



SOEN 6611 Software Measurement

Assignment -3
On
Empirical Investigation and Quality-in-Use Measurement Model.
Submitted To: Dr. Olga Ormandjieva

Mrinal Rai – 40193024
Akshay Dhabale - 40163636

Table of Contents

Conception.....	1
Overview.....	1
Definition of Quality-in-Use Model	1
Objectives.....	1
Website Overview.....	2
Design	2
Hypotheses.....	2
Experiment	4
Overview.....	4
Subjects.....	4
Objects.....	5
Treatments	5
Treatment Dependencies.....	6
State Variables.....	7
Response Variables.....	7
Raw Measurement Data	8
Execution	9
Task 1 – Undergraduate Admission.....	9
Task 2 – View Program Details.....	10
Task 3 – Ask a Question	11
Analysis.....	12
Raw Measurement Data.....	12
Effectiveness	13
Measurement Data.....	13
Statistical Analysis Using T-Test.....	13
Analysis.....	14
Productivity	15
Measurement Data.....	15
Statistical Analysis Using T-Test.....	15
Analysis.....	16

Task Efficiency.....	16
Measurement Data.....	17
Statistical Analysis Using T-Test.....	17
Analysis.....	18
Safety.....	19
Measurement Data.....	19
Statistical Analysis Using T-Test.....	19
Analysis.....	20
Task Navigation.....	21
Measurement Data.....	21
Statistical Analysis Using T-Test.....	22
Analysis.....	22
Risks.....	23
Various Testing Environments.....	23
Improper Sample Population	23
Insufficient Sample Population.....	24
Use of Language.....	24
Varying Internet Connection Speeds.....	24
Dissemination and Decision-Making	25
Desktop UI vs. Mobile UI Percent Difference.....	25
Effectiveness.....	25
Productivity	25
Efficiency.....	25
Safety	26
Navigation	26
Decision-Making	28
Overview.....	28
Concrete Suggestions.....	28

Conception

Overview

The overall objective of this study is to evaluate the quality-in-use measurements for both the mobile user interface and the desktop user interface of the Concordia University web site in order to determine whether there is a significant difference in quality between them. In order to collect the data necessary to evaluate the quality-in-use values, users will be asked to perform three tasks on both a desktop environment and a mobile environment. They will then fill out a questionnaire to rate the satisfaction of the tasks performed in both the mobile user interface and desktop user interface. With these responses we will be able to evaluate the Effectiveness, Productivity, task efficiency, safety and task navigation for both the desktop user interface (DUI) and the mobile user interface (MUI) and perform statistical analysis upon the results to draw up conclusions about the quality of the designs.

Definition of Quality-in-Use Model

The Quality-in-use characteristics as defined in ISO/IEC 9126-4 are as follows:

Effectiveness	The capability of the software product to enable users to achieve specified goals fully and accurately
Productivity	The capability of the software product to enable users to consume appropriate amounts of resources to complete the task, such as time, or the effectiveness of the software product relative to the effort expended by the user
Safety	The capability of the software product to limit the risk of harm to people, businesses, software, property, and the environment to an acceptable level
Satisfaction	The user's response to interacting with the software product, which includes his/her attitudes towards using the product. <i>Note that is a subjective factor.</i>
Task Efficiency	Effectiveness of the user in completing the task in a specified context of use
Task Navigation	The user's cognitive load measured by the total number of actions relative to the number of views in a specified context of use

Objectives

- ✓ Measure the Quality-in-Use factors described above for both the MUI and DUI of the Concordia.ca website.
- ✓ Use the measurements to compare the different interfaces for the Concordia.ca.
- ✓ Make suggestions for improvement based on the analysis of the measurements above.

Website Overview

Concordia.ca is a high traffic website whose primary user base is both current and prospective students, as well as the faculty and staff of Concordia University. Its main purpose is to serve as a point of information on anything pertaining to the institution. Among which includes: academic information regarding the various degrees offered, information pertaining to admission, etc. In order to provide an experience across all devices, both a desktop user interface and a mobile user interface exists.

