SKYPE VS GOOGLE HANGOUTS

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ABSTRACT
This report describes a study conducted on two platforms, Skype and Google hangouts, comparing some of their common features for usability, intuitiveness and quality.

1. INTRODUCTION
We conducted a study between two applications, Google Hangouts and Skype, for their services of video call, screen sharing, voice call and instant messaging. The reason to choose these systems is because; they are the most popular applications available today. The study conducted was in order to investigate which of the two systems the participants would prefer when compared with regards to intuitiveness, usability and quality for the aforementioned features.

2. BACKGROUND
Users require having respective accounts in order to use these systems. With regards to the functionality, both the systems are fundamentally similar when it comes to video calls and instant messaging. However, with regards to voice calls, Hangouts only allows users to make free calls across States and North America, but Skype users can either make a free skype to skype call or buy credits in order to make phone calls. Hangouts being a web application is accessed within a browser, while Skype requires users to download a separate application to use it. Screenshots of both the system can be seen in Figure 1 and Figure 2 below.

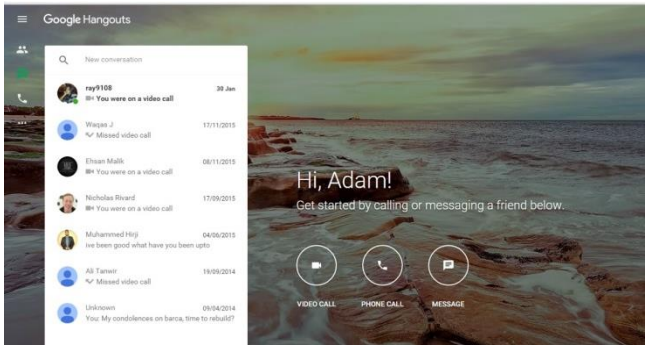

Figure 1.Google Hangouts welcome page. The three services offered by Google Hangouts are listed in the middle of the page. The user can also search for contacts on the left.

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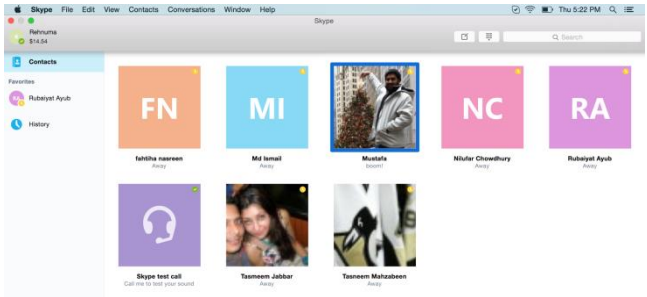


Figure 2. Screenshot for Skype. On logging in user are shown their recent contacts. To start a conversation or make calls the user can select a contact from here, search contacts in the search bar on the top left or view all added contacts..

3. METHODOLOGY
The study involves finding out which system the participants would find easier to use and if they preferred one over the other. Each session with a participant was divided into parts, starting off with asking the participants to complete certain narrated tasks. 12 participants of fairly different backgrounds, aged between 20-26 years old were asked to participate at random from the Hertzberg building. The participant was placed in front of a laptop with Skype and Hangouts pre-logged in. One of the group members sat across the participant, narrating instructions and tasks. The second group member stood by the participant timing and observing each task, noting the difficulties each participant was having. The third group member sat in a separate room, connecting and communicating with the participant via the systems. The systems were alternated between each participant for each session. All tasks completed by the participants were done on a contact named "Ray". The tasks were as follows:

1. Send a text message to the contact.
2. Make a voice call from Skype to the contact. Since Hangouts doesn't allow voice calls, we provided the group member's phone number so she could receive the call. The participant had a brief conversation to give them a sense of the voice clarity.
3. Make a video call to the contact. Again the participant had a brief conversation to give them a sense of the voice clarity and video quality.
4. Screen Share while connected on video call with the contact.

Each session started once the instructing group member said so. The observing group member started the stopwatch simultaneously, and observed till the particular task was completed. He then recorded the time for the task and any difficulties the participants faced. Once the session was

completed, the participants filled in a questionnaire based on the tasks that were performed. This was a way to collect ordinal data based on the Likert-style scale to find out the user's opinion on the system. The questions were based on how easy or difficult they found the tasks to be. We asked the participants how intuitive finding each service was, how useable a service was once found and the quality of the service being used. The questions can be found in the appendix.

The reason to choose this method was because, it allowed us to accurately time tasks and also actively monitor participants and their problem solving skills. We observed why some participants took longer than others and how they approached tasks. That being said, we have some limitations. Firstly, the idea of being watched, made the participants nervous, which might have influenced their behavior. They would apologize if a particular task took longer than they anticipated. We tried counteracting that by explaining, that it was the interface that was being tested, not them. The other limitation is that, many participants were familiar with both interfaces and knew exactly how to accomplish tasks.

4. ANALYSIS & INTERPRETATION

After examining the quantitative data, we found that the Skype layout was faster to use than the Google Hangouts interface. The results of the Likert-type scale data also showed that there was a measurable difference in user experience between the two systems. We analyzed the time data using a Paired t test and the ordinal data using the Wilcoxon Signed-Rank test. As the following four box plots show, the Skype timings were comparatively faster and had less variability. Figures 3, 4, 5, 6 can also be found in the appendix in large format. The only task where Google Hangouts actually outperforms Skype is the Messaging Time. We used the p-value to test if the differences were significant. The confidence interval was set to 95%. The null hypothesis for our experiment and tasks was that there will be no significant difference in the time it takes to accomplish a task on either system.

