

Microsoft Teams: Improvements on the online collaboration tool

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UX Design Report

ABSTRACT

Microsoft Teams is a commonly used platform for business communication, but it is becoming increasingly popular among students and instructors in the online learning environment caused by COVID-19. With the increasing use of online collaboration software worldwide, improving it to let students effectively complete tasks is necessary and effective. To better understand how users currently use the desktop version of this application, observations and semi-structured interviews were applied in the first study, and user errors and effective suggestions in four tasks were collected. Then to improve the usability of operating this software, a low-fidelity prototype was proposed and evaluated in the second study, and the results showed the problems that users are now facing when completing tasks through the prototype. After analyzing the cost importance table, we now gathered the issues that must be fixed in the low-fidelity prototype, and the recommendations for the high-fidelity prototype and future implementation.

Author Keywords

E-learning platform; User experience; User study; Usability assessment; Interface design prototyping; User-centered design.

INTRODUCTION

Purpose and motivation

To prevent the spread of COVID-19, most schools around the world have been closed and forced to switch to online learning environments. According to UNESCO's data [1], in April 2020, more than 80% of enrolled learners were affected and could only study from home. The learning behavior suddenly changed from face-to-face to online communication. Both students and instructors faced many challenges when adapting to new learning methods while ensuring the quality of online collaboration. For students, learning to use online learning platforms efficiently has become an essential skill. In this type of software, Microsoft Teams Desktop is used by many universities to conduct virtual classrooms and group online cooperation due to distinct reasons, such as compatibility with Microsoft Office suite and platform stability. However, there are still many students who find it confusing to operate the system during daily use, and some designs do not conform to the first

intuition. The purpose of improving the application is to make the application easier to use so that students can complete online learning tasks as efficiently as possible. Since our project is designed for users, our motivation is to find out the main problems they currently face and understand how to effectively help them reduce the learning cost of the operation by the prototype we proposed, to use the software more efficiently.

Study Process

Our work aims to improve the current design of MS Teams Desktop to support convenient and efficient online collaboration. To improve the usability of this application, a variety of user research methods were used throughout the research process. We performed the following four stages to form the final design suggestions.

1. We collected users' current processes and opinions on using the software through observation and semi-structured interviews. Four tasks were designed in common scenarios to understand how the user currently interacts with the application.
2. After obtaining and analyzing user feedback in the first step, we summarized the necessary features that need to be improved, by categorizing user suggestions into themes in the affinity diagrams. Based on the results, we then designed a low-fidelity prototype (LFP) for the three selected features.
3. Based on the proposed low-fidelity prototype, we conducted an evaluation session to understand whether the prototype is easy to use. We asked evaluators to operate the prototype step by step and see if they encountered any difficulties in the process. The cognitive walkthrough is used at this stage to record flaws in the LFP.
4. After collecting data in the evaluation phase, we used the cost importance table to analyze and sort the problems in LFP. Suggestions for final improvements have been generated at this stage for future research.

After conducting the above four stages, the findings and recommendations will be sufficient to guide us to confidently build high-fidelity prototypes in high quality.

BACKGROUND

Improvement work in the field of Designing the elements of UI/UX begins from the fundamentals of UX Design, parts of which are described in the UX book by Harston [2]. Our research aims directly at improving the online learning experience of users of Microsoft Teams Desktop, for which we went through multiple studies that tackled various aspects of the remote learning environment.

Looking at video conferencing and the effects of visibility of speakers and audience concerning the degree of engagement, we understood the importance of placing o certain UI/UX elements on screen [3].

While checking the impact of interactivity on users studying in a remote learning environment, another research adjudged three main principles: convenient access, interpersonal communication, and responsiveness [4]. Through this, we were able to identify and understand that even a simple application when combines the learning experiences of more than one individual, requires a sense of community and sense of belonging. Thus, it needs to be analyzed differently compared to other apps.

We even ideated on the concept of a hybrid classroom [5], where Microsoft Teams can be used as a video conferencing tool while some students attend the class in person as well. This study shows how useful a tool Microsoft Teams can be if utilized in an online learning environment because, in addition to its video conferencing abilities, it can serve as file storage and sharing platform given its close integration with Microsoft Office Suite.

