UX Research and Usability Testing For Expedia And Kayak

With Suggestions On How To Improve Both

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Experiment Design Overview

Features That I Tested

For this project, I compared the travel booking websites Expedia and Kayak. These websites allow users to book hotels, cars, and flights from around the world. I decided to focus specifically on the flight booking services of these two websites for my project.

The features that I tested were

- Finding the cheapest flight from one destination to another
- Finding a flight that a user thought was a good deal and that aligned with a user's flight preferences

To learn more about these features, I ran two experiments. For the first experiment, the task was to find the cheapest premium economy direct flight to Hong Kong for two adults. For the second experiment, the task was for participants to find and book a flight to Hong Kong that they thought was worth the price based on their flight preferences such as flight time, travel class, number of stops, etc. Below is a breakdown of the **scenario, task, and steps** of these two experiments on Expedia and Kayak:

Experiment 1:

- **Scenario:** Two adult passengers want you to help them book the cheapest direct flight to Hong Kong. These passengers also have specific requirements that they want for their flight:
  - They want a roundtrip flight from Toronto Pearson Airport to Hong Kong International Airport.
  - They want to leave Toronto on Saturday, December 17, 2022 and return on Saturday, January 7, 2023.
  - They want a premium economy ticket.
- **Task:** Find the cheapest premium economy direct flight to Hong Kong. Say the price of the task out loud once you have found it.
  - **Steps** (for Expedia):
    - Click on "Flights"

- Type Toronto for "Leaving from" and Hong Kong for "Going to". Select the airports from the search results
- Select Saturday, December 17 as the departure flight date and Saturday, January 7 as the return flight date
- Change 1 adult to 2 adults
- Change Economy to Premium Economy
- Click search
- Select "Nonstop" under "Stops"
- Say the price ($3,858)
- **Steps** (for Kayak)
  - Click on "Flights"
  - Type Hong Kong for "To?" and select it from the search results
  - Change 1 adult to 2 adults
  - Change Economy to Premium Economy
  - Select Saturday, December 17 as the departure flight date and Saturday, January 7 as the return flight date
  - Click search
  - Hover beside "Direct" under "Stops" and click "Only"
  - Say the price ($3,858)

Experiment 2:

- **Scenario:** You and a friend your age want to book a budget-friendly flight to Hong Kong. Whether this flight is direct or has stops in between is up to your personal preference. You may also choose your preferred time for the flight. However, your flight must follow these specific requirements:
  - It is from Toronto Pearson Airport to Hong Kong International Airport.
  - The departure date is Saturday, December 17, 2022 and the return date is Saturday, January 7, 2023.
- **Task:** Find your preferred flight to Hong Kong. The task ends when you reach the page with the passenger information form.

- **Steps** (for **Expedia**):
    - Entering the Flight Requirements
        - Click on "Flights"
        - Type Toronto for "Leaving from" and Hong Kong for "Going to". Select the airports from the search results
        - Select Saturday, December 17 as the departure flight date and Saturday, January 7 as the return flight date
        - Change 1 adult to 2 adults
        - Click search
    - Browsing the Flight Results
        - Use the filters to add your own preferences
        - Find your preferred flight by comparing prices, number of stops, time, etc. and click on it
    - Selecting a flight
        - Click "Select" in the slide-out menu
        - Select the return flight
        - Click "Check out"

- **Steps** (for **Kayak**)
    - Entering the Flight Requirements
        - Click on "Flights"
        - Type Hong Kong for "To?" and select it from the search results
        - Change 1 adult to 2 adults
        - Select Saturday, December 17 as the departure flight date and Saturday, January 7 as the return flight date
        - Click search
    - Browsing the Flight Results
        - Use the filters to add your own preferences
        - Find your preferred flight by comparing prices, number of stops, time, etc. and click on it

- Selecting a Flight
  - Click "View Deal" beside your preferred flight
  - It will redirect you to another website. If the redirected website does not work (Air Canada's website showed an error message during my experiments), click the down arrow beside "View Deal" and select a different website
  - Click "Book" to continue booking the flight on the redirected website

Note: Experiment 1 was used to determine time on task while Experiment 2 was used to determine task success and the UMUX score. A separate experiment was done to determine time on task because I thought participants would want to take their time to search for a flight that matched their preferences. If time on task was determined through Experiment 2, the results would be based more on the participants themselves instead of the design of Expedia and Kayak's interfaces.

The Participants

Participant #	Age	Gender	Experience with the product	Frequency of Use
#1	21	Female	Used both websites for the first time in my experiment; Preferred Kayak after completing the experiment.	Has not used either but used a flight booking website in the past year
#2	50	Male	Has used Expedia before to book hotels and flights; Used Kayak for the first time in my experiment; Preferred Expedia after completing the experiment.	Used Expedia once at least 5 years ago
#3	16	Female	Used both websites for the first time in my experiment; Has never visited a travel booking site; Preferred Expedia after completing the experiment.	Does not use travel booking websites
#4	17	Female	Used both websites for the first time in my experiment; Has never visited a travel booking site; Preferred Kayak after completing the experiment.	Does not use travel booking websites
#5	24	Male	Believes he may have visited Expedia before; Never visited Kayak; Preferred Kayak after completing the experiment.	Limited use of travel booking websites in the past 5 years

Method of Research

  Research with all participants was conducted online on Zoom. Participants shared their screens so I could observe them completing their tasks. I chose to do my research on Zoom due to its video recording and transcription features which would help me easily find user quotes during the analysis of my research. Participants were notified beforehand that the experiment would be recorded and agreed to being recorded.

Part #1: Behavioural Study

Conducting the Think-Aloud Protocol

  I started my experiment by asking if the participant used Expedia or Kayak before. If they answered yes, I asked them about the last time they used it, whether they used the flight booking service or a different service, and how many times a year they used it. Then, I set up the scenario of the experiment and told them about the specific requirements for the flight (the flight had to be for 2 adult passengers, the departure flight date had to be December 17, the return flight date had to be January 7, and it had to be from Toronto Pearson Airport to Hong Kong International Airport). I also provided written reminders of the flight requirements for the users to reference in the Zoom chat in case they forgot about them during the experiment. For the second experiment, I allowed participants to pick any flight that met the previously mentioned flight requirements. This meant whether the flight was economy or business class, in the day or night, or was a direct flight or had stops in between was up to their preferences. I encouraged participants to share their thoughts and feelings while browsing the available options and to express what they liked and disliked about Expedia and Kayak out loud. I wrote brief notes concurrently about the usability issues and strengths of the website that they found and went back to the recording afterwards to capture their quotes. For the first experiment, since I was measuring time on task, I did not ask participants to think out loud as that would increase their recorded time since the time would include them sharing their opinions. After the experiment ended, I recorded and categorized the statements as positive negative or neutral.

