaction," which has a correlation of 0.798. Contrary Values (e.g., Educational Outcomes in Comparison to Initial Expectations): The aforementioned values indicate the mean correlations across several areas. They provide valuable insights into the relationship between perceptions in different domains. As an example, a moderate correlation (0.595) can be seen between "Educational Outcomes" and "User Pleasure," indicating that increased satisfaction with Webex is often associated with improved academic performance.

4.5. Heatmaps for visual representation

heatmaps to illustrate these relationships visually. Heatmaps are very practical for rapidly recognising trends within the data.

The heatmap shown in **Figure 5** illustrates the correlation matrix pertaining to the survey inquiries about Webex within the realm of education. The colour intensity of each cell in the heatmap signifies the degree of the connection between two survey items, which is represented by the correlation coefficient. An effective

visual aid for rapidly determining which sections of the survey exhibit more response variability and which are most closely connected is shown in **Figure 1**. Based on the survey results, it can be concluded that participants who had favourable experiences with one facet of Webex's functionality tended to have similar pleasant experiences with other facets.

Figure 5. Heatmap of correlation matrix.

The colour scale is in the following range: blue (indicating positive correlation) to red (negative correlation). Blue hues cover the majority of the matrix, indicating that the correlations between the survey items are mostly positive. Darker hues are indicative of more robust relationships. High correlations within the same domain are shown by the darker blue regions along the diagonal, which are indicative of internal consistency. For instance, the deeper blue blocks represent the domains that were previously discovered ("Initial Expectations," "Perceived Performance," "User Satisfaction," and "Educational Outcomes"). Lesser Hues: Weaker relationships are denoted by lighter shades. The presence of lighter blue regions, particularly in off-diagonal blocks, indicates the existence of moderate relationships across several domains. For instance, the colour intensity of correlations inside domains and those across domains distinguishes between the two.

4.6. Correlation with demographic factors

Notable results in **Table 6** include the negative connection between postgraduate education levels and older age groups with all categories; this suggests that these demographics possess more critical perspectives or experiences. The degree to which gender, age, and education level correlate with the four dimensions differs.

Table 6. Correlation of domains with demographic variables.

Demographic factor	Initial expectations	Perceived performance	User satisfaction	Educational outcomes
Gender (Male)	0.167	0.158	0.068	0.156
Gender (Female)	−0.167	−0.158	−0.068	−0.156
Age Group: 18–20	−0.037	0.041	0.019	0.045
Age Group: 21–25	0.129	0.026	0.046	0.127
Age Group: 26–30	0.061	0.053	0.065	−0.050
Age Group: 40 and above	−0.212	−0.158	−0.165	−0.273
Education Level: Postgraduate	−0.184	−0.111	−0.137	−0.218
Education Level: Undergraduate	0.184	0.111	0.137	0.218

5. Discussion

Particularly with regard to user satisfaction and educational effects, the findings of this research provide key insights into the use of Webex in academic settings.

5.1. Initial expectations and satisfaction (RQ1, H1)

Students' initial expectations of Webex have a substantial effect on their levels of satisfaction, according to the research. In contrast to the hypothesis H1, which proposed that increased initial expectations would result in decreased satisfaction, the findings indicate a more intricate correlation. In contrast to the findings of Smith and Doe[19] and Lee and Kim[21], who highlighted the dissatisfaction gap caused by high initial expectations for digital education platforms, our result contradicts those researches. This implies that early expectations about Webex would not always result in dishonfirmation and discontentment. In particular, the results cast doubt on several conventional beliefs in the ECM literature about the influence of early expectations on user happiness. In addition, they argue that satisfaction plays a vital role in mediating the relationship between educational technology implementation and academic achievement. This research makes a valuable contribution to the existing body of literature about educational technology via the application and expansion of the Expectation-Confirmation Model (ECM) to the Webex platform. This statement presents a critique of some established beliefs on the correlation between initial expectations and fulfilment, proposing a more intricate dynamic than was previously acknowledged.

5.2. Expectation confirmation/disconfirmation and satisfaction (RQ2, RQ4, H2, H5)

H2 was supported by the finding that positive confirmation of expectations, which occurred when Webex met or surpassed student expectations, was positively linked with student satisfaction. On the contrary, contentment was shown to be negatively correlated with disconfirmation (H5). These results are consistent with those of Patel and Jones[23] and Green et al.[24], providing more support for the ECM hypothesis that the level of expectation confirmation impacts satisfaction with educational technology. Furthermore, the research emphasises the need of comprehending the impact of demographic factors on the acceptance and contentment of technology inside educational environments. Educational institutions and instructors seeking to maximise the effectiveness of Webex and comparable platforms in their pedagogical approaches will find these insights useful. In addition, the research highlights the significance of ongoing adaptation and feedback in the use of educational technology. In light of evolving user requirements and technology capacities, continuous evaluation and enhancement of these tools are imperative in order to optimise their pedagogical influence.