Design

Hypotheses

Effectiveness Hypotheses

Null Hypothesis I: There is no significant difference between the quality of the Concordia website using the MUI versus using the DUI based on the effectiveness of the website.

Alternative Hypothesis I for null Hypothesis I: The effectiveness of the Concordia website using the DUI is less than the effectiveness of the website using the MUI.

Alternative Hypothesis II for null Hypothesis I: The effectiveness of the Concordia website using the MUI is less than the effectiveness of the website using the DUI.

Productivity Hypotheses

Null Hypothesis II: There is no significant difference between the quality of the Concordia website using the MUI versus using the DUI based on the Productivity of the website.

Alternative Hypothesis I for null Hypothesis II: The productivity of the Concordia website using the DUI is less than the productivity of the website using the MUI.

Alternative Hypothesis II for null Hypothesis II: The productivity of the Concordia website using the MUI is less than the productivity of the website using the DUI.

Task Efficiency Hypotheses

Null Hypothesis III: There is no significant difference between the quality of the Concordia website using the MUI versus using the DUI based on the task efficiency of the website.

Alternative Hypothesis I for null Hypothesis III: The task efficiency of the Concordia website using the DUI is less than the task efficiency of the website using the MUI.

Alternative Hypothesis II for null Hypothesis III: The task efficiency of the Concordia website using the MUI is less than the task efficiency of the website using the DUI.

Safety Hypotheses

Null Hypothesis IV: There is no significant difference between the quality of the Concordia website using the MUI versus using the DUI based on the safety of the website.

Alternative Hypothesis I for null Hypothesis IV: The safety of the Concordia website using the DUI is less than the safety of the website using the MUI.

Alternative Hypothesis II for null Hypothesis IV: The safety of the Concordia website using the MUI is less than the safety of the website using the DUI.

Task Navigation Hypotheses

Null Hypothesis V: There is no significant difference between the quality of the Concordia website using the MUI versus using the DUI based on the task navigation of the website.

Alternative Hypothesis I for null Hypothesis V: The task navigation of the Concordia website using the DUI is less than the task navigation of the website using the MUI.

Alternative Hypothesis II for null Hypothesis V: The task navigation of the Concordia website using the MUI is less than the task navigation of the website using the DUI.

Experiment

Overview

For the experiment, students from the Concordia were asked to perform some general taskson the Concordia.ca webpage. The actions that the subjects performed were then recorded by grad students to determine the efficiency of each subject completing the task. The subject was assumed to have minimal to average previous experience with the Concordia.ca website.

The criterion for the efficiency of navigating to the specified page is categorized as follows:

NV – Number of Views changed to complete the task successfully

NA – Number of Correct actions in each task

NI – Number of Incorrect actions in each task

Time – Time from start of task until completion

For the experiment there were 3 tasks that the subjects completed.

- 1. Search for full Undergraduate Admission on the Concordia Website**
- 2. View the full program details for Computer Engineering**
- 3. Ask a question – How do I apply**

The execution of each is described in the “Execution Section”.

After the tasks were completed on a desktop, the subjects were asked to complete the same tasks again on a mobile device. The mobile device used was one of either: Iphone 13 Pro, OnePlus Nord. For more information, please refer to the following section.

Subjects

Subject – Graduate Student	
Description	A Graduate Student is a person working on completing a master’s degree in Applied Computer Science at Concordia University. He or she, on average, is between the age of 18 and has a fair amount of technical knowledge and experience with the Concordia.ca website.
Role	Serve as the test subject for the experiment.

Objects

Object – Desktop Computer	
Description	The Desktop Computer serves as a stationary platform for personal computing. The specifications for the device used in the experiment follow.
Role	Serve as the testing environment for the desktop user interface (DUI).
Model	Lenovo ThinkPad
Operating System	Windows 10
Processor	Intel i5 vPro 7 th Gen
RAM	12 GB

Object – Smartphone	
Description	Although the Smartphone's primary focus is telecommunication, it strives to be a medium of mobile personal computation. The specifications of the devices used in the experiment follow.
Role	Serve as the testing environment for the mobile user interface (MUI).
Model	Iphone 13 Pro
Operating System	iOS 15.1
RAM	6 GB

Treatments

Treatment – Concordia.ca Search Feature	
Description	The Concordia.ca Search Feature is present to assist users in acquiring information and locating tools provided by the institution.
Role	The search feature is used in the first task to locate the "undergraduate admissions" feature described below.