According to the study by Ahmad et al. [6], the study highlights the shortcomings of online learning collaboration platforms from the perspectives of students and faculty. The survey information with about 200 responses provides us with a solid foundation for better design and research on these issues. Some of the main problems that students are dissatisfied with online learning are that they are less helpful in solving problems, insufficient training of tools used in the laboratory, reduced feedback and encouragement in the classroom, and excessive activities. When designing improvements for the Microsoft team, the research results also inspired us to design functions related to laboratories, tasks, and online activities, especially those tasks that require more feedback and encouragement.

THE PROBLEM AND APPROACH

The problem we are tackling is to find ways to improve the user experience aspect of the Microsoft Teams Desktop application, in a way that makes it more accustomed to the online learning environment. Given, the increase in demand and popularity of the online learning environment, Microsoft Teams Desktop has established its place as a mainstay in the education and work industry. However, there are still a lot of

places for improvement, which is the foundation of our problem statement.

The main aspect of this problem is to land at some points of conclusion that would enable us to make the user interaction with the software much simpler. We try to perform this study in a manner that focuses more on the impact of certain design elements and workflows in the application's features on the user's experience. Experiments that include asking participants to perform simple tasks would help us to understand possible user errors and direct feedback in multiple aspects from a user's perspective. By efficiently performing user research and evaluation experiments, in a limited environment, we would gain a deeper understanding of the basic cognitive structure of how users interact with the application. This would further enable us to make important improvements to the user interface in a manner that would improve the application.

Through this study, the main research questions we are targeting are listed below.

1. How users currently use the Microsoft Teams Desktop version in the context of online learning?
2. How can we make the online learning experience better for Microsoft Teams Desktop?
3. Do users find the proposed low-fidelity prototype simple, easy to use, and intuitive?

THE USE OF MICROSOFT TEAMS FOR ONLINE LEARNING

Improving an online learning application requires understanding how users use it to accomplish their goals. Therefore, we examined how users perform tasks in MS Teams and, from that starting point, we made decisions on the features that need to be improved to offer a better user experience.

Contextual Inquiry Process

To better understand how to improve an online learning app like MS Teams Desktop, we wanted to learn how people use it. Therefore, we conducted a first study to answer the following research question: How users currently use MS Teams Desktop in the context of online learning? To answer this question, we selected four relevant tasks in MS Teams to evaluate: *make and record an online presentation, create a new team, create and edit a document, and set up a meeting in a specific time zone*. Therefore, we designed our study as a semi-structured interview with four think-aloud sections. The study process was the following.

1. We welcomed the participant and provided him the instructions.
2. We asked the participants to first perform a task following the thinking aloud protocol. The idea was to listen to the participants' thoughts as they were performing the task. After performing the task, we asked open-ended questions to learn more about their experience doing the task. We repeated this step for the four different tasks.

3. Finally, we asked the participant end-of-study questions to learn about the overall experience using MS Teams and other online learning applications.

It is important to note that while the participants were performing the task, we observed them and recorded these observations using a coding sheet. The same coding sheet was used to record participants' responses to the open-ended questions. We ran the study completely online using Collaborate Ultra and asked the participants to share their screens as they performed the tasks using MS Teams Desktop on their computers. For this first study, we ran 3 interviews with one participant per interview and each of them took between 25 to 30 min.

A semi-structured interview was a suitable study type as it allowed us to have a guideline of questions to ask the participants, and at the same time, it allowed us to ask more questions to elicit participants' feedback when it was necessary. Likewise, the think-aloud protocol was relevant to recognize when a participant was confused or having trouble performing the task.