As Figure 3 shows, Messaging Time for Hangouts is quicker and has less variability. The mean time to send and receive a test message in Skype was 21.75 seconds with a standard deviation of 14.70, whereas the mean time for Google Hangouts was 19.6 seconds and a standard deviation of 4.45. The median value calculated to send and receive messages in Google Hangouts and Skype is 19.31 and 17.24 respectively, since the means for both Applications is significantly larger than the median we can conclude that the data is skewed to the right. The small standard deviation of Google Hangouts shows that the results were very close together and more consistent, despite only a 2.15 second difference between the means. But with a p-value of 0.657 and a CI of 95%, therefore we cannot reject the null hypothesis hence the difference between the Applications for the messaging feature is not significant. This also correlates with the results of the Wilcoxon test, which showed there was not statistical difference in the participants' answers to the questionnaire. We got a p-value of 0.893 for how intuitive was it to find the messaging service and a p-value of 0.834 for the usability of the messaging service once if was found. Therefore we cannot conclude that there was any statistical difference between the systems for this service.

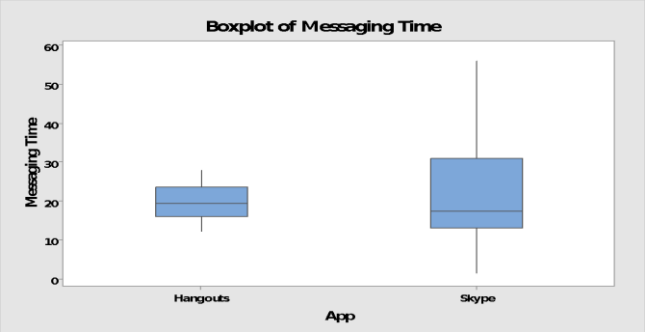


Figure 3. Messaging Time recorded for Skype and Google Hangouts.

Figure 4 shows that participants were able to complete the task of Video Call much faster in Skype than in Google Hangouts. Also the variability of the data for Skype is a lot less. Participants took a long time in finding how to connect to a contact once the video call feature was launched in Google Hangouts. Whereas in Skype, the participants knew how to start a video call with a contact as finding the contact is done first to start a video call. The mean time to complete the Video Call in Skype was 8.17 seconds and a standard deviation of 7.07 seconds, whereas in Google Hangouts was 25.67 seconds, with a standard deviation of 12.45. The median time to complete a Video Call in Hangouts and Skype is 26.25 and 6.77 respectively, since the median is close to the mean value recorded for Skype's Video Call service we can conclude that the data is symmetric. However, for Hangouts Video Call service, the mean is larger than the median value therefore we can justify that the data is skewed to the right and the difference in mean of 17.5 seconds. A p-value of 0.001 was calculated and with a CI of 95%, we can conclude that the difference is significant. The Wilcoxon Signed-Rank test also showed that there was a difference between the systems when it comes to how intuitive it was to find the Video call service and the usability of it. We got a p-value of 0.036 for both, intuitive and usability. This means the participants felt there was a difference in how intuitive it was to find the video call service and its usability. But we got a p-value of 1.00 for the video quality. So we cannot conclude that there was a difference between the video qualities of the two systems.

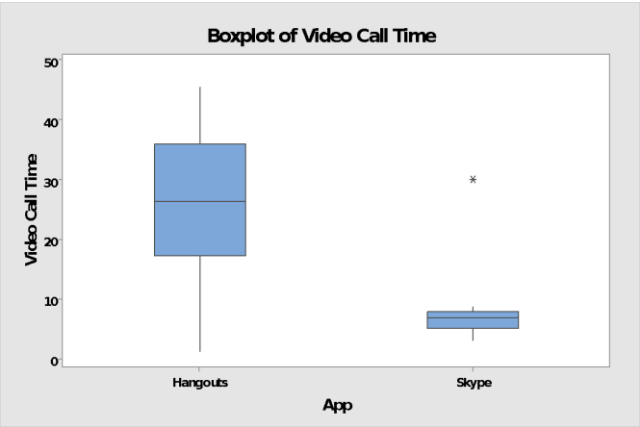


Figure 4. Video Call timings recorded for Skype and Google Hangouts.

Figure 5 shows that participants were able to complete the task of the Voice Call faster in Skype than in Google Hangouts. The mean time to complete this task in Skype was 10.8 seconds and in Google Hangouts it was 27.9. The median time to complete a

voice call in Google Hangouts and Skype is 28.88 and 9.33, since the median and mean values are close together we can conclude that the data is symmetric. The graph also shows very little variability in the data of Skype compared to Hangouts. This is proven by the standard deviations of Skype, which is 8.27, and for Google Hangouts, which is 12.21. We can also conclude, with a p-value of 0.001 and a CI of 95%, that we reject the null hypothesis and that the difference between the two systems is significant. The Wilcoxon test returned a p-value of 0.076 for how intuitive it was to find the voice call service between the two systems. This isn't low enough to conclude that the participants felt the difference was significant, but it is very close. But we got a p-value of 0.205 for the usability of the voice call service. So even though the paired t test shows that there is a statistical difference in the times of making the voice calls, we cannot conclude that the participants believe there was a big difference.