Positive, Negative, and Neutral Statements

Below are the statements from participants while users used <u>Expedia</u>:

Positive:

1. "Wow, this is way easier. Nice!" - Participant 1 when selecting flight dates on the calendar

2. "Oh, this one looks so much nicer!" - Participant 5 when viewing the calendar

3. "I do like how at the top here you can also change it to Roundtrip, 2 travellers, First class, and Any airline. And on the side it lets you do super filters" - Participant 5 commenting about the filters that appear on the flight results page

4. "See this is what I'm saying. When it loads automatically, that's good." Participant 5 commenting about how he likes that the filters on the left reload the flight results automatically

5. "Oh you can change it. That's pretty cool. It's like a little filter for when you want to leave" - Participant 5 commenting about the filter options of Early Morning, Morning, Afternoon, and Evening

6. "Oh this is cool. It shows you when you'll get there and all that stuff over here" - Participant 5 commenting about how he likes that the "Review Your Trip" page gave him a breakdown of the time for his departure, layover, and return

Negative:

1. "I feel like I knew to put 2 travellers only because of my mistake on Kayak. Otherwise, I feel like they are the same. They are both really hidden." - Participant 1 after selecting the number of travellers for the flight

2. "What happened? What just happened? I thought I picked the right one" - Participant 1 when she landed on the "Choose returning flight" page

3. "Huh? Oh, this is not good" - Participant 2 when using the calendar. Selecting the return flight date confused him.

4. "Where did it go? What the heck? Was it this one?" - Participant 3 when she landed on the "Choose returning flight" page

5. "Why is it showing hotels…Why is it still in hotels!?" - Participant 4 who entered the flight information into the hotels form under "Stays" and tried to fix her mistake but was still unsuccessful.

6. "Select your fare to Hong Kong? What? What is this?" - Participant 4 being confused about the slide out menu that appears when Expedia offers more expensive customizations of the plane ticket

7. "I don't like how it doesn't say you have to select it again. Cause on the other site (Kayak) it was reactive. It showed now you have to do this" - Participant 5 commenting about selecting the return flight date from the calendar

8. "What is all this? What? Who designed this website?" - Participant 5 commenting about the information below the form where users enter flight requirements because he thought that information was not relevant

9. "What I do think they should do is when you select a new thing, it should reload automatically. I hate that. Load automatically!" - Participant 5 commenting about how the filters at the top of the flight results page do not reload the results automatically. He had to press "Search" again.

10. "This does not make me feel happy. Why is it in red? It makes me feel bad" - Participant 5 commenting about how "Arrives Sunday, December 18" was in red

11. "Wait, what happened? I clicked it and nothing happened. Oh it says "Choose returning flight". But I selected roundtrip shouldn't it automatically base it on when I'm returning. Where's the logic in that?" - Participant 5 commenting about his dislike for a separate page for choosing the return flight

Neutral:

1. "Aha! I know their tricks" - Participant 1 when she applied her learning from a mistake she made in Experiment 1 of not clicking "Flights" on the home page

2. "There are not many choices but I see there's a way to save some money here."
   - Participant 2 after using the filters to find a nonstop flight and comparing the two provided flight options.

3. "Wow this is insane. It's just too expensive. So I might need to save some money here. I'll try one stop maybe." - Participant 2 deciding to change his flight preferences because the nonstop flight was not a good deal.

4. "Wait what is this? How do you go back? How do I change the date? Oh I see"
   - Participant 4 trying to figure out how to use the calendar but figuring it out soon
5. "I feel like I'm going to regret not clicking on Flights right here…Oh these are hotels. Yeah I messed up" - Participant 5 noticed while the page was loading that he entered his flight information in Stays but he checked "Add a flight" and the page was about to load so he did not change his decision. Once he saw the hotels in the results, he knew he should have clicked on Flights.

Below are the statements from participants while users used Kayak:

Positive:
1. "Oh, it is already there. Nice!" - Participant 1 when she saw Kayak automatically put Toronto as the departure location
2. "Woah I like this. It says both" - Participant 4 when she saw Kayak groups the departure and return flights together
3. "I do like how it knew Roundtrip. Like it doesn't say Single right away" - Participant 5 while entering the flight requirements

Negative:
1. "What just happened? What is this? I don't understand what this means." - Participant 1 when trying to select dates for the flight but the calendar performed an action that she did not expect
2. "Why does it say 1 adult. I literally put 2 adults. I thought it would automatically filter when I switched the travellers there. I didn't think I had to put on the search button again." - Participant 1 when she was booking the flight but saw Kayak did not update the change which she made in the filters at the top of the flight results.
3. "Why is it stopping at Seoul? I'm so confused right now. I thought this was direct."
   - Participant 1 when she was on the Flight Details page for a flight that only had a direct return flight. She did not notice the departure flight had a stop in between.
4. "Huh? This is departure? This is return?" - Participant 2 when he saw that departure was written above one month and return was written above the other month in the calendar

5. "Hm? Try again? Oh it's an Air Canada website. I can't book on Kayak?" - Participant 2 when he encountered an error message between Kayak and Air Canada and learned that Kayak redirects users to a different website (This is a common error message that participants experienced. I have included an image below.)
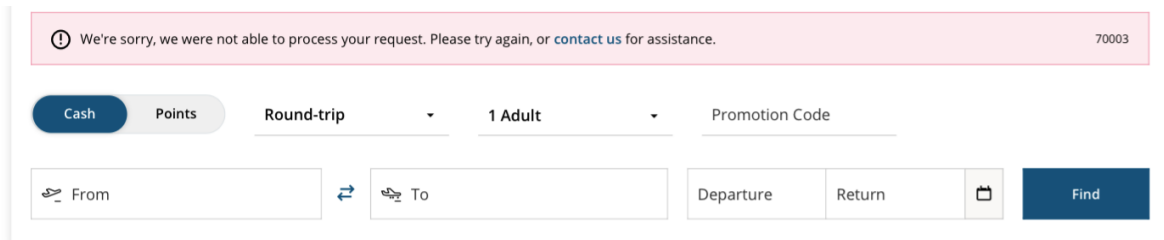
6. "Stop asking me for stuff. I don't like that." - Participant 3 when she was trying to close the Google pop up. Kayak prompts users to sign in with Google.

7. "What do I press though? Where do I go? Do I keep on going down?" - Participant 3 when she did not see the search button located on the right

8. "Wait are these different ones? But this looks like one whole ticket" - Participant 3 when she saw the grouped flights in Kayak and was unsure if it was two separate flights

9. "Wait what does that mean? Did I select it?" - Participant 3 using the checkbox feature to the left of the flight results to select only the arrival flight from the group of two suggested flights

10. "You know, I'd hire someone to do this for me" - Participant 3 trying to find a flight

11. "What!? Uh, what do I do?" - Participant 5 confused about the Air Canada error message

12. "You know, what sucks is it says two people at the top here but on the thing it doesn't actually say two people. I don't like that." - Participant 5 commenting about the grouped flight results. "The thing" refers to the white box that groups a departure and return flight together. (The image below shows the white box Participant 5 is talking about. Based on the per person price and the total price, the tickets are for two people. However, "2 people" is not shown in this white box.)
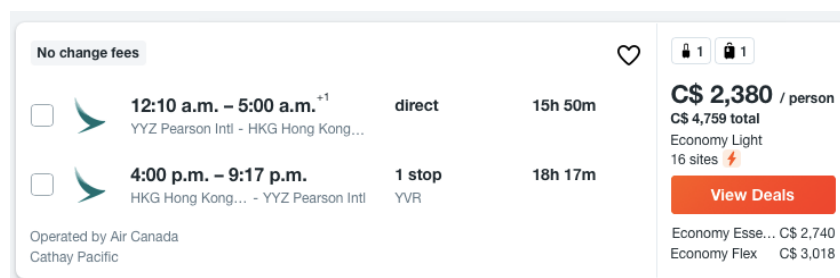
Neutral:

1. "I do not want 2+ stops. That's disgusting" - Participant 1 when she saw a filter option to "Hide 2+ stops"

2. "Find a stay. No I'm not going to find a stay. I'm going to find flights instead."
   - Participant 2 who noticed he had to switch from "Stays" to "Flights" on the homepage since the homepage stated "Find a stay"

3. "How do I book then? View Deal?" - Participant 2 when he was looking for how to select a flight to book and then guessed that clicking "View Deal" was the answer

4. "What, how do I select this? View Deal?" - Participant 5 when he was looking for how to select a flight to book and then guessed that clicking "View Deal" was the answer

Ratio of Positive to Negative Comments

Expedia received 6 positive comments and 11 negative comments during the think aloud protocol. The ratio of positive to negative comments is 6 to 11 which is equal to about 0.545. Kayak received 3 positive comments and 12 negative comments. The ratio of positive to negative comments is 3 to 12 which is equivalent to 1 to 4. This ratio in decimal form is 0.25.
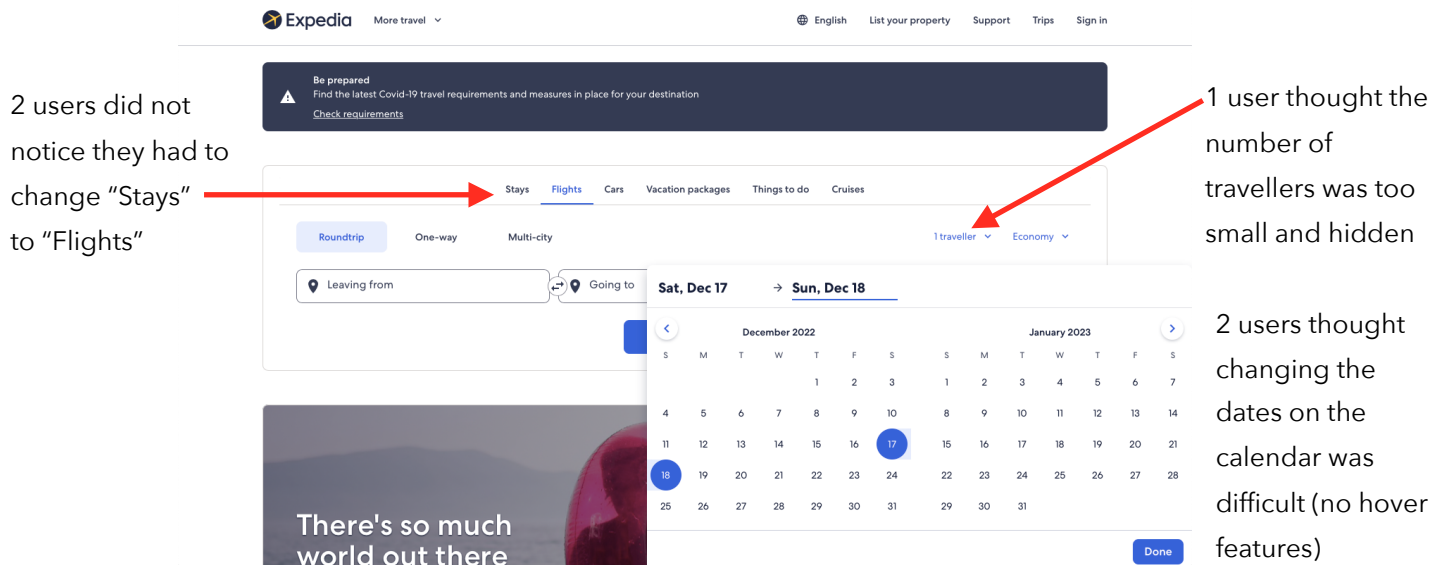
Analysis of Ratios

For the ratio of positive to negative comments, a larger number is desired as it signifies a larger proportion of positive comments than negative ones. Expedia received a higher number in my experiment. It received a higher propor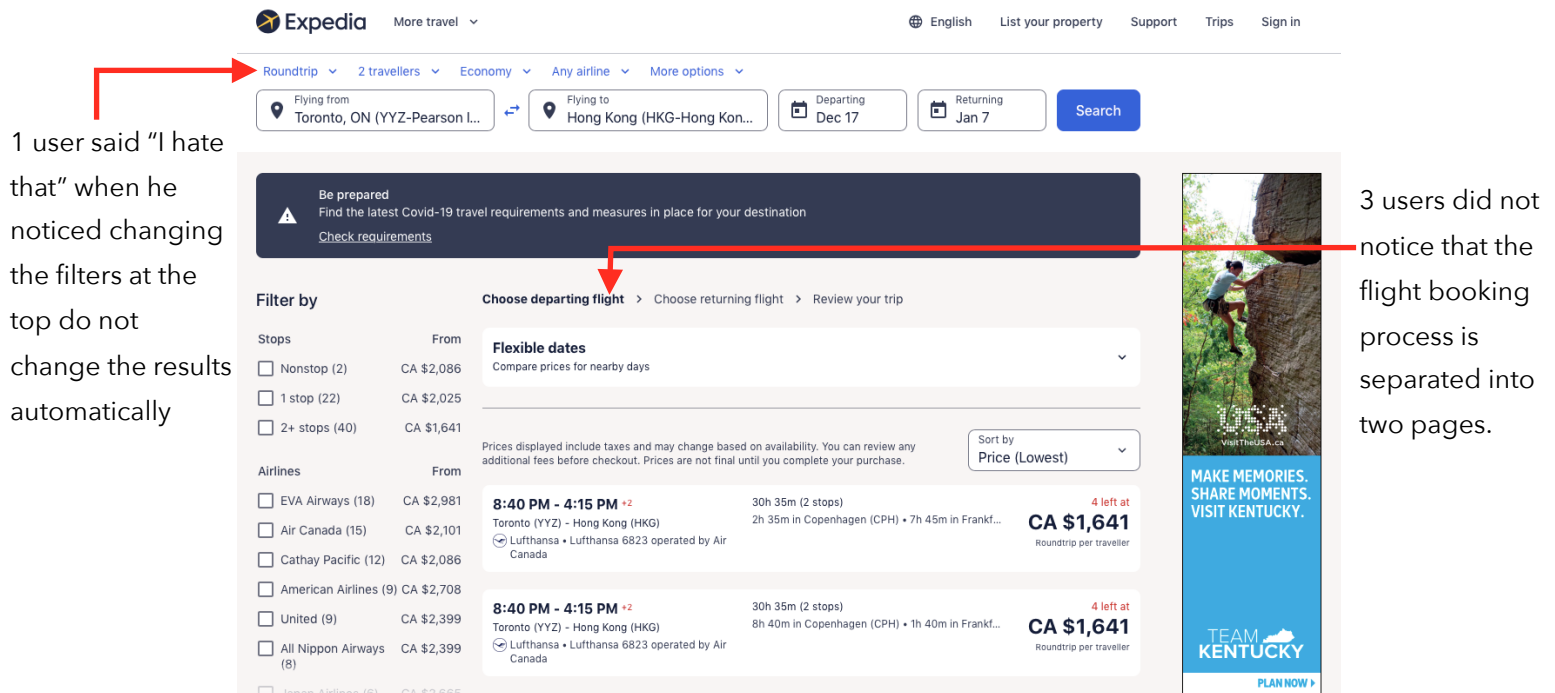tion of positive comments compared to Kayak. However, in my post-experiment interview, when I asked what website the participants would prefer to use again in the future if they needed to find a flight, 2 participants chose Expedia and 3 participants chose Kayak. The ratio of positive negative comments in the think aloud protocol do not reflect the actual opinions of the 5 participants as Kayak had a lower ratio than Expedia but more people preferred Kayak. This could be a result of participants not verbally expressing some of the positive characteristics of Kayak that they liked during the think aloud protocol or because users had stronger negative comments for Expedia than Kayak which caused them to choose Kayak in the end.