Results and Discussion

After running the study, we analyzed all the responses and observations collected in the coding sheets. For analyzing that data, we used an affinity diagram as it is a tool to organize ideas into themes. We carried out three stages to produce the final affinity diagram. In the first stage, all the team members wrote down data from the interviews using one sticky note per idea. Once we had transferred all the data to the sticky notes, including the task, the question, and the participant of that idea, we proceeded with the first affinity diagram's iteration. We started with a blank canvas. Each member had its turn to place the sticky note somewhere on the canvas and attempted to create groups by affinity. After we finished placing all the notes on the canvas, we started the second round, which allowed us to rearrange groups/themes to assign a better affinity. We repeated the same process a second time to refine the process and gave a name and description to the themes.

After passing over three rounds to create the affinity diagram, we produced six themes: positive aspects, difficulties encountered, confusions (observations), suggestions for UI, suggestions (hard to implement), and comparisons with other apps, (see Figure 1). However, after feedback was obtained, we narrowed them down to three themes: *positive aspects*, *difficulties encountered*, and *comparison with other apps*.

Positive aspects

The first theme groups all the comments from the participants that mentioned features they like from MS Teams Desktop. The feedback contained in this theme is relevant to understand which features in the application are already good and it is not necessary to change them at this point of time, i.e., it is not essential to change what already works fine for online learning and collaboration. Participants

mentioned that creating a new team in the app is easy "It was simple to navigate to create a new team. I didn't find any difficulties T2, Q1, P1", "Already quite good to create a new team T2, Q3, P2", "I haven't used any other apps that allow me to create teams such as this but from what I used it is already quite good T2, Q4, P3". Likewise, participants liked the app's icons because they help with the navigation "The features that stood out to me is that the user interface is good, the icons and headings are big and you can easily create teams T2, Q2, P2", "I have presented in other than in teams. Icons are better and easier to locate in Teams. T1, Q4, P1". Furthermore, participants provided good feedback when sharing a document in an online meeting or editing a file "On Teams, it is easier to collaborate online and share PowerPoint presentation T1, Q4 P3" and "Good experience on editing shared documents in Teams, gives me a real-time view of who is editing on which line T3, Q2, P1".

Difficulties encountered.

The second theme *difficulties encountered* provided us with ideas of features to improve the app. The information grouped in this theme is vital to meet our general research objective — find ways to improve online learning and collaboration features in MS Teams Desktop. This theme contains participants' comments related to tasks that were hard to perform for them and confusions they had using certain features. Participants stood out difficulty finding the time zone feature when scheduling a meeting "Scheduling was easy but setting time zone was difficult. T4, Q3, P1", "Improve visibility to enter time zone. The button should be right beside the time T4, Q1, P2", "Time zone selection needs to be improved. I had to scroll more to find the time zone. T4, Q4, P3". Likewise, they expressed difficulty finding the recording button "The toughest step was to find the record button. It was hidden with more options T1, Q2, P1", "Instead of under "more option", start recording should be straighter forward in Teams. T1, Q3, P2", "I could not find the record button. They could add a direct button T1, Q1, P2". Participants also expressed confusion when creating a new file in Teams "Clicked the wrong button (+ right next to Files, create a tab) to create a file T3, Q1, P1".

Comparisons with other apps

The third theme is *comparisons with other apps*. This theme groups participants' comments related to what they like best from other online learning and collaboration tools compared to MS Teams Desktop. Most of the feedback was not related to the four main tasks the participants performed, but to give their general opinion of what they would like to improve or change in MS Teams. This theme is also relevant to meet our research objective because it provided us with good ideas from other applications that can improve MS Teams' features. A participant mentioned he likes WhatsApp chat better than MS Teams chat because it does not open chats that he is not ready to read. "My idea of group chat is like WhatsApp; I want to go back to WhatsApp. I can choose when to open a message End of study questions, Question 3, Participant 2 (EndQn, Q3, P2)". Another participant showed

a preference for Slack which has good collaboration features “slack - no improvement. It has many distinctive features like formatting, emojis, schedule meeting just by writing text EndQn, Q3, Q4, P1”.