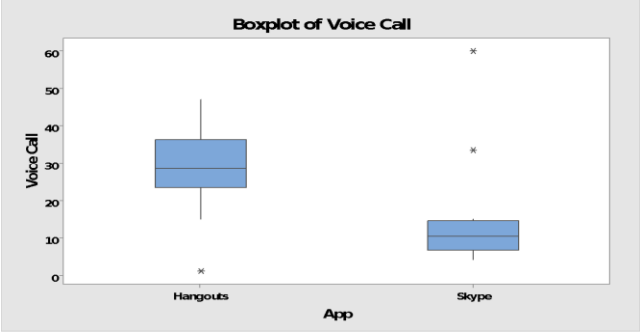


Figure 5. Voice Call timings for Skype and Google Hangouts.

Figure 6 shows that participants were able to complete the task of the Screen Share in Skype and in Hangouts in about the same time. The mean time to complete this task in Skype was 27.3 seconds and in Google Hangouts it was 41.2. The median time to screen share during a video call in Hangouts and Skype is 20.09 and 19.06 respectively. Since the median is less than the mean for this data set we can justify that the data is skewed to the left. The graph also shows similar variability in the data of Skype and Hangouts. The standard deviation for Skype was 22.9 and Hangouts was 57.0. But this may be due to the fact that the data for Hangouts has two outliers very far from the rest of the data. We can also conclude that with a p-value of 0.448 and a CI of 95%, we cannot reject the null hypothesis and that the difference between the two systems is not significant. This matches our results from the Wilcoxon test for intuition and quality.

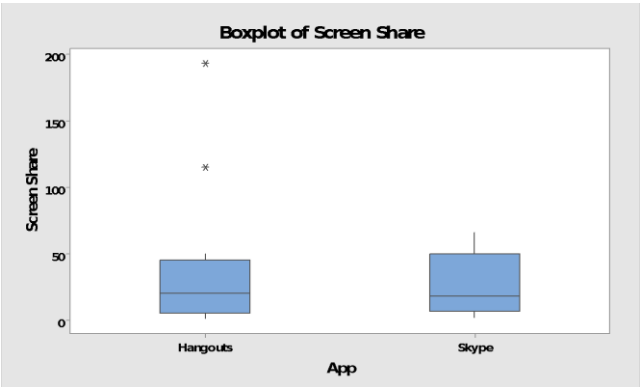


Figure 6. Screen Sharing timings for Skype and Google Hangouts.

We have added a table below, table 1, showing the p-values from the Wilcoxon Signed-Rank test

Table 1. Wilcoxon p-values

Question about service	p-value from Wilcoxon Test
Messaging – Intuitive	0.893
Messaging – Usability	0.834
Voice Call – Intuitive	0.076
Voice Call – Usability	0.205
Voice Call – Clarity	0.584
Video Call – Intuitive	0.036
Video Call – Usability	0.036
Video Call – Quality	1.000
Screen Share – Intuitive	1.000
Screen share – Quality	0.834

5. DISCUSSION

The voice calling feature in skype and google hangout are very easy to spot, both applications have a very standard graphic representing the calling feature.

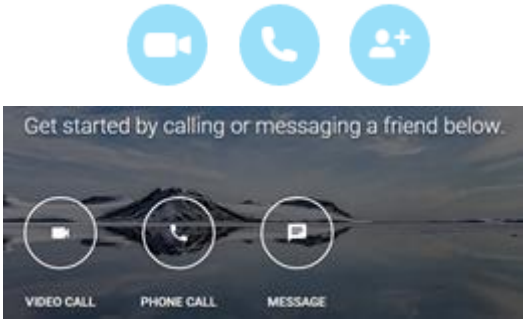


Figure 7. Call feature representation for Skype(top) and Google hangouts(bottom).

Upon clicking the telephone logo on skype, it directly navigates to the call. Most of the subjects didn't take much time to figure out Skype's voice calling feature. Most of the participants were satisfied with the voice clarity. This also reflects in the quantitative data analysis.

Since Hangout doesn't have the same voice call function as Skype, participants were caught off guard when they were presented with interface that consisted of text-box that had default text "Name, phone number", when clicking on the phone logo. Rest of the calling interface had no directions whatsoever. Bottom of the interface was vast white space.

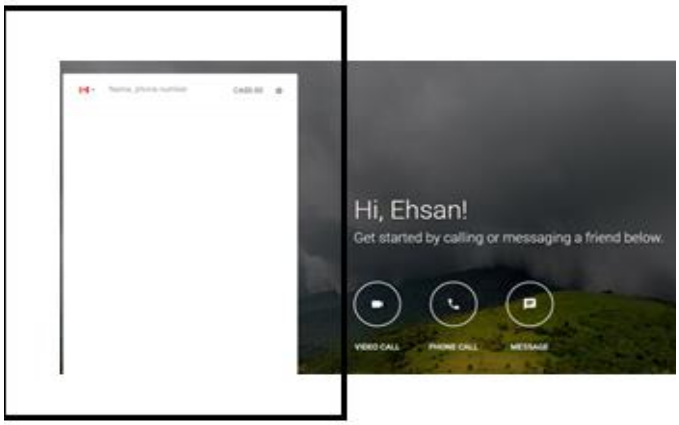


Figure 8. Highlighted box showing Google Hangouts Phone Call feature

The text-box directs users to enter the person name they want to call. Most of the participants proceeded to search for the contact in the textbox but this feature doesn't work which confused the participants even more.