Treatment – Concordia.ca Undergraduate Admissions Feature

Description	The undergraduate admission feature provides both prospective and current students access to information pertaining to their chosen degrees.
Role	In the second task this feature is used to retrieve information on the program details of the Software Engineering undergraduate degree.

Treatment – Concordia.ca Ask A Question Feature

Description	The “ask a question” feature is a system where both prospective and current students can ask simple questions pertaining to the institution.
Role	In the third task this feature is used to retrieve information on how to apply to Concordia University.

Treatment Dependencies

Treatment Dependency – Google Custom Search Engine

Description	The Google Custom Search Engine provides the tools necessary in adding a search box to a website which can then be used to help people find what they need on the site.
Role	The Concordia.ca search feature is built with and thus relies upon the Google Custom Search Engine.

State Variables

Time	The time it takes to complete a task from start to finish
Number of Actions	Total number of clicks performed to complete a task
Number of Incorrect Actions	Total number of clicks performed that did not directly lead to successfully completing a task (redirected to a wrong place)
Number of views	Number of navigation panes (or views) viewed in the completion of a task

Response Variables

Effectiveness	The capability of the software product to enable users to achieve specified goals fully and accurately
Productivity	The capability of the software product to enable users to consume appropriate amounts of resources to complete the task, such as time, or the effectiveness of the software product relative to the effort expended by the user
Safety	The capability of the software product to limit the risk of harm to people, businesses, software, property, and the environment to an acceptable level
Task Efficiency	Effectiveness of the user in completing the task in a specified context of use
Task Navigation	The user's cognitive load measured by the total number of actions relative to the number of views in a specified context of use

Raw Measurement Data

Time	The time it takes to complete a task from start to finish
Number of Actions	Total number of clicks performed to complete a task
Number of Incorrect Actions	Total number of clicks performed that did not directly lead to successfully completing a task (redirected to a wrong place)
Number of views	Number of navigation panes (or views) viewed in the completion of a task

Execution

Note: all tasks begin at www.concordia.ca

Task 1 – Undergraduate Admission

Search for “Undergraduate Admissions” on the Concordia Website

Task Steps:

1. Click in the Search box on the main page. (The search box is located at the top right of the home page, below the Media Menu)
2. Type in “Undergraduate Admissions”, and click on Search Icon
3. This will bring all the searches from the Google Web Page
4. Click on the first link this will redirect to
<https://www.concordia.ca/admissions/undergraduate.html>

Successful Conclusion:

The undergraduate admissions information page is displayed.

Common Incorrect Actions:

User may click on different link in step 3 and results in incorrect web page.

Task 2 – View Program Details

View the Full Program Details for Software Engineering (BEng).

Task Steps:

1. Hover Mouse over 'Academics' icon (Located directly under the Concordia University Logo at the top of the page)
2. A menu will the pop up, click the option that says "Undergraduate programs" which will redirect you to <http://www.concordia.ca/academics/undergraduate.html>.
3. Scroll down and click the option for Software Engineering and the subject will be redirected to <https://www.concordia.ca/academics/undergraduate/software-engineering.html>

Successful Conclusion:

Full Program details of Undergraduate Software Engineering Program is displayed.

Common Incorrect Actions:

The user might get confused between Computer Engineering and Software Engineering as both are BEng.

Task 3 – Ask a Question

Ask a question - How do I apply?

Task Steps:

1. Hover Mouse over 'Academics' icon (Located directly under the Concordia University Logo at the top of the page)
2. A menu will the pop up, click the option that says "Undergraduate programs" which will redirect you to <http://www.concordia.ca/academics/undergraduate.html>.
3. Scroll down and click on how to apply.
4. Find your program and read program requirements
5. Click on ask a question icon in case of further queries.