Suggestions

This first study helped us to learn how the users use and interact with different features on MS Teams Desktop in the context of an online environment. As we discussed before, we observed that there are features that were easy to use for the participants, which indicates there is no necessity for change. On the other hand, we observed that some users had trouble using some other features, which tells us what is essential to fix, (see Figure 2). Additionally, we learned how participants use other online learning applications and what they like from them. The affinity diagram provided us with more clarity to see patterns in the participant’s comments. After we finished the three rounds, we observed three features with relevant room for improvement in MS Teams Desktop to offer a better online learning experience. First, set up a meeting in a specific time zone is a significant feature to improve since the three participants in our study expressed difficulty when performing the task. Additionally, as researchers, we observed how the participants scrolled the screen searching for the time zone feature and took some time to find it. Therefore, we believe it is of great importance to improve it. Second, make and record an online presence is a task that two participants struggled with, especially when finding the recording button. Participants mentioned that they would like to see that feature more accessible because it is becoming more important for online presentation. Finally, the third feature we will improve is to load a default screen when opening the chat window. One participant expressed a preference for other chat applications like WhatsApp over MS Teams because Teams automatically displays the last opened chat every time a user clicks the chat button. This is an undesired action that can be improved for better communication. The prior features were our suggestions for improvement for the second phase of our research.

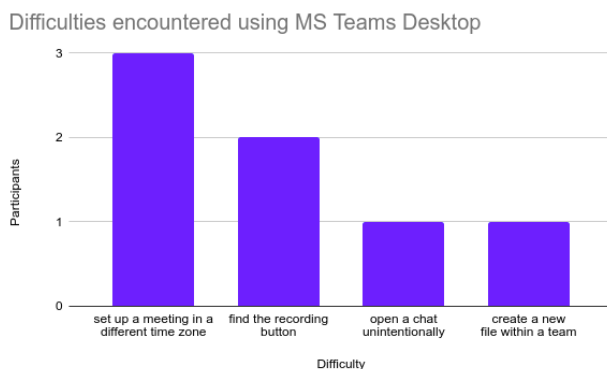


Figure 2. Difficulties encountered using MS Teams Desktop.

PROTOTYPE DESIGN FOR MICROSOFT TEAMS DESKTOP

The results of the first study shed light on the areas of improvement for selected features present in the desktop application. The observations noted by the researchers while the participants were performing tasks, the participant's responses in the interview, as well as the recommendations mentioned by them, formed the basis for our second study. By applying the affinity diagram methodology to the results mentioned above, the relationship between participant responses was identified and visualized. The affinity diagram helped to group the ideas into themes and to select three features to improve. A low-fidelity prototype was designed to evaluate these features. With this second study, we wanted to answer two more research questions: How can we make the online learning experience better for MS Teams Desktop? Do users find the proposed low-fidelity prototype simple, easy to use, and intuitive?

The Design Process

The design process was initiated by selecting three features from the final iteration of the affinity diagram. The features were shortlisted considering the issues reported by multiple participants, usability issues, or ambiguous design elements which were present while the participants performed the tasks. The features selected for evaluation from the affinity diagram were scheduling a meeting, record an online presentation, and chat with other users.

Regarding the task to schedule a meeting, most participants found difficulty in locating the field to select the time zone. Hence, while designing the prototype for scheduling a meeting in a particular time zone, the visibility and placement of the time zone field were considered as the two most important criteria for the new and improved design. Additionally, it was reported that once the meeting was scheduled the user did not receive any feedback from the system. As an improvement to the existing design, it was proposed to add a confirmation screen that would provide feedback to the user once the meeting is scheduled. The confirmation message would indicate the status of the scheduled meeting and prevent any ambiguity.

While analyzing the feature of recording an online presentation, the participants reported that the record button was not visible. To enhance the usability of the presentation feature, the prototype was designed to change the current placement of the record meeting option. Thus, the user can easily find the button to start recording the presentation. Moreover, the user took time to find the share presentation option. The suggestion of one of the participants was taken into consideration to improve the design of this feature. The participant had suggested adding a share presentation button.

Finally, the third feature selected for improvement was the chat. To resolve the participant’s issue related to the last opened chat being shown whenever the application is opened, a new screen was proposed to be added. The

proposed new screen will improve the usefulness of the chat feature.