Figure 9. The contact search to make a call

The participants then clicked on the contacts to find the person they want to call but google doesn't allow computer to computer voice call. If the contact you are trying to make a phone call to doesn't have their number linked to their Gmail then no option is presented to you at all (not even to make a phone call to their cellphones). The participants were confused even more. The participants were then told to call a telephone number to get their feedback on voice clarity.

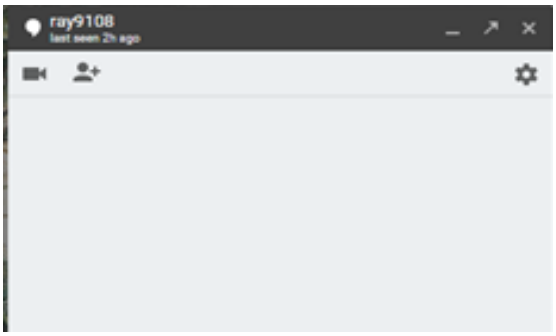


Figure 10. Conversation window for contact Ray in Google Hangouts

Skype features had positive feedback over all but one of the features that participants had trouble figuring out was initiating screen share. It was mostly because the graphical representation of screen-share button is misleading. It's a simple plus sign and most of the participants stated that they didn't think about clicking the plus sign to screen share because the button looks like a button for adding a person into their chat. Most of the participants spent time looking at the toolbar to initiate screen share despite having the button for screen share present on their conversation screens.

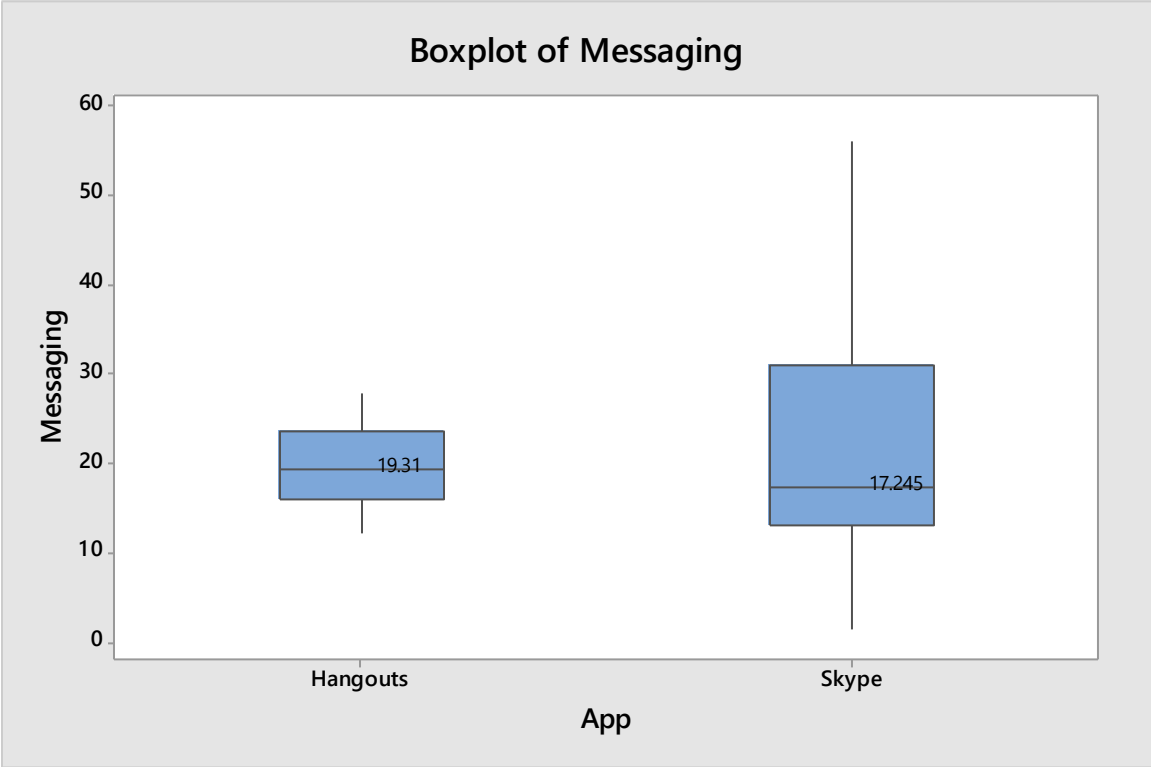
6. CONCLUSION

Based on our observation and the analysis of the recorded results, we conclude that Skype was preferred by the participants over Google Hangouts.