Screenshots with Annotations of Usability Issues

Below is a screenshot of Expedia's home page which users see when they click "Expedia" on Google. By default it is on "Stays" and users must switch it to "Flights".

2 users did not notice they had to change "Stays" to "Flights"

1 user thought the number of travellers was too small and hidden

2 users thought changing the dates on the calendar was difficult (no hover features)

Next is the flight results page. Expedia starts with choosing a flight for the departure flight.

1 user said "I hate that" when he noticed changing the filters at the top do not change the results automatically

3 users did not notice that the flight booking process is separated into two pages.

After selecting a flight from the list, a menu slides in from the right asking users to select their fare. One user was confused about this because she thought she had already selected her flight.

"What does this mean" said Participant 3. "I thought I already selected it. Why is it more expensive now?"

After the departure flight, users see a return flight. However, since the title "Choose returning flight" is small and not emphasized in the visual hierarchy, 3 users were confused why they had to choose a flight again.

3 users did not see the title "Choose returning flight"

Moving on to Kayak, this is a screenshot of the home page and some usability issues there.

1 user thought the number of travellers was too small and hidden
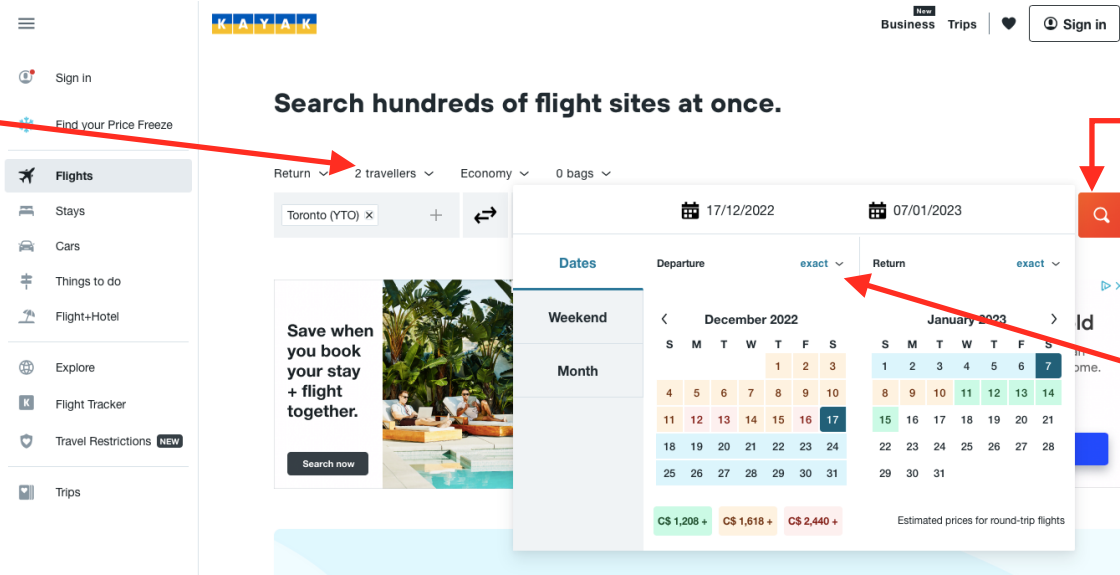
1 user did not notice the search button and was confused how to see the results

1 user thought the calendar was confusing as there was too much extra info and additional features

On the flight results page, these are some of the usability issues users found.

1 user thought the time filter was confusing as it had too many numbers

1 user wanted to select just one of the flights in the group but had trouble figuring out how
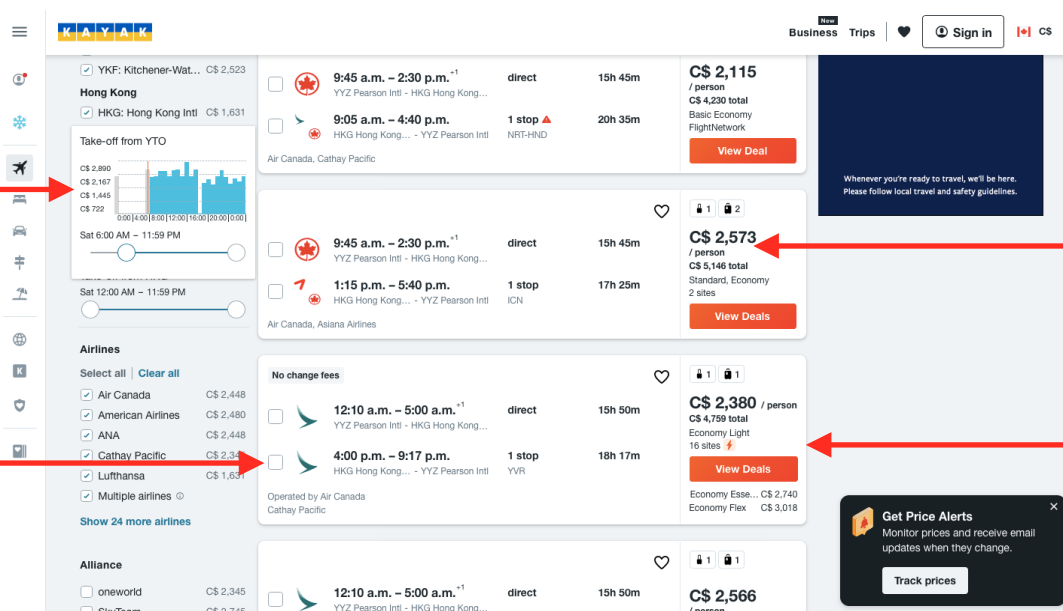
1 user did not like how it does not say how many passengers the booking is for. Users must infer this from the total price.

2 users did not realize until after awhile that they needed to click "View Deals" to book a ticket

The biggest usability issue is for Air Canada flights. Kayak redirects users to the Air Canada website after they have selected a flight. However, none of the flight information is saved on Air Canada and users get an error message instead. This is a high severity issue.
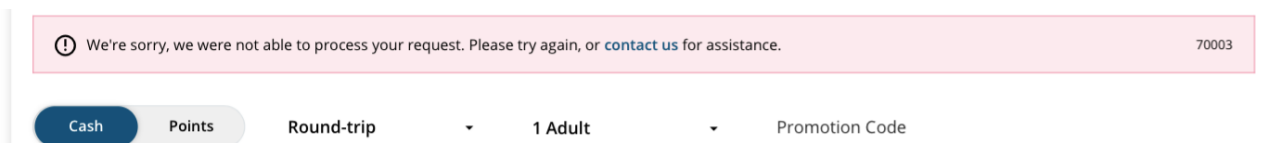
Part #2: Combined Metrics Score

Standard Usability Score Combining 3 Metrics

The following table shows the combined metrics of task success, time on task, and UMUX for Expedia. There were 10 steps to complete the task in Experiment 2. A task was considered completed successfully if the participant did not need my help to complete it. For the Time on Task %, it was calculated by first calculating the "min - max" which is the minimum time on task out of all participants subtracted by the maximum out of all participants. Then, an individual's time on task was subtracted by the maximum time and divided by the "min - max" to calculate the time on task %. The UMUX score was determined by calculating the results from the UMUX questionnaire which my participants completed after finishing their tasks.