Successful Conclusion:

The answer to How to I apply is answered to by displaying the application steps.

Common Incorrect Actions:

User might try to find ask a question on homepage but it's available in under specific programs

Analysis

Raw Measurement Data

For Desktop Application

		Task1				Task 2				Task 3			
	Std. ID	View	Actions	Incorrect Actions	Time	N.V	N.A	N.I	T	N.V	N.A	N.I	T
1	40163636	4	4	0	40.98	4	3	0	35	7	8	1	76
2	40193024	4	5	1	45	5	4	1	50	7	10	2	100
3	40202192	4	4	0	42	4	4	0	55	8	9	1	88
4	40201535	4	5	0	38	6	4	0	52	9	8	0	90
5	40198645	4	5	0	44	5	4	0	60	7	9	2	74

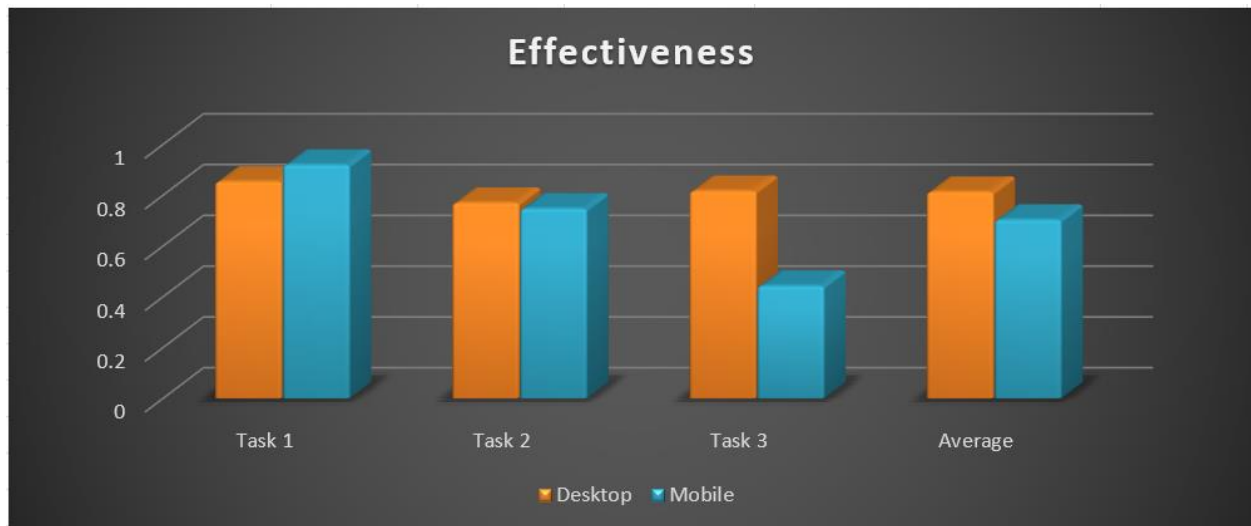
For Mobile Application

		Task1				Task 2				Task 3			
	Std. ID	View	Actions	Incorrect Actions	Time	N.V	N.A	N.I	T	N.V	N.A	N.I	T
1	40163636	3	3	0	45	5	4	0	50	8	10	1	85
2	40193024	4	4	1	51	6	6	1	60	9	11	3	105
3	40202192	3	3	0	47	5	5	1	55	10	9	1	94
4	40201535	4	3	0	40	6	6	2	70	11	4	2	98
5	40198645	4	3	0	48	6	4	0	75	9	7	1	90

Effectiveness

Effectiveness								
	Desktop				Mobile			
Student ID	Task 1	Task 2	Task 3	Average	Task 1	Task 2	Task 3	Average
40163636	1	1	0.888889	0.962963	1	1	0.363636	0.787879
40193024	0.666667	0.6	0.666667	0.644444	0.6	0.571429	0.285714	0.485714
40202192	1	0.75	0.8	0.85	1	0.666667	0.4	0.688889
40201535	0.8	0.75	1	0.85	1	0.5	0.666667	0.722222
40198645	0.8	0.75	0.727273	0.759091	1	1	0.5	0.833333
Average	0.853333	0.77	0.816566	0.8133	0.92	0.747619	0.443203	0.703608