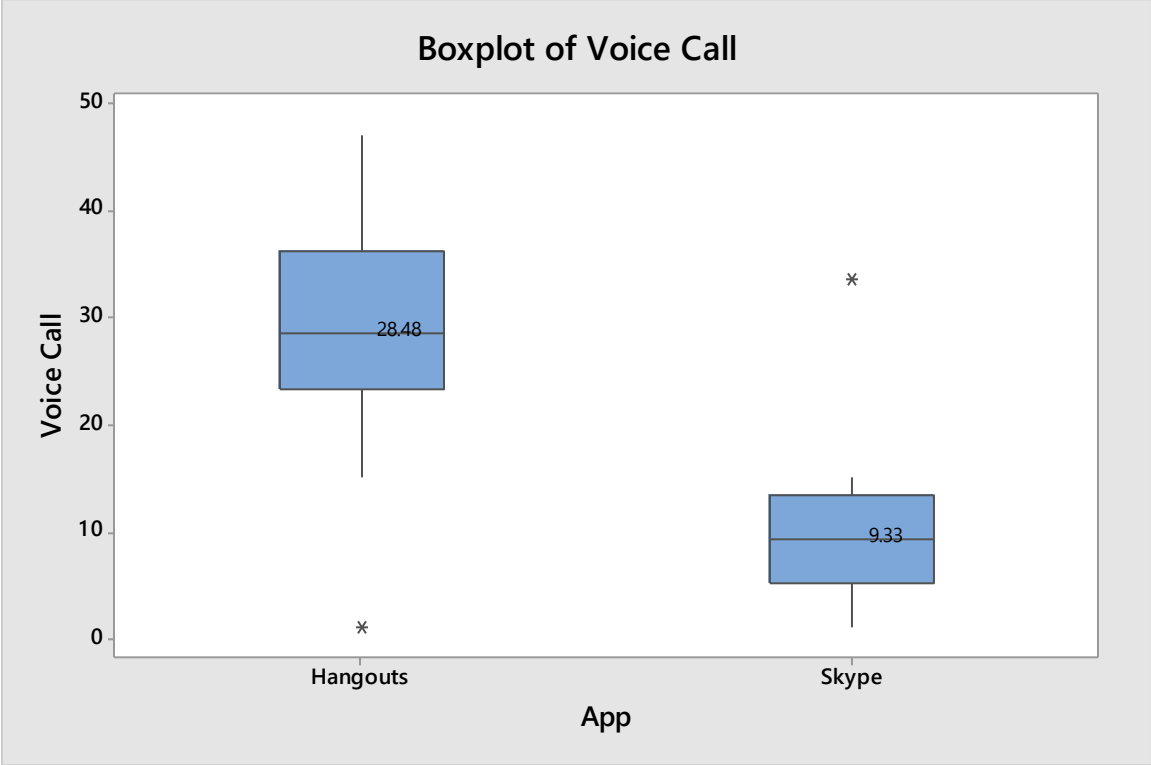
As mentioned above we tested both systems in terms of a combination of both categories and common services among both the systems; the categories were intuitiveness, usability and quality and the services were messaging, voice call, video call, and screen sharing. The participants found no difference in both the messaging and screen sharing service but for voice call and video call participants opted for Skype over Hangouts. Therefore we conclude that although based on services of the application, participants' preference varied between the two applications but overall they found Skype to be more user friendly and were likely to use it again.

7. APPENDIX

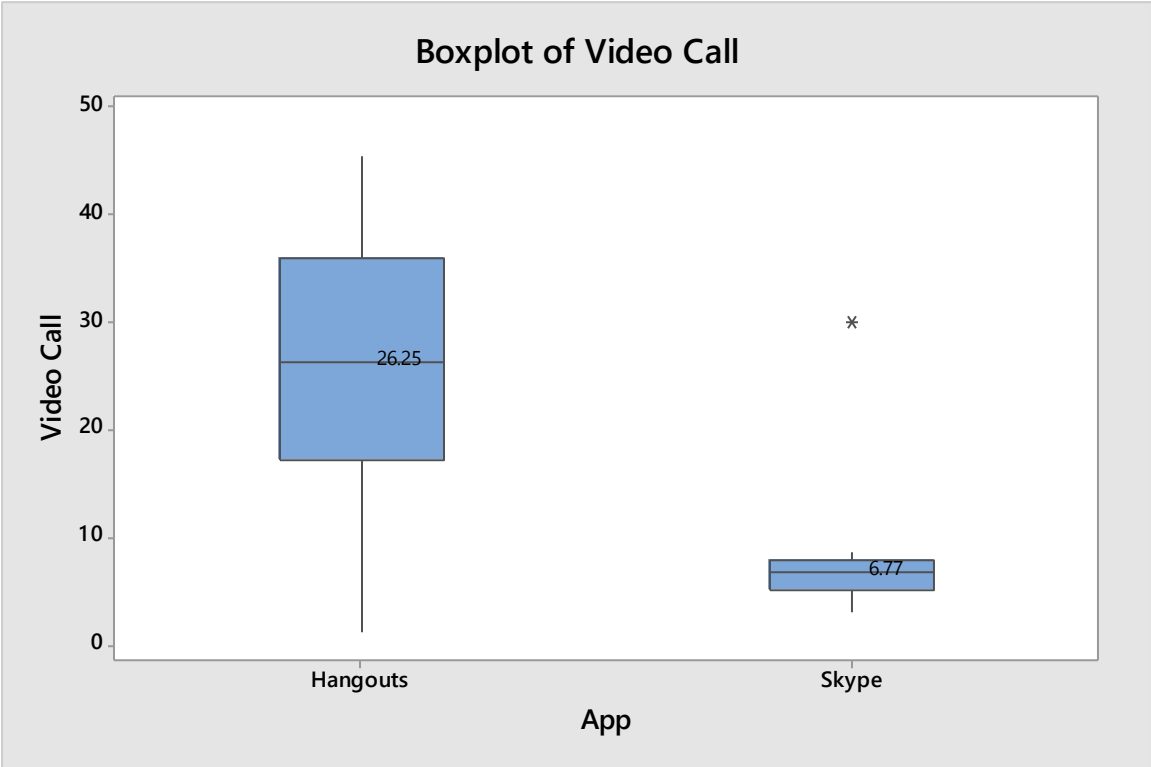
7.1 Box Plots of Times for Tasks in Google Hangouts and Skype