Combined Metrics Based on Percentages: Expedia

Participant	Task Success (out of 10)	Task Success %	Time on Task (seconds)	Time on Task %	UMUX (out of 100)	UMUX %	Average Percentage (Individual)
1	9	90%	225	48.8%	87.5	87.5%	75.4%
2	10	100%	144	86.9%	80	80%	89.0%
3	8	80%	116	100%	87.5	87.5%	89.1%
4	8	80%	329	0%	16.7	16.7%	32.2%
5	10	100%	173	73.2%	75	75%	82.7%
Average Percentage (All)		90%		61.8%		69.3%	73.7%

Combined Metrics Based on Percentages: Kayak

Participant	Task Success (out of 10)	Task Success %	Time on Task (seconds)	Time on Task %	UMUX (out of 100)	UMUX %	Average Percentage (Individual)
1	9	90%	164	53.1%	50	50%	64.4%
2	8	80%	232	0%	41.7	41.7%	40.6%

Participant	Task Success (out of 10)	Task Success %	Time on Task (seconds)	Time on Task %	UMUX (out of 100)	UMUX %	Average Percentage (Individual)
3	7	70%	211	16.4%	45.8	45.8%	44.1%
4	9	90%	116	90.6%	66.7	66.7%	82.4%
5	10	100%	104	100%	75	75%	91.7%
Average Percentage (All)		86%		52.0%		55.8%	64.6%

Next, for the combined metrics based on Z scores, I used the Standardize function in Excel to calculate the Z scores.

Combined Metrics Based on Z Scores: Expedia

	A	B	C	D	E	F	G	H	I
1	Expedia								
2	Participant #	Task Success (out of 10)	Time on Task (seconds)	UMUX (out of 100)	z Task Success	z Time	z Time*(-1)	z UMUX	Average z
3	1	9	225	87.5	0	0.32898432	-0.3289843	0.60734325	0.09278631
4	2	10	144	80	1	-0.6365131	0.63651313	0.35651317	0.6643421
5	3	8	116	87.5	-1	-0.9702653	0.97026534	0.60734325	0.1925362
6	4	8	329	16.7	-1	1.56863537	-1.5686354	-1.7604928	-1.4430427
7	5	10	173	75	1	-0.2908412	0.29084121	0.18929311	0.4933781
8	Mean	9	197.4	69.34					
9	Standard Deviation	1	83.8945767	29.90071905					

Combined Metrics Based on Z Scores: Kayak

	A	B	C	D	E	F	G	H	I
12	Kayak								
13	Participant #	Task Success (out of 10)	Time on Task (seconds)	UMUX (out of 100)	z Task Success	z Time	z Time*(-1)	z UMUX	Average z
14	1	9	164	50	0.35082321	-0.0248194	0.02481942	-0.4079102	-0.0107558
15	2	8	232	41.7	-0.5262348	1.18069518	-1.1806952	-0.9876455	-0.8981918
16	3	7	211	45.8	-1.4032928	0.80840391	-0.8084039	-0.7012702	-0.970989
17	4	9	116	66.7	0.35082321	-0.8757709	0.8757709	0.75854526	0.66171312
18	5	10	104	75	1.22788123	-1.0885088	1.08850877	1.33828058	1.21822353
19	Mean	8.6	165.4	55.84					
20	Standard Deviation	1.14017543	56.4074463	14.31687815					

Explanation of Findings

For the combined metrics based on percentages, I had three metrics: task success, time on task, and UMUX. In all three of these categories, Expedia had a higher average percentage than Kayak. For task success, the difference in percentage between Expedia and Kayak is very small. However, it is slightly larger for time on task and UMUX. There is a difference of 9.8% for the average time on task %, and there is a difference of 13.5% for the average UMUX %. Since Expedia had higher average percentages for all three metrics and had a better ratio for positive to negative comments, all this data suggests that users preferred Expedia over Kayak. However, the majority of my participants reported in my post-study interview that they preferred Kayak. Perhaps, this difference between the statistical data and what participants say could be because 5 participants is not enough. Although 3 participants reporting that they like Kayak better is the majority, it is only 1 more participant than those who prefer Expedia. If I were to experiment with more participants, perhaps more people would report that they prefer using Expedia and my findings from the post-study interview would match my findings from the combined metrics.

For the Z score, this is not an overall usability score but a way to show how much a score is above or below the average of the score distribution. Note that for the average Z score, I converted the Z score for Time on Task by multiplying it by -1. This was done because in Task Success and UMUX, a higher Z score indicated positivity (higher task success rate and higher UMUX rating). For the original Time on Task, a higher Z score indicated it was worse (took longer to complete), so I multiplied it with -1 to match the pattern of the other two metrics. Looking at the Z scores for Expedia, Participant 4 appears to be further away from the other participants in the distribution. She is the only participant with a negative Z score and a Z score that begins with the number 1. The other Z scores begin with the number 0. Participant 4 is likely further away from the mean score distribution because she is the participant who entered the flight information into the hotels information form. She did not realize her mistake and after trying to find out why she was not seeing any flights for 3 minutes, I decided to step in and give her a hint. The other participants did not experience a problem as severe as this, which is why they are closer to each other in the distribution. For Kayak, Participant 5 appears to be further away from the other participants in the distribution. He is the only participants whose Z score is

greater than 1. This is likely because he was able to complete all the tasks in Kayak, completed his task in the fastest time out of all 5 participants, and thought that Kayak had good usability which he expressed in the UMUX questionnaire. The other participants either were not as successful in their tasks, not as fast, or not as satisfied with Kayak's usability.

Part #3: Accessibility

Accessibility A/B Test of the Two Systems

For this part of the project, I evaluated whether or not the tasks in my experiment for booking a flight followed the accessibility guidelines of WCAG. I used the table below to help record my findings for whether the websites were Perceivable, Operable, Understandable, Robust, and the Conformance level of the websites. I also downloaded this screen reader Chrome extension so that I could test how compatible Expedia and Kayak were with a screen reader. There is also criteria in the WCAG guidelines about using only a keyboard to access a website. The screen reader which I got from the link above allowed me to test this as I could use the tab, shift, arrow buttons, and enter key to navigate the contents of the website. Using a screen reader firsthand allowed me to gain a better understanding of a website's accessibility to users, such as those who are visually impaired, those who are unable to use a mouse, and other users who use websites with the help of a screen reader. Below is a table showing how Expedia compares to Kayak for different WCAG principles and guidelines.

Principle	WCAG Accessibility Guidelines	Expedia	Kayak	Which is better in accessibility?
Perceivable	Provide text alternatives for non-text content.	The calendar arrows have an aria label for "Previous month" and "Next month". Most of the features are already provided through text such as the search button being labelled "Search" instead of a magnifying glass icon.	The search button has an aria label for "Search". The calendar arrows have an aria label for "Previous month" and "Next month". Airline logos have alt text stating "(Name of airline) logo".	Both Expedia and Kayak provide aria labels and alt text for non-text content.