Graphical Representation of Measurement Data in terms of Effectiveness

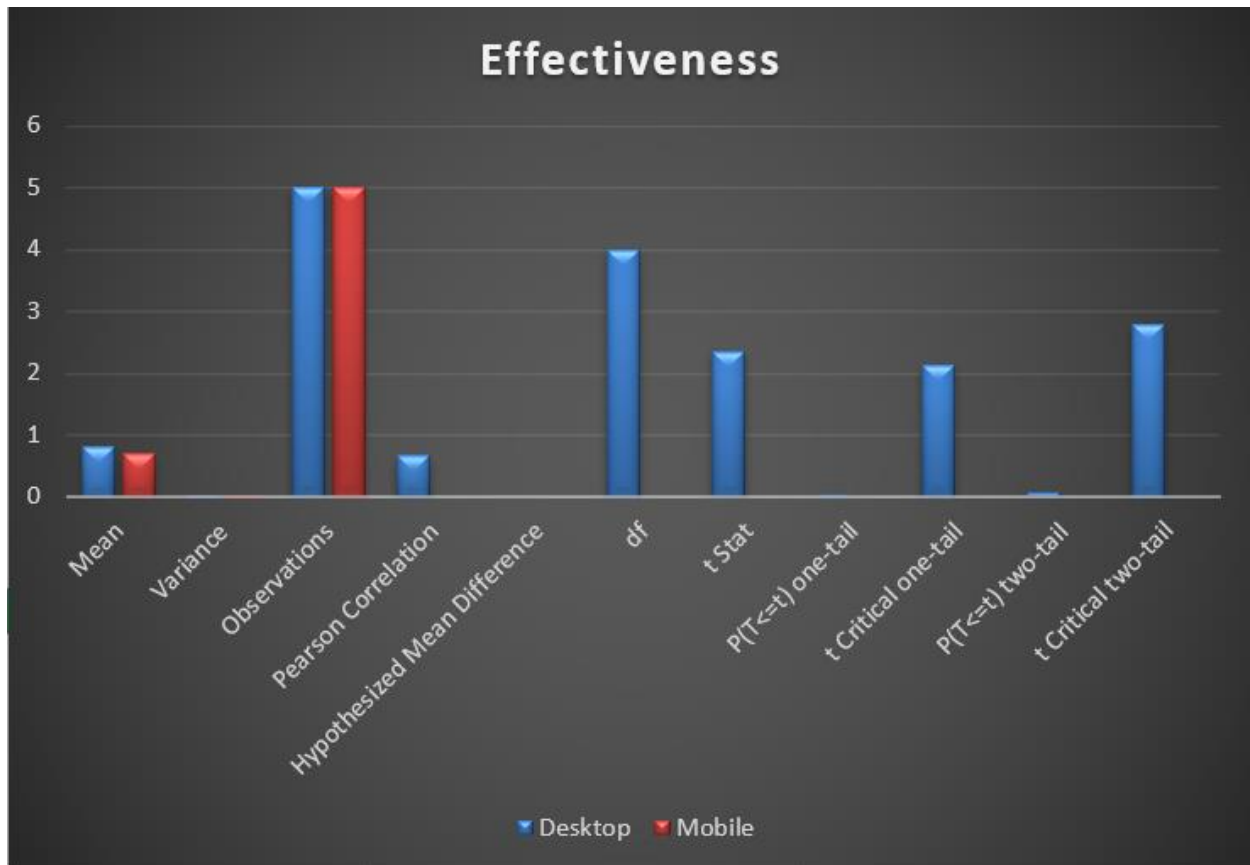


T-Test Results

	Desktop	Mobile
Mean	0.813299663	0.703607504
Variance	0.014135902	0.01799276
Observations	5	5
Pearson Correlation	0.666462959	

Hypothesized Mean Difference	0
df	4
t Stat	2.35248568
P(T<=t) one-tail	0.039151238
t Critical one-tail	2.131846786
P(T<=t) two-tail	0.078302477
t Critical two-tail	2.776445105

Graphical Representation of T-Test Analysis In Terms of Effectiveness



Analysis

The p value of the two tails for (Effectiveness) is 0.078 > alpha (0.05). Hence, we fail to reject the null hypothesis for this factor as there is no significant difference between the effectiveness of the DUI and the MUI.