The Prototype

The prototype was developed using Canva. The free tier of the software was used to model the prototypes. The presentation mode on Canva was used to begin our design process. The prototype for the schedule meeting feature corrects the original flawed design by changing the placement of the time zone button closer to the fields beside the start and end time, (see Figure 3). Once the meeting is scheduled the prototype screen shows a confirmation message “Meeting created successfully!”. The designed prototype covers all the use cases related to scheduling a meeting in a particular time zone. The second prototype improves the feature for recording a presentation by adding the record meeting icon to the main header section so that end users can easily recognize it. A red color recording icon will be shown when the recording is in progress and it will grey out when it is not recording. Additionally, a share presentation button is added so that the users can directly share a presentation file, (see Figure 4). The final feature’s prototype consists of a default chat screen that will fix the user’s issue and prevent the last opened chat from loading on the screen whenever the application’s chat feature is opened (see Figure 5). The prototypes were designed with usability and user experience as the top priorities.

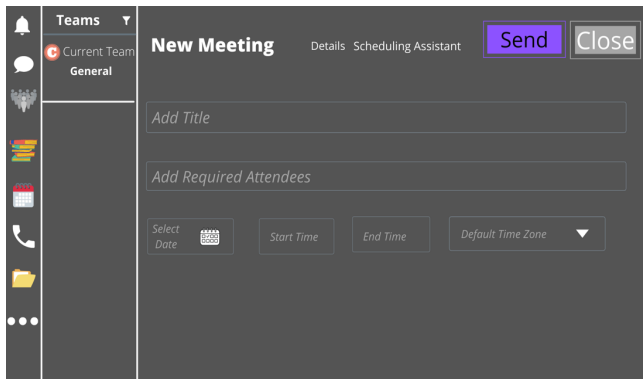


Figure 3. Low fidelity prototype for scheduling a meeting in a particular time zone.

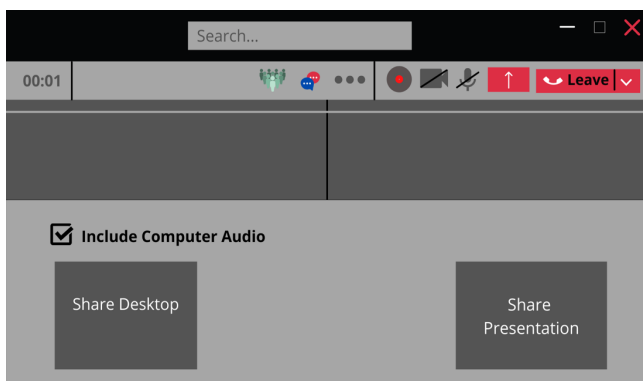


Figure 4. Low fidelity prototype with record icon and share presentation button for recording a presentation.

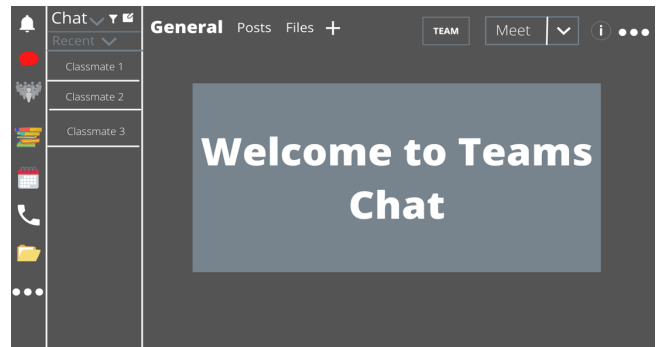


Figure 5. Low fidelity prototype with the default chat screen for chat feature

Evaluation Process – Cognitive Walkthrough

A cognitive walkthrough study was conducted to evaluate the prototypes and identify any gaps in the proposed design and enhancements. The main motivation behind opting for the cognitive walkthrough study was to confirm that our new design improves the user experience and ensures that the features meet the end-user goals. The walkthrough process evaluates the proposed improvements using the designed prototypes.