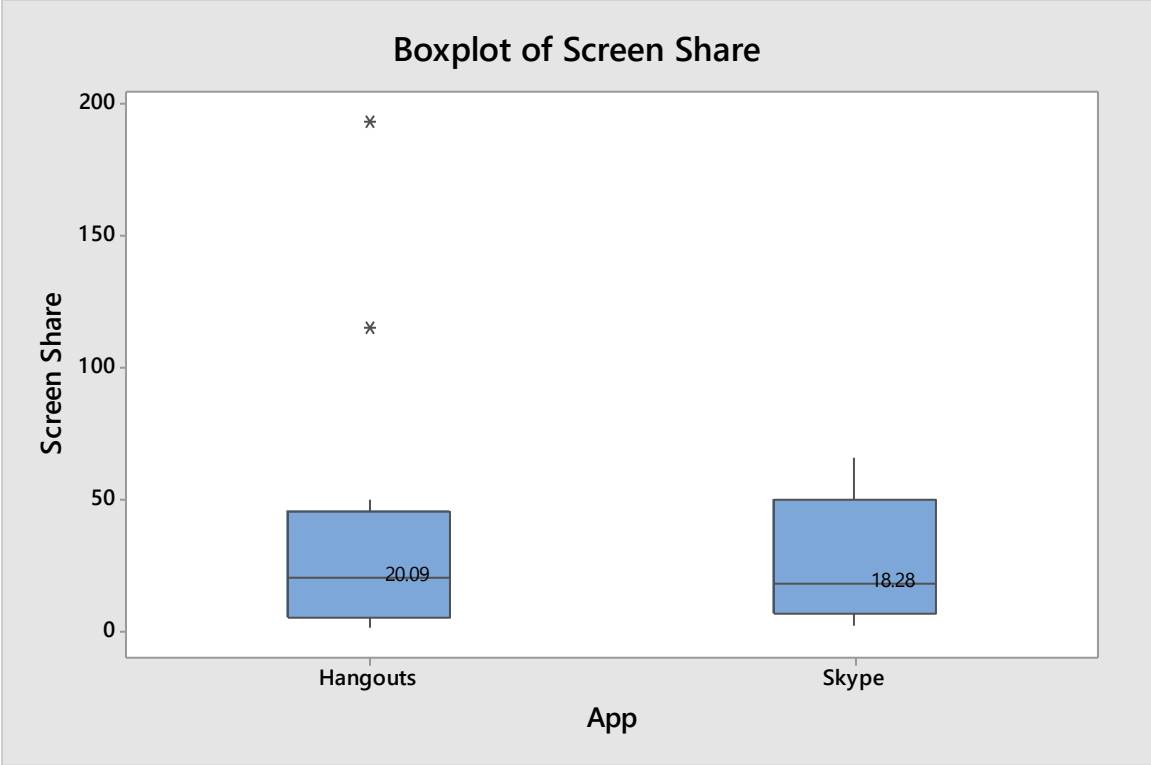
A 1. Messaging Times for Hangouts and Skype



A 2. Voice Call Times for Hangouts and Skype



A 3. Video Call Times for Hangouts and skype



A 4. Screen Shot Times for Hangouts and Skype

7.2 Wilcoxon Signed-Rank Test

Wilcoxon Signed Rank Test: Difference for Messaging Intuitive

Test of median = 0.000000 versus median ≠ 0.000000

	N	N for Test	Wilcoxon Statistic	P	Estimated Median
Difference	12	5	8.5	0.893	0.000000000

Wilcoxon Signed Rank Test: Difference for Messaging Usability

Test of median = 0.000000 versus median ≠ 0.000000

	N	N for Test	Wilcoxon Statistic	P	Estimated Median
Difference	12	8	20.0	0.834	0.000000000

Wilcoxon Signed Rank Test: Difference for Phone Call Intuitive

Test of median = 0.000000 versus median ≠ 0.000000

	N	N for Test	Wilcoxon Statistic	P	Estimated Median
Difference	12	9	38.0	0.076	1.250

Wilcoxon Signed Rank Test: Difference for Phone Call Usability

Test of median = 0.000000 versus median ≠ 0.000000

	N	N for Test	Wilcoxon Statistic	P	Estimated Median
Difference	12	7	22.0	0.205	1.000

Wilcoxon Signed Rank Test: Difference for phone call clarity

Test of median = 0.000000 versus median ≠ 0.000000

	N	N for Test	Wilcoxon Statistic	P	Estimated Median
Difference	12	4	7.0	0.584	0.000000000

Wilcoxon Signed Rank Test: Difference for Video Call Intuitive

Test of median = 0.000000 versus median ≠ 0.000000

	N	N for Test	Wilcoxon Statistic	P	Estimated Median
Difference	12	6	21.0	0.036	0.7500

Wilcoxon Signed Rank Test: Difference for video call Usability

Test of median = 0.000000 versus median ≠ 0.000000

	N	N for Test	Wilcoxon Statistic	P	Estimated Median
Difference	12	6	21.0	0.036	0.5000

Wilcoxon Signed Rank Test: Difference for Video Call Quality

Test of median = 0.000000 versus median ≠ 0.000000

	N	N for Test	Wilcoxon Statistic	P	Estimated Median
Difference	12	4	5.0	1.000	0.000000000