Principle	WCAG Accessibility Guidelines	Expedia	Kayak	Which is better in accessibility?
	Make it easier for users to see and hear content.	When using the calendar, the screen reader provides special instructions on how to navigate the calendar using the keyboard. I cannot understand what is being said in the last sentence of the instructions however. Colour is not used as the only visual way to share information which is good. Images are rarely used as the only way to convey information. There are no built-in tools to increase text size but the text will increase if the user enlarges the page in the browser.	The screen reader also provides special instructions on how to use Kayak's calendar. These instructions were easy to hear and follow. Colour is not used as the only visual way to share information. Images are rarely used as the only way to convey information. There are no built-in tools to increase text size but the text will increase if the user enlarges the page in the browser.	Kayak is better. Both websites are similar in making it easy for users to see content. There are no audio features in the websites themselves, but when using the audio from a screen reader, it is easier to understand the instructions on Kayak.
	Create content that can be presented in different ways	The presentation of the content changes depending on the width of the window. It is responsive on smaller screens. The calendar on a less wide window is actually easier to use because it lets the user scroll through the calendar instead of pressing the next month arrow button many times.	Similar to Expedia. The main difference is that on Kayak the calendar takes up the whole screen while on Expedia it appears as a pop-up window.	Both websites present content in different, responsive ways depending on the size of the window or screen of the device the user is using.

Principle	WCAG Accessibility Guidelines	Expedia	Kayak	Which is better in accessibility?
Operable	Make all functionality available from a keyboard.	Exiting the calendar was frustrating. I had to keep pressing tab until I reached the end of the month to leave the calendar pop up even though I already selected my date. I had to go through all the filters first before I had access to the flight results. This is frustrating as some filters like the airline filters is a long list, making this a time consuming task. Thankfully, it does not go through the filters again for the "Choose returning flight" page which saves time.	Once "Flights" is selected, I had to go through all the menu options again to get to the form where I could fill in my flight information. In the calendar, I could not access the previous and next month buttons with the keyboard. The up and down arrows had to be used instead which moves the calendar one week at a time. This is very time consuming. The calendar in general was extremely difficult to use. The departure and return dates were grouped together in the calendar when keyboard navigation was used. It was hard to switch between selecting a departure date and selecting the day for the return flight. After the flight results loaded, I had to go through the navigation menu again. However, it gave me options to access internal links and go directly to the flight filters, to edit my search form, or go to the flight results.	Expedia is easier to use when only using the keyboard as it is able to bypass lots of content that is unnecessary to the user at that stage of the flight booking process. In Kayak, after the user fills in the flight information form, they must go through the menu at the top which includes signing in, changing the language, and other features not necessary at that stage. However, Kayak does use internal links to help users jump to the content that they need on the page they are on, which is something Expedia should definitely implement to increase the functionality of the website from a keyboard.

Principle	WCAG Accessibility Guidelines	Expedia	Kayak	Which is better in accessibility?
	Give users enough time to read and use content.	Users are not timed when browsing for flight options but the flight results page will refresh if there is no activity for a period of time. There are no warnings for when the website will have a message that requires the user to reload the page since the user is inactive. Other pages further into the flight booking process do have a countdown however.		Both websites give users enough time to read and use content but could implement a countdown for the timeout in the flight results page.
	Help users navigate and find content.	The visual hierarchy and labelling is not as strong here as in Kayak. Some titles do not have a font-weight and/or font-size large enough to create sufficient contrast between the title and the text below it. The screen reader can bypass the navigation menu but not other sections like the filters.	Items are grouped together and the visual hierarchy helps users find the content they need. The navigation menu on the left cannot be bypassed when using the screen reader. However users can bypass other sections by using internal links. There are clear headings for pages.	Kayak is better as its labelling has more contrast and is more easy to spot. Easy to spot labelling helps users navigate the website and find the content they need.
Understandable	Help users avoid and correct mistakes.	Not putting in a departure or arrival location will warn the user about their error. Labels are given for each section the user must fill out.	The suggestions provided of what to do if users encounter the Air Canada error message bug is to try again or to contact them. Not putting in a departure or arrival location will warn the user about their error. Labels are given for each section the user must fill out.	Expedia does not have any bugs similar to the Air Canada bug in Kayak so it may seem better but both websites are actually quite similar for this category.

Principle	WCAG Accessibility Guidelines	Expedia	Kayak	Which is better in accessibility?
	Make text readable and understandable.	Language can be changed at the top of the page. It states the current language at the top. All text is written at an appropriate, easy to understand reading level	Language can also be changed at the top but unlike Expedia, Kayak puts the flag of a country at the top instead of putting the name of the language. All text is written at an appropriate, easy to understand reading level	Expedia is better as having the name of the language written out is more clear than having a flag as a symbol of the language. However, in terms of written content, both websites are quite similar.
	Make content appear and operate in predictable ways.	The navigation menus are consistent. Changing the filters only changes the content of the page and not the context (a new page/window is not opened). However, selecting dates in the calendar does not operate in a predictable way. Selecting the return flight date is confusing.	The navigation menus are consistent. Changing the filters only changes the content of the page and not the context (a new page/window is not opened). Selecting the dates in the calendar is more predictable than in Expedia as the dates in between the departure and return flight dates are highlighted in the calendar when the user hovers over a date.	Kayak is better as the calendar provides an affordance (highlighting) that helps make the date selecting process more predictable. It is helpful to see live updates in the calendar when the user hovers over a date.
Robust	Maximize compatibility with current and future user tools.	Compatible with the Google Chrome Screen Reader extension. However, after the screen reader is used for a period of time, the page becomes extremely slow compared to when the screen reader is not used.		Both websites are quite similar in this area.

Principle	WCAG Accessibility Guidelines	Expedia	Kayak	Which is better in accessibility?
Conformance	The system meets the minimum normative and conformance requirements	Level AA: Both websites satisfy the Level A and Level AA Success Criteria, but they can still be improved in some Level A and AA areas (such as using the keyboard only to navigate the website). It is not Level AAA as some AAA criteria (such as providing information about Timeouts) is not applicable		Both websites are quite similar in this area.

Part #4: Post-Study Interview

After my experiment, I ended the study with an interview with each participant. Below are the questions I asked the participants as well as a summary of the answers they gave me for the questions.

- **What is the biggest strength of Expedia?**
  - Each participant gave a unique answer for this question.
  - Participant 1: "The filter system is more visual. It only takes a quick glance so it's easier to use from the get go"
  - Participant 2: "I like that there is no need to switch to another website. I can do everything inside Expedia"
  - Participant 3: "I like how they separated the going to and coming back and how they separated their prices"
  - Participant 4: "Am I allowed to say none?"
  - Participant 5: "Their UI lets you instantly change the traveller and what type of trip it is"

- **What is the biggest strength of Kayak?**
  - Each participant also gave a unique answer for this question.
  - Participant 1: "I like that it groups both the departure and return. It also has better deals"

- Note: The deal the participant found on Expedia was actually cheaper but for some reason they though Kayak's was cheaper.
- Participant 2: "I don't see there are any strengths. I feel disappointed I need to be redirected"
- Participant 3: "I like the colours. There is yellow on it."
- Participant 4: "I like how there is a button for the "best" possible flight"
- Participant 5: "Their information set up. It's easy to switch options"

- **What is the biggest weakness of Expedia?**
  - The most common issues that were shared include the need to choose the return flight separately, having difficulties with the date selection in the calendar interface, being confused with the "Select your fare" slide-out menu, and the "Stays" page being the default instead of a general page where the user could select "Stays" or "Flights".