We fail to reject the Null Hypothesis I: **There is no significant difference between the quality of the Concordia website using the MUI versus using the DUI based on the effectiveness of the website.**

Productivity

Productivity								
	Desktop				Mobile			
Student ID	Task 1	Task 2	Task 3	Average	Task 1	Task 2	Task 3	Average
40163636	0.097609	0.085714	0.105263	0.096195	0.066667	0.08	0.117647	0.088105
40193024	0.111111	0.08	0.1	0.097037	0.078431	0.1	0.104762	0.094398
40202192	0.095238	0.072727	0.102273	0.090079	0.06383	0.090909	0.095745	0.083495
40201535	0.131579	0.076923	0.088889	0.09913	0.075	0.085714	0.040816	0.067177
40198645	0.113636	0.066667	0.121622	0.100642	0.0625	0.053333	0.077778	0.064537
Average	0.109835	0.076406	0.103609	0.096617	0.069286	0.081991	0.08735	0.079542

Graphical Representation of Measurement Data in terms of Productivity

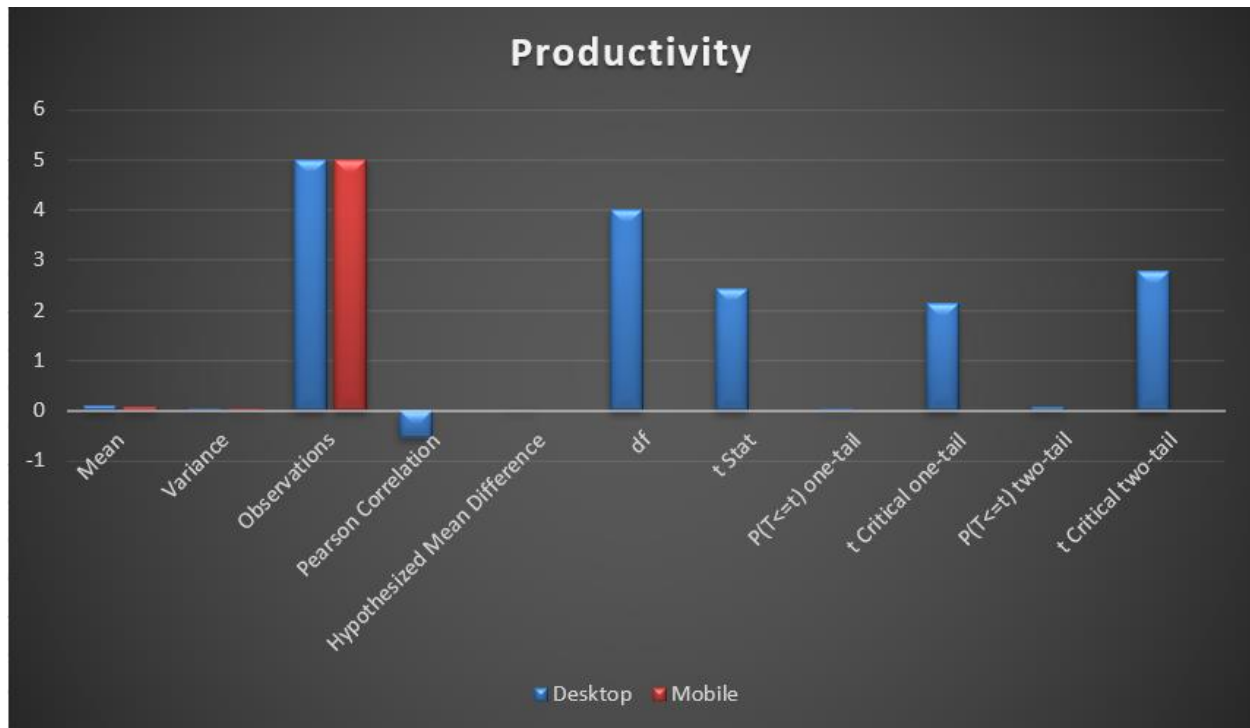


T-Test Results for Productivity

	Desktop	Mobile
Mean	0.09661672	0.079542152
Variance	1.64022E-05	0.00017192
Observations	5	5
	-	
Pearson Correlation	0.539883388	