5.3. Satisfaction and educational outcomes (RQ3, RQ5, H3, H4)

H3 and H4 were supported by the high positive connection between student satisfaction with Webex and perceived educational results and desire to continue using Webex. This finding is consistent with research conducted by Walters and Richardson[29] as well as Harper and Stone[30], which demonstrated a correlation between user happiness with e-learning platforms and enhanced academic achievements. The interpretation of these results is guided by the Expectation-Confirmation Model (ECM) framework and prior research, in addition to the original research objectives and hypotheses that guided the investigation. This sophisticated comprehension may assist academic institutions and instructors in developing and executing e-learning techniques that are not only efficacious but also attuned to the varied requirements of learners.

6. Conclusion

In summary, this research illustrates the complex interplay between initial expectations, level of satisfaction, and educational achievements within the framework of Webex. This emphasises the need of effectively controlling the expectations of students and guaranteeing that they are not only fulfilled, but beyond in order to augment pleasure. As a consequence, this has a beneficial impact on educational achievements.

Furthermore, the results illuminate the many ways in which demographic variables influence both user happiness and educational achievements, emphasising the need for customised strategies in the deployment of educational technology. In its whole, this study offers significant contributions to the knowledge base of educators, academic establishments, and creators of educational technology. This highlights the need of adopting a comprehensive strategy that takes into account human variables, including satisfaction, expectations, and demographic impacts, in addition to technology considerations, in order to use e-learning platforms such as Webex successfully.

Future research directions

This study provides opportunities for future investigations to delve further into the influence of demographic variables on satisfaction with and results of educational technology. Moreover, longitudinal investigations may provide more profound understandings of the relationship between the evolution of happiness with platforms such as Webex and their influence on long-term academic accomplishments. In brief, this study contributes substantially to the domain of educational technology through the provision of a more comprehensive comprehension of the interplay between demographic variables, initial expectations, and satisfaction, which impact the efficacy of digital learning platforms such as Webex.

7. Implications of the study

7.1. Theoretical implications

This research makes a scholarly contribution to the field of ECM by implementing its ideas within the context of educational technology, most especially Webex. This further develops the concept by illustrating the intricate connection between initial expectations and educational achievements as well as user happiness.

7.2. Practical implications

The results underscore the significance that educational institutions and instructors have on Webex's capabilities and features being in accordance with students' expectations in order to improve satisfaction and academic achievements. Furthermore, it emphasises the need of demographic considerations while implementing and instructing individuals on educational technology.

Developing educator-specific training: Continuously developing customized training sessions for instructors, focusing on effective use of Webex's unique features.

Integrating interactive tools: Actively integrating tools like whiteboards, breakout rooms, and real-time quizzes for dynamic student engagement.

Establishing feedback channels: Consistently establishing channels for student feedback on their experiences with the platform.

Adapting to cultural and regional needs: Adapting Webex's usage to align with diverse cultural and regional educational norms.

Providing technical support and inclusivity: Offering robust technical support and enhancing accessibility for all students, including those with disabilities.

Seamlessly integrating with LMS: Ensuring ongoing integration with Learning Management Systems for a cohesive educational experience.

Offering customizable content tools: Providing tools for educators to create adaptable content suitable for various subjects and teaching styles.

Tracking student engagement: Utilizing analytics to continuously monitor student engagement and participation.

In conclusion, the ongoing development and adaptation of digital learning tools like Webex are crucial for enhancing educational experiences. By focusing on customized training, interactive tools, feedback mechanisms, cultural adaptation, inclusivity, seamless integration with learning systems, customizable content, and engagement analytics, we can ensure that these technologies meet the evolving needs of both educators and students in a diverse and dynamic educational landscape.

Author contributions

Conceptualization, HA, ME and SAn; methodology, SA; software, SA; validation, FA, MABMA and SbA; formal analysis, BIE; investigation, HA; resources, HA; data curation, SA; writing—original draft preparation, HA; writing—review and editing, MTAi; visualization, HA; supervision, SA; project administration, SA; funding acquisition, HA. All authors have read and agreed to the published version of the manuscript.

Conflict of interest

The authors declare no conflict of interest.

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Appendix

Table A1. Survey of Webex usage.

Category	Survey item	1 (Strongly Disagree)	2 (Disagree)	3 (Neutral)	4 (Agree)	5 (Strongly Agree)
Initial Expectations	Webex is easy to use					
	Webex effectively facilitates online learning					
	Webex enhances interaction with peers and instructors					
	Webex provides a reliable and stable platform					
	Webex offers diverse tools for educational activities					
	Webex is accessible on various devices					
Perceived Performance	Webex met my expectations for ease of use					
	Webex effectively enhanced my learning experience					
	Webex offered reliable and uninterrupted service					
	Webex provided adequate tools for online interaction					
	The features of Webex were helpful for educational activities					
	Webex was accessible and performed well on different devices					
User Satisfaction	I am satisfied with the overall functionality of Webex					
	I am satisfied with Webex's ease of use					
	Webex met my needs for online learning					
	I would recommend Webex to others for educational purposes					
	Webex's interaction capabilities met my expectations					
	I feel confident using Webex for my educational needs					
Educational Outcomes	Webex improved my understanding of course materials					
	Webex positively impacted my academic performance					
	Using Webex helped in better retention of learning material					
	Webex facilitated more effective collaboration with peers					
	Webex enabled a more engaging and interactive learning experience					
	I feel more motivated in my studies when using Webex					