The cognitive walkthrough process was conducted using a user persona and a cognitive walkthrough sheet. The persona that was selected for the study was Abby, a Ph.D. student who makes use of technology to complete her tasks. It was assumed that she is optimistic about learning new technologies when the need arises. Moreover, she prefers to learn by performing tasks rather than by experimenting and trying out new features using the application. The cognitive walkthrough sheets consisted of use cases for each feature. The low fidelity prototypes which were designed for each use case were included in the walkthrough sheet. The prototypes correspond to the steps of the use case. The task and task scenarios are described so that the evaluators will perform each step of the task using the given low fidelity prototype. The use case mentioned the high-level overview steps to be performed and not how to do it. It did not provide any detailed information which would mislead or influence the evaluators while they reviewed the prototype.

During this process, the evaluators examined each step of the use cases and evaluated the usability and learnability to perform the given task. Each step (one-page prototype) was evaluated by answering a set of questions from the user's perspective which will help us to gain deeper insights into a user's experience while executing each step of the task. The evaluation was done using the persona that is mentioned above. Three tasks were described namely schedule a meeting, record an online presentation, and chat with other users. The two evaluators (at a time) completed these tasks individually using the low fidelity prototype, and if any problems or confusion was found in each step, their thoughts, suggestions, and severity rate (1 to 5, 1 is minor and 5 is critical) was noted down. These responses were noted down by the evaluators when they answered three questions: if the

user will know what to do, how to it, and finally, will they be able to interpret the response from the system for the steps of the use case. After all the tasks are complete, both evaluators met to discuss issues found in each task to came up with 2-3 must change for each task.

Results and Discussion

The result of the cognitive walkthrough process is obtained by analyzing the cognitive walkthrough sheets. The problems which were noted by the evaluators for each task were noted. The data from the second study was filled into a cost importance table. The problems are given an importance rating between 1 to 5 where 5 implies a high critical feature if it is not fixed then it could impact and degrade the user experience. Whereas an issue with a rating of 1 does not affect the performance of the application. If the evaluator provides a rating of M means that the issue is a Must Fix. The final solutions are derived based on the suggestions of the evaluators or based on the ideas of the group members to fix the design issues that were present in the features.

After running the study, we answered one of our research questions. We found out that participants did not find the prototype completely intuitive, easy-to-use, nor simple. Therefore, to answer the remaining research question *How can we make the online learning experience better for MS Teams Desktop?* We will provide the following analysis. While performing the first task a couple of issues were noted. All evaluators mentioned that they could not find the button to save the settings of the meeting and they rated it as M. To fix this the button was renamed to “Save the meeting”. The second issue was that 2 out of 4 participants were unable to relate a button labeled “Meet” with scheduling a meeting task and gave it a rating of M. As a solution, it was proposed to rename the button as “Schedule meeting” to provide a more explicit label. One of the evaluators reported that the system did not provide any feedback after the meeting was saved and gave it a rating of 4. The confirmation message that is displayed once the meeting is created is sent out to the user. An issue with rating 3 was reported by 2 evaluators. This issue was with the start/end time formats as it was found to be confusing. The proposed solution suggested that a checkbox should be added so that the end-users can easily toggle between the 12h and 24h format.

The evaluators faced difficulties while performing the second task of recording a presentation. Two out of four evaluators were confused by the buttons labeled “Meet” and “Team. The share icon was unclear and could not be recognized by a few of the users. They also reported that there were unable to select the file to share as well as the system did not provide any feedback to them regarding the status of the recording. The evaluators were unable to see a clear indication of whether the recording has started or ended. As improvements, it was suggested to re-label the buttons and icons more appropriately and explicitly to improve learnability for the user. Visual cues such as pop-up

notifications are also suggested for the missing feedback use cases.