Hypothesized Mean Difference	0
df	4
t Stat	2.435945142
P(T<=t) one-tail	0.035760268
t Critical one-tail	2.131846786
P(T<=t) two-tail	0.071520537
t Critical two-tail	2.776445105

Graphical Representation of T-Test Analysis In Terms of Productivity



Analysis

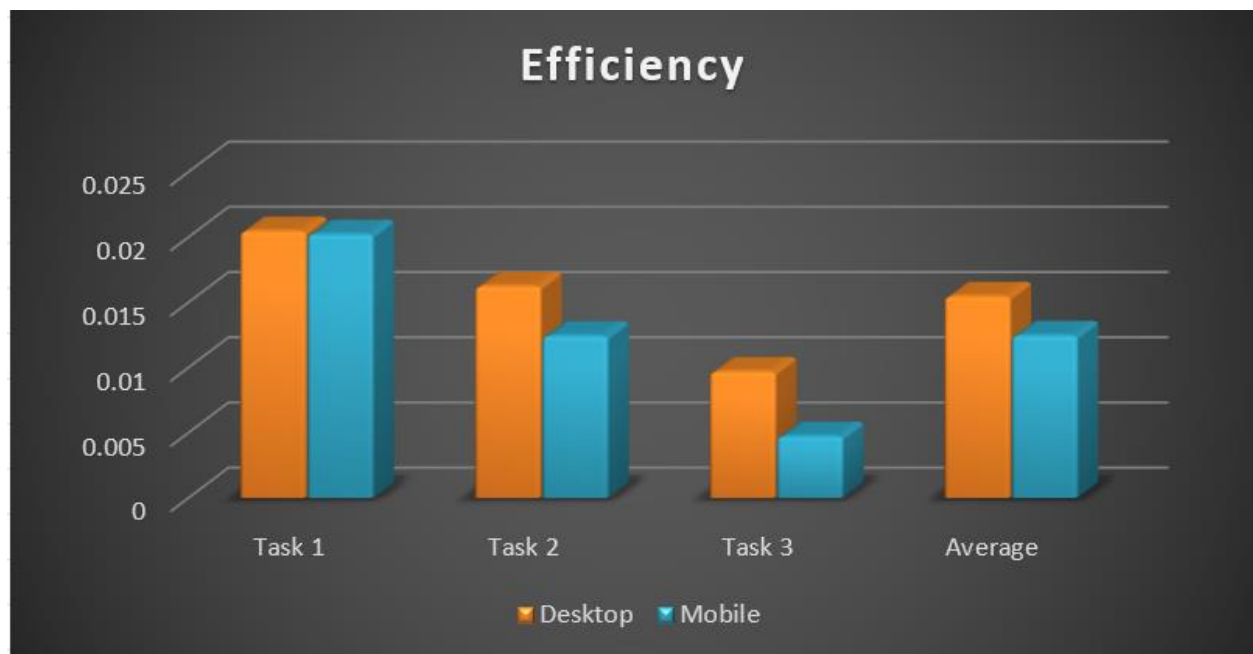
The p value of the two tails for (Effectiveness) is 0.071520537 > alpha (0.05). Hence, we cannot reject the null hypothesis for this factor as there is no significant difference between the productivity of the DUI and the MUI.