- **What is the biggest weakness of Kayak?**
  - The most common answer was that it could not keep the flight information when the user was redirected to the Air Canada website. The other comment was about Kayak's date filter having too many options.

- **Are there any expectations you have for a flight booking website that were not satisfied by Expedia? How about Kayak?**
  - For Expedia, 2 participants commented that they expected both the departure and return flights to be on the same page, especially because they selected Roundtrip.
  - For Kayak, 1 participant commented that the calendar had too many options for what they expected in the calendar.
  - The other participants gave comments that applied to both websites. One thought the user interfaces functioned as they expected, one thought booking flights would be cheaper, one did not expect cars, flights, and hotels to have their own sections on the websites, and one thought that users should be able to book hotels right under their flight after selecting it.

- **Which website would you use again in the future if you needed to find a flight? Why?**
  - 3 users voted for Kayak and 2 users voted for Expedia.
    - Participant 1: "I would use Kayak only because they have better deals. When it comes to travelling, I want the best deal. I don't care if it's an ugly, outdated website"
    - Participant 2: "Expedia. I don't see why I should use Kayak if I'm going to be redirected"
    - Participant 3: "Expedia. I like how the prices are separated and easy to read"
    - Participant 4: "Kayak because they have a button for the "best" option"
    - Participant 5: "I would say Kayak. I like their UI better. I like their calendar. It changes when you hover over the dates and it shows the prices in the legend"

Part #5: Possible Changes to Improve the Products

In the following tables, I have listed problems I found during my A/B test related to the WCAG guidelines and accessibility, as well as some common problems from Expedia and Kayak that were reported by the participants in my experiment. To the right of the problem, I have included a possible design change that could fix that issue.

Here are some ways to fix the issues in Expedia:

Problem	Possible Design Changes
Cannot hear the instructions given by the screen reader extension for using the calendar.	Rephrase the instructions to use a synonym instead of the current word that is being read by the screen reader as that word is hard to distinguish by ear.
Difficulty with exiting the calendar pop-up using only the keyboard.	Once a return date is selected, automatically close the calendar pop-up so that the user does not need to use the tab key to go through the rest of the dates of that month in order to exit the calendar.
There are no warnings for when the website page will no longer be usable and a message will appear asking the user to reload the page since they are inactive.	After the user is inactive for 3 minutes, add a small countdown timer in the corner to warn the user when the page is going to be no longer usable.

Problem	Possible Design Changes
Need to go through all the filters before the flight results could be accessed.	Implement internal links that let users jump to specific sections of the page that match their needs. (Kayak currently does this.) This option should be given to users early on when navigating the page.
Some titles do not have a font-weight and/or font-size large enough to create sufficient contrast between the title and the text below it.	Do not only rely on either font-weight or font-size to create contrast and emphasis. Use both, especially for the title "Choose returning flight" which many participants missed.
Selecting and changing the calendar dates is challenging and often results in the user making mistakes	Once users have selected a departure date, when they are hovering over the calendar, highlight the days in between the departure date and the date which the user is hovering over. Kayak does this and users liked the hover feature as it was clear what dates were being selected.
The return flight needs to be chosen separately; This confuses users as they are unsure what that page is for	Make the title "Choose return flight" much larger so users see it right away. There could also be an option for users to book both the departure and return flights on the same page.
The "Select Your Fare" pop-up which tries to up-sell the plane ticket is confusing as the user thought they already selected a ticket	Instead of having the ticket that was listed in the results right beside the more expensive ticket options, put the more expensive options below the listed ticket in its own section. Label the section "Upgrade your flight".
The filters at the top do not change the flight results automatically. The user must click the search button again.	Update the results automatically when the filters at the top are changed
The user enters information for the plane ticket into the hotels page as it is not clear that it is a hotels page	Make the labels "Stays", "Flights", etc. larger so users can see it more clearly. Instead of the generic "Search" button, it could be changed to "Search for hotels" or "Search for flights" so users know if they are in the right section.

Here are some ways to fix the issues in Kayak:

Problem	Possible Design Changes
Once "Flights" is selected, the user must go through all the menu options again to get to the flight information form.	Once the user selects "Flights", allow the navigation menu to be bypassed so that the user can fill out the form immediately.

Problem	Possible Design Changes
No access, when using keyboard navigation, to the previous and next month buttons in the calendar even though they are there.	Code these buttons in a way that they are accessible using screen readers. This is possible as Expedia's previous and next month buttons can be accessed with only the keyboard when using the screen reader.
Departure and return dates are grouped together in the calendar when keyboard navigation is used, making it hard to switch between selecting a departure date and selecting a return flight date.	Make the departure and return dates separate buttons instead of the same button so that users using only the keyboard can easily navigate between them.
There are no warnings for when the website page will no longer be usable and a message will appear asking the user to reload the page since they are inactive.	After the user is inactive for 3 minutes, add a small countdown timer in the corner to warn the user when the page is going to be no longer usable.
The option to change the language requires the user to click on the Canada flag button. For users using screen readers, they may not know the option to change the language is behind the button that the screen reader calls "Canada".	Include the name of the language in text in addition to the flag icon.
The calendar has lots of information which confuses the user	Some users liked that the calendar included prices while 1 user did not like it. Give participants the option to show prices if they want a more detailed calendar or to turn these details off.
The flight information on the results page does not list out the number of passengers directly. Instead it lists out the price per person and a total price.	List out the number of passengers near the total price as well.
Since the departure and return flights are grouped together, it was difficult for a user to figure out how to keep one flight option from the group but change the other	Participant 3 did not notice that the squares on the left are actually checkboxes to select one flight from the group. There could be a label above the top checkbox in the group saying "Check to select one"
Participant did not see the search button after selecting their flight requirements	Use the words "Search for Flights" instead of the small magnifying glass. This will also make the search button bigger.
Whenever Kayak directs the user to the Air Canada Website, there is always an error	Under Air Canada flights, Kayak should have a message saying "if the Air Canada Website results in errors, select a different website from the following list". Flight Network can be included in that list as that website works.

Appendix: Usability Issue Charts, UMUX Scores, and Frequency Bar Graphs

Usability Issue Charts

The following charts shows usability issues mentioned by the participants, the severity of the issue, and how many users mentioned that issue during the experiment. For the severity, "Low" refers to issues that may slightly frustrate the user but do not interfere with the completion of the task. They may slightly increase time on task and decrease satisfaction. Issues with the severity of "Medium" are more significant and will likely impact task time and user satisfaction. These issues may cause users to create errors which they must fix; however "Medium" issues do not lead to task failure. "High" severity issues lead to task failure and create significant negative impacts to a user's effectiveness, efficiency, and satisfaction.