The results of the second study for the third task of responding to a chat conversation found that the low fidelity prototype had design flaws. Most evaluators found issues with the chat icon which was used to open the chat feature as well as the chat icon used to indicate if the chat is a group chat or an individual chat. The icon issue is fixed by adding a text below the icon to provide more clarity and make it recognizable. Currently, the Teams application does not indicate the number of messages which are unread in each chat. The evaluators have pointed out that this is a missing feature that needs to be implemented. Therefore, a number is added as a solution beside each chat icon to provide information about the number of unread messages. A text area to type and respond was missing in the low fidelity prototype which was proposed to be corrected by adding a custom text box field for each chat. The usability issues and possible solutions tackled in this stage can also be found in Table 1.

Table 1. Problems and solutions gathered in the Cognitive Walkthrough phase

Feature	Problem (with severity)	Solution
Task 1: Schedule a meeting in a specific time zone	Not clear on how to schedule the meeting . (M)	The button might be named more appropriately. (Save the meeting)
	No, save button or an indicator for confirmation. (M)	The “Schedule meeting” button can be added.
	No save message is displayed to let the user know the meeting is saved. (4)	A clearer saved meeting response needs to be added.
	Cannot see the option to schedule a meeting. (4)	A screenshot could be added after this to indicate Abby of different meeting options.
	Confused about the start time and end time formats . (3)	Add checkbox to show different time formats (24hr/12hr format).
Task2: Record Online presentation	Confused by the buttons labeled “ Meet ” and “ Team ” to proceed to start the meeting. (M)	Change the label wording of the “Meet” button to “Start New Meeting”.
	Users do not recognize the “ share ” icon to start sharing their screen/presentation. (M)	Add label to the icon with text “Share Content”.
	The user is unable to see the option to select the file from the local device. (M)	The ‘Share presentation’ button is replaced with ‘Select file for presentation’.
	No indication/feedback to the user that the	A pop-up notification with the text

Task3: Select a chat and respond to a conversation	recording has started . (M)	“Recording has started” is added.
	No notification/feedback once the recording is stopped . (4)	A pop-up notification with the text “Recording has ended” is added.
	The chat icon is not visible. (M)	Move the chat icon to the center of the navigation bar and label it as “Chat”.
	No indicator for writing and sending a text in the chat. (M)	Add a chat text box along with a send button.
	No indication of who should Abby respond to. (M)	Add a number shown in front of the user avatar, depicting the number of unread messages from them.
	No proper system response after selecting the chat that she wants to respond to. (5)	Change the title of a chat, showing the right name that the user selected to chat with.
	No system response after sending a message through the chat. (5)	Add a screen to show how a message response would appear on the chat window.
	Not clear whether the chat icon is associated with a team group or an individual chat. (3)	Add labels to all the icons in the menu and sort the chat from most recent to oldest.

Therefore, from the cognitive walkthrough evaluation process, it was evident that the low fidelity prototypes also had design gaps that needed to be filled. The results of this study will improve the prototypes and the end-users will benefit from the final solution. The final product will be better through these iterations that verify the usability and user experience provided by the improved features.

FINAL DISCUSSION AND GUIDELINES

The first research question considered was how users currently use the Microsoft Teams Desktop version in the context of online learning. The first study was conducted in an interview format by using a task list with a questionnaire about the task performed and end of study questions that consisted of general questions related to the application. The answers of the participants to the questions and observations of the researchers while the participants performed the tasks helped to understand the current usage of the application in an online learning environment and user behavior. The study helped to find improvement areas in the application.

The second research question in scope was how to improve the online learning experience for the MS Teams Desktop application. To this end, the affinity diagram research technique was applied to classify the results of the first study and identify areas in the application that have scope for improvement. Three features were selected to enhance the user experience. These features were shortlisted since the

users either experienced difficulty while performing the task or the design was not intuitive. The improvement for these features was put forward using low fidelity prototypes and a cognitive walkthrough process helped to evaluate the usability of the prototypes.

The final research question analyzed whether the low fidelity prototypes were intuitive, simple, and easy to use. To answer this question a cognitive walkthrough study was conducted. The proposed improvements or enhanced features were evaluated and the flaws in the proposed solution were discovered. The results of the second study were used to further improve the prototypes and solve any design issues by brainstorming and using the responses that the evaluators noted down in the cognitive walkthrough sheets.