We fail to reject the Null Hypothesis II: **There is no significant difference between the quality of the Concordia website using the MUI versus using the DUI based on the Productivity of the website.**

Task Efficiency

Efficiency								
	Desktop				Mobile			
Student ID	Task 1	Task 2	Task 3	Average	Task 1	Task 2	Task 3	Average
40163636	0.024402	0.028571	0.011696	0.021556	0.022222	0.02	0.004278	0.0155
40193024	0.014815	0.012	0.006667	0.01116	0.011765	0.009524	0.002721	0.008003
40202192	0.02381	0.013636	0.009091	0.015512	0.021277	0.012121	0.004255	0.012551
40201535	0.021053	0.014423	0.011111	0.015529	0.025	0.007143	0.006803	0.012982
40198645	0.018182	0.0125	0.009828	0.013503	0.020833	0.013333	0.005556	0.013241
Average	0.020452	0.016226	0.009679	0.015452	0.020219	0.012424	0.004723	0.012455

Graphical Representation of Measurement Data in terms of Efficiency

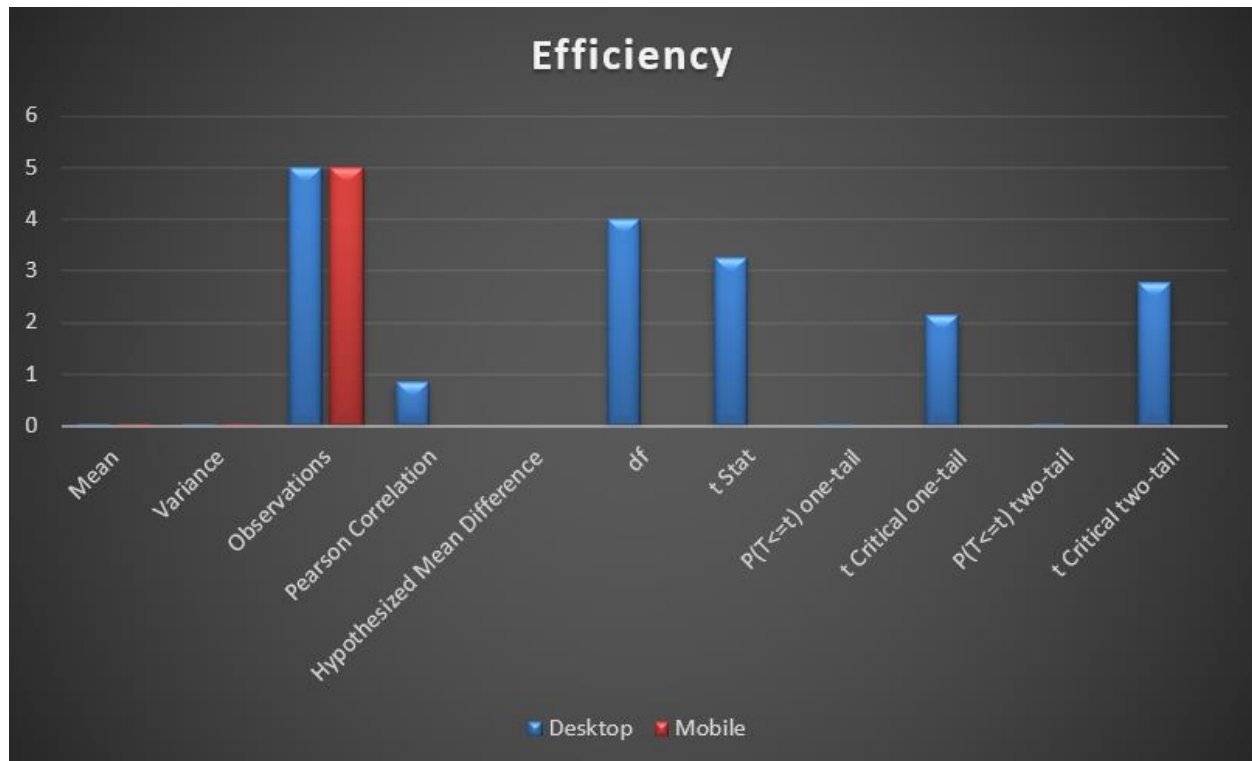


T-Test Results for Efficiency

	Desktop	Mobile
Mean	0.01545229	0.01245539
Variance	1.4872E-05	7.4988E-06
Observations	5	5
Pearson Correlation	0.85717531	

Hypothesized Mean