Wilcoxon Signed Rank Test: Difference for Screen Share Intuitive

Test of median = 0.000000 versus median ≠ 0.000000

	N	N for Test	Wilcoxon Statistic	P	Estimated Median
Difference	12	9	23.0	1.000	0.000000000

Wilcoxon Signed Rank Test: Difference10 for Screen Share Quality

Test of median = 0.000000 versus median ≠ 0.000000

	N	N for Test	Wilcoxon Statistic	P	Estimated Median
Difference	12	6	9.0	0.834	0.000000000

7.3 Paired T-Test for Skype and Google Hangouts

Messaging
Paired T-Test and CI: Skype, Hangout

```
Paired T for Skype - Hangout

             N   Mean  StDev  SE Mean
Skype       12  21.75  14.70     4.24
Hangout     12  19.60   4.45     1.28
Difference  12   2.15  16.29     4.70


95% CI for mean difference: (-8.20, 12.50)
T-Test of mean difference = 0 (vs ≠ 0): T-Value = 0.46  P-Value = 0.657
```

Video Call
Paired T-Test and CI: Skype, Hangout

```
Paired T for Skype - Hangout

             N    Mean  StDev  SE Mean
Skype       12    8.17   7.07     2.04
Hangout     12   25.67  12.45     3.59
Difference  12  -17.50  13.72     3.96


95% CI for mean difference: (-26.22, -8.78)
T-Test of mean difference = 0 (vs ≠ 0): T-Value = -4.42  P-Value = 0.001
```

Voice Call
Paired T-Test and CI: Skype, Hangout

```
Paired T for Skype - Hangout

             N    Mean  StDev  SE Mean
Skype       12   10.80   8.27     2.39
Hangout     12   27.90  12.21     3.52
Difference  12  -17.11  14.02     4.05


95% CI for mean difference: (-26.02, -8.20)
T-Test of mean difference = 0 (vs ≠ 0): T-Value = -4.23  P-Value = 0.001
```

Screen Share
Paired T-Test and CI: Skype, Hangout

```
Paired T for Skype - Hangout

             N   Mean  StDev  SE Mean
Skype       12   27.3   22.9      6.6
Hangout     12   41.2   57.0     16.4
Difference  12  -13.9   61.1     17.6


95% CI for mean difference: (-52.7, 25.0)
T-Test of mean difference = 0 (vs ≠ 0): T-Value = -0.79  P-Value = 0.448
```

7.4 Raw Data for T-Test

Skype				
	Timings(sec)			
Participant	Message	Video Call	Voice Call	Screen Share
1	12	7	15	20
2	14	5	6	5
3	13	7	5	34
4	56	3	11	9
5	13	5	13	13
6	21.73	6.33	9.58	50.48
7	33.37	6.54	13.58	58.9
8	1.28	4	4	46.99
9	16.91	30	1.03	1.05.90
10	17.58	7.88	33.48	2.14
11	39.08	7.72	9.08	16.56
12	23.06	8.62	8.79	5.93

Participant	Timings(sec)			
1	Message	Video Call	Voice Call	Screen Share
2	19	17	15	1.54
3	16	31	47	2.56
4	22	13	1.08	29
5	16	1.2	25	2.09
6	18	41	28	13
7	12.07	17.56	43.18	49.7
8	23.99	37.35	37.88	16.99
9	19.62	29.18	29.58	1.55.27
10	27.74	26.35	25.15	31.11
11	21.57	26.15	31.14	20.78
12	15.34	23.04	22.84	19.4
	23.9	45.26	28.96	3.12.96

7.5 Wilcoxon Test Raw Data From Likert-Style Scale

Participants	M-Intuitive Skype	M-Intuitive Hangout	M-Usability Skype	M-Usability Hangout
1	5	5	7	5
2	6	6	6	6
3	6	5	5	5
4	6	5	7	6
5	6	6	7	7
6	6	6	7	5
7	6	4	7	4
8	3	5	3	6
9	6	6	4	7
10	5	5	5	5
11	4	5	5	6
12	6	6	7	6

Participants	P-Intuitive Skype	P-Intuitive Hangout	P-Usability Skype	P-Usability Hangout	P-Clarity Skype	P-Clarity Hangout
1	6	4	6	5	5	5
2	6	5	6	6	6	6
3	6	3	4	4	5	6
4	6	3	6	3	5	5
5	6	2	7	2	5	2
6	6	5	7	6	5	5
7	6	4	5	5	5	3
8	5	5	5	5	5	5
9	3	6	3	7	5	5
10	5	5	6	6	4	4
11	6	6	7	5	5	6
12	6	5	7	5	6	6

Participants	V-Intuitive Skype	V-Intuitive Hangout	V-Usability Skype	V-Usability Hangout	V-Quality Skype	V-Quality Hangout
1	6	3	6	5	5	5
2	6	5	6	5	5	6
3	6	4	7	5	5	5
4	5	5	6	6	5	5
5	6	5	6	5	5	5
6	6	3	7	6	5	5
7	5	5	5	5	5	5
8	6	6	7	7	5	5
9	5	5	6	6	5	4
10	6	6	6	6	5	6
11	6	5	7	4	6	5
12	6	6	6	6	6	6