Usability Issues in Expedia

Usability Issue	Severity	# of Users who Experienced It
The number of travellers button is small and easy to miss	Low	1
Selecting and changing the calendar dates result in errors as it's not immediately clear how to use it	Low	2
The return flight selection page confuses users as they are unsure what that page is for	Medium	3
The "Select Your Fare" pop-up which tries to up-sell the plane ticket is confusing as the user thought they already selected a ticket	Medium	1
The filters at the top do not change the flight results automatically. The user must click the search button again.	Medium	2
The user enters information for the plane ticket into the hotels page as it is not clear that it is a hotels page	High	2

Usability Issues in Kayak

Usability Issue	Severity	# of Users who Experienced It
The number of travellers button is small and easy to miss	Low	1
The filter for the time of the flight is a slider which has too many numbers	Low	1
The calendar has lots of information which confuses the user	Low	1
The phrase "View Deal" is not clear to users trying to book a plane ticket because they are looking for a word similar to "Book"	Low	2
The flight information on the results page does not list out the number of passengers directly. Instead it lists out the price per person and a total price.	Low	1
Since the departure and return flights are grouped together, it was difficult for a user to figure out how to keep one flight option from the group but change the other	Medium	1
Participant did not see the search button after selecting their flight requirements	Medium	1
Whenever Kayak directs the user to the Air Canada Website, there is always an error	High	4

UMUX (Usability Metric for User Experience) Scores

Participants responded to the following questions after they finished booking flights on both Expedia and Kayak in my 2 experiments:

- Expedia's/Kayak's capabilities meet my requirements
- Using Expedia/Kayak is a frustrating experience
- Expedia/Kayak is easy to use
- I have to spend too much time correcting things with Expedia/Kayak

These questions were written based on the 4 standard questions in the Usability Metric for User Experience questionnaire.

Participants ranked the statements from 1 to 7, where 1 meant Strongly Disagree and 7 meant Strongly Agree. I followed the UMUX method of scoring to determine the scores where the score for the odd-numbered statements is (user rating - 1) and the score for the even-numbered statements is (7 - user rating). To calculate the final UMUX score, the 4 scores were added, divided by 24, and then multiplied by 100. Below are the 4 scores for the 4 UMUX questions of each participant and their final score:

- Participant 1
  - Expedia: 6, 4, 6, 5   Final Score: 87.5
  - Kayak: 6, 2, 3, 1   Final Score: 50
- Participant 2
  - Expedia: 5, 5, 5, 5   Final Score: 80
  - Kayak: 2, 2, 4, 2   Final Score: 41.67
- Participant 3
  - Expedia: 5, 5, 5, 6   Final Score: 87.5
  - Kayak: 3, 2, 2, 4   Final Score: 45.83
- Participant 4
  - Expedia: 2, 1, 1, 0   Final Score: 16.67
  - Kayak: 4, 5, 4, 3   Final Score: 66.67
- Participant 5
  - Expedia: 6, 5, 5, 2   Final Score: 75
 - Kayak: 6, 5, 5, 2   Final Score: 75

The average UMUX score for Expedia is **69.33**.

The average UMUX score for Kayak is **55.83**.

Therefore, according to the UMUX scores, Expedia has better usability than Kayak.

Frequency Bar Graphs

These bar graphs show the frequency of all usability issues as well as their severity to help visualize which issues are the most common. I grouped the usability issues into three task categories: entering the **flight requirements**, browsing the **flight results**, and **selecting a flight**.

Frequency of Usability Issues in Expedia

Frequency of Usability Issues in Kayak
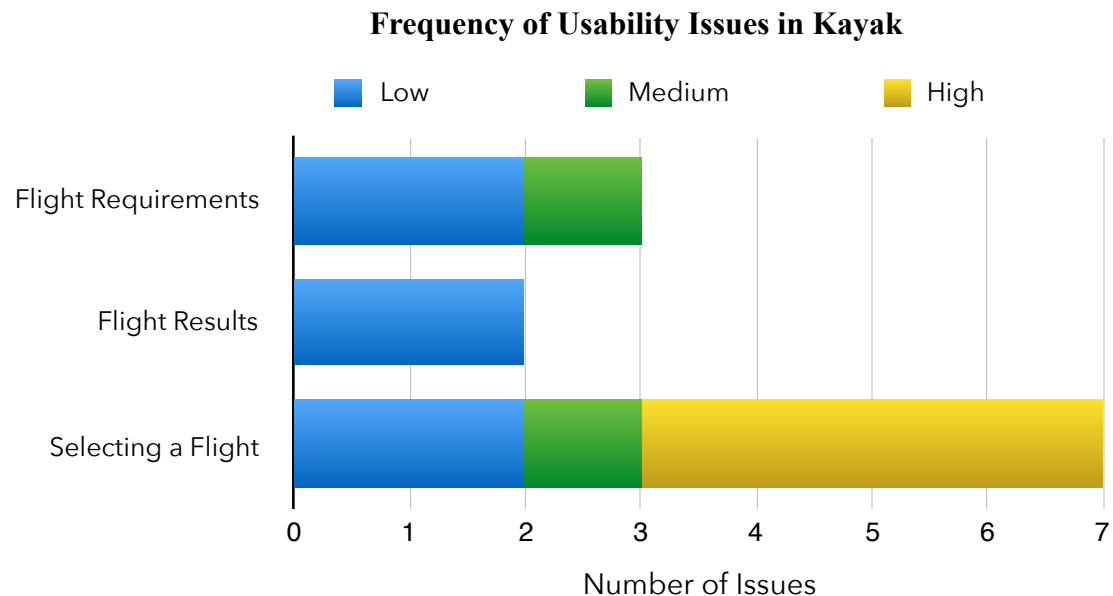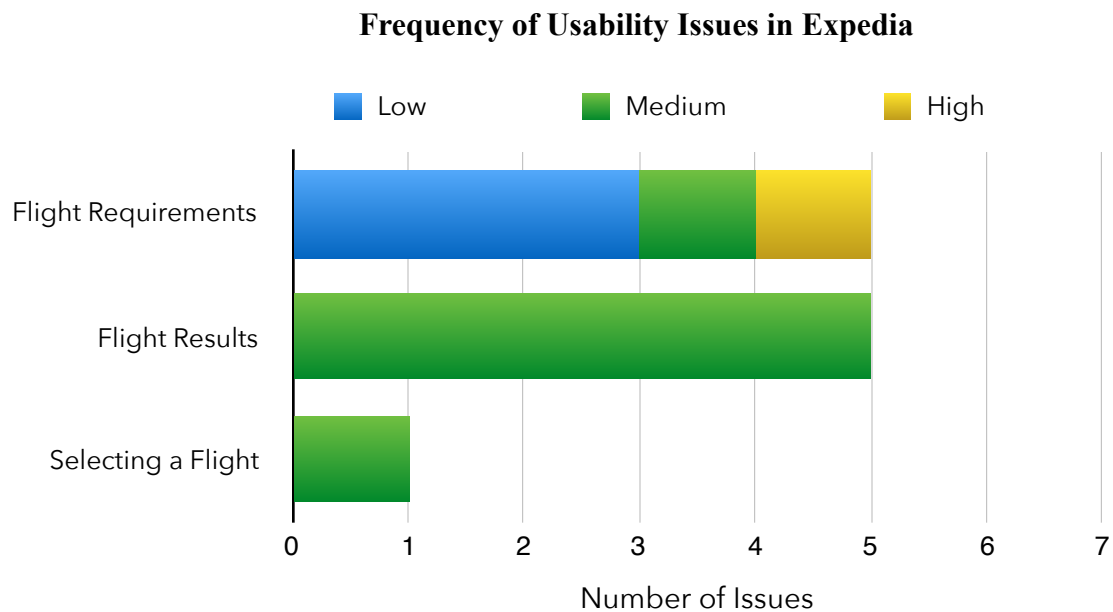
While Expedia had more issues earlier on and fewer issues later on in the process of booking a flight, Kayak had more issues later on and fewer issues earlier on in the process.