Thereby the second study produced the following final guidelines. Most issues that the participants faced while performing the tasks were related to (1) Missing or unclear labels. (2) Insufficient feedback from the application while the task is performed. (3) Missing visual elements that would help the user to complete the tasks efficiently. The issue related to missing or unclear labels for buttons can be resolved by updating the button labels to include action verbs that elicit the user to perform some action. The wording used in the label should be clear and familiar to the user. For the second issue, displaying an error or a confirmation message to the user once an action is performed will provide the user with the necessary feedback. At last, some other features could be improved by adding a visual element like an icon with a text label placed below it.

Overall, the discussions in the entire study helped to gain insights on what can be improved in the application that would make the user's life much easier in the online environment to collaborate with others.

CONCLUSION AND FUTURE WORK

Our research study explores the existing features of using a group collaboration tool such as Microsoft Teams Desktop application and applies user-centric research techniques to improve the overall experience. The results of the studies highlighted the areas of improvement in the application and the prototypes for the proposed enhancements have been evaluated and improved. Therefore, by using the observations and responses from the interview coding sheets, affinity diagrams, low fidelity prototypes, cognitive walkthrough sheets, and cost estimation table, the usability of the application has improved.

The study was initiated with the data gathering phase that involved participants answering a series of questions related to existing features and a general questionnaire related to the application. The responses of this stage were used for the data analysis phase. This analysis phase used an affinity diagram to group the comments from the participants based on certain common themes. This stage helped to see a pattern in the user's comments and helped us to identify three key features. The next stage of the study is the data modeling

phase. After analyzing the list of possible user tasks to improve based on the affinity diagram, we selected three tasks to prototype and improve. Task scenarios were defined for each of the selected features and the prototypes were designed for the steps of the use case. The prototypes were designed by referencing the actual MS Teams Desktop application, but we made sure that it incorporates the new or improved features that enhance the user experience. The evaluation phase aims to examine the proposed improvements using the designed prototypes. During this process, the evaluators will examine each step of the use case and evaluate the useability and learnability to perform the given task. The final stage of the study is summarizing the problems faced using a cost estimation table. The table would show the time it would take to fix the design issue as well as the solution to the problem at hand. Hence by the end of all the stages, we can significantly improve the user experience. The low fidelity prototypes can be corrected while designing the high-fidelity prototypes.

The limitations which might have influenced the results of the study are (1) Fewer participants present during the information gathering phase and cognitive walkthrough process. (2) Time constraints while conducting the study. (3) Unable to interact with the participants in person due to the COVID pandemic. (4) Technical difficulties encountered while interacting with participants in a virtual setting. (5) The application was evaluated only on Windows and MAC operating systems while other operating systems like Linux-based ubuntu, fedora, etc. were not considered.

As a future extension of our research study, the execution of tasks in the Microsoft Teams mobile and desktop applications can be investigated to understand how difficult it is for the user to perform the same task on both platforms. The presentation of features in both versions of the software can be studied further to make the tasks alike perform on both platforms. Moreover, research can be done to evaluate the similarities or differences in the navigation of the application. The user behavior can be assessed in both devices and improvements for the Microsoft Teams application could be proposed such that a consistent user experience is provided for users who utilize the desktop and mobile versions of the Microsoft Teams software.

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"This paper constitutes original work done by ME and my group (names and student numbers filled in below). The paper consists entirely of ideas, observations, information, and conclusions composed by the group, except for statements contained within quotation marks and attributed to the best of the group's knowledge to their proper source in footnotes or references. Direct quotations make up an exceedingly small proportion of the text and are appropriately cited. Material paraphrased from a source (e.g., print sources, multimedia sources, web-based sources, course notes, or personal interviews) has been clearly identified by a numerical reference citation (ACM or IEEE). All the sources consulted and/or included in the report have been listed in the Reference section of the paper. All drawings, diagrams, photos, maps, or other visual items derived from other sources have been identified by numerical reference citations in the caption. No part of the document has been submitted for any other course."

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