Participants	S-Intuitive Skype	S-Intuitive Hangout	S-Quality Skype	S-Quality Hangout
1	4	2	6	5
2	5	1	4	6
3	6	4	5	6
4	5	5	5	5
5	4	4	4	5
6	4	5	5	5
7	2	5	4	4
8	3	5	5	5
9	2	6	5	5
10	3	4	4	4
11	4	4	6	5
12	6	3	6	5

7.6 Questionnaire

1. How intuitive was finding Skype's text messaging option ?
Extremely Easy
Easy
Somewhat Easy
Somewhat Difficult
Difficult
Extremely Difficult

2. Rate the usability of Skype's text messaging option.
Extremely Easy
Easy
Somewhat Easy
Somewhat Difficult
Difficult
Extremely Difficult

3. Would you use Skype's text messaging service often ?
Yes
No

4. How intuitive was finding Skype's phone call option?
Extremely Easy
Easy
Somewhat Easy
Somewhat Difficult
Difficult
Extremely Difficult

5. Rate the usability of Skype's phone call option
Extremely Easy
Easy
Somewhat Easy
Somewhat Difficult
Difficult
Extremely Difficult

6. How was the voice clarity in the phone call ?
Very Clear
Clear
Somewhat Clear
Somewhat Unclear
Unclear
Very Unclear

7. Would you use Skype's phone call service often ?
Yes
No

8. How intuitive was finding Skype's video call option ?
Extremely Easy
Easy
Somewhat Easy
Somewhat Difficult
Difficult
Extremely Difficult

9. Rate the usability of Skype's video call option
Extremely Easy
Easy
Somewhat Easy
Somewhat Difficult
Difficult
Extremely Difficult

10. How intuitive was finding Skype's screen share option?
Extremely Easy
Easy
Somewhat Easy
Somewhat Difficult
Difficult
Extremely Difficult

11. How was the quality of the audio and video during the video call ?
Extremely Clear picture and audio
Clear picture and audio
Somewhat Clear picture and audio
Somewhat Unclear picture and audio
Unclear picture and audio
Extremely Unclear picture and audio

12. How was the quality of the audio and video of a video being played over screen sharing ?
Extremely Clear picture and audio
Clear picture and audio
Somewhat Clear picture and audio
Somewhat Unclear picture and audio
Unclear picture and audio
Extremely Unclear picture and audio

13. Would you use Skype's video phone call service often ?
Yes
No

14. How intuitive was finding Hangouts's text messaging option ?
Extremely Easy
Easy
Somewhat Easy
Somewhat Difficult
Difficult
Extremely Difficult

15. Rate the usability of Hangouts's text messaging option.
Extremely Easy
Easy
Somewhat Easy
Somewhat Difficult
Difficult
Extremely Difficult

16. Would you use Hangout's text messaging service often ?
Yes
No

17. How intuitive was finding Hangout's phone call option?
Extremely Easy
Easy
Somewhat Easy
Somewhat Difficult
Difficult
Extremely Difficult

18. Rate the usability of Hangout's phone call option
Extremely Easy
Easy
Somewhat Easy
Somewhat Difficult
Difficult
Extremely Difficult

19. How was the voice clarity in the phone call ?
Very Clear
Clear
Somewhat Clear
Somewhat Unclear
Unclear
Very Unclear

20. Would you use Hangout's phone call service often ?
Yes
No

21. How intuitive was finding Hangout's video call option ?
Extremely Easy
Easy
Somewhat Easy
Somewhat Difficult
Difficult
Extremely Difficult

22. Rate the usability of Hangout's video call option
Extremely Easy
Easy
Somewhat Easy
Somewhat Difficult
Difficult
Extremely Difficult

23. How intuitive was finding Hangout's screen share option?
Extremely Easy
Easy
Somewhat Easy
Somewhat Difficult
Difficult
Extremely Difficult

24. How was the quality of the audio and video during the video call ?
Extremely Clear picture and audio
Clear picture and audio
Somewhat Clear picture and audio
Somewhat Unclear picture and audio
Unclear picture and audio
Extremely Unclear picture and audio

25. How was the quality of the audio and video of a video being played over screen sharing ?

Extremely Clear picture and audio

Clear picture and audio

Somewhat Clear picture and audio

Somewhat Unclear picture and audio

Unclear picture and audio

Extremely Unclear picture and audio

26. Would you use Hangout's video phone call service often ?

Yes

No

Abdul Bin Asif Niazi 100917191

- Assisted with Design of Experiment
- Was the timer for one day of the experiment
- Assisted with the Wilcoxon Signed-Rank Test
- Assisted to Write and Edit the Report
- Assisted with Analysis

Malik Ehsanullah 10083343

- Assisted with Design of Experiment
- Was the timer for one day of the experiment
- Assisted to insert the raw data from paper to excel
- Assisted in making of diagrams
- Assisted to Write and Edit report

Rehnuma Tarannum 100838870

- Assisted with Design of Experiment
- Was the person to instruct the participants and interact with participants on the systems for both days of the experiment
- Assisted to insert the raw data into excel
- Did the paired T-test on the time data
- Assisted to write and edit the report
- Assisted in making diagrams

Muhammad Mustafa 100823576

- Assisted with Design of Experiment
- Was the person to instruct the participants and interact with participants on the systems for both days of the experiment
- Assisted with the Wilcoxon Signed-Ranked Test
- Assisted to write and edit the report
- Formatted the entire report
- Assisted in making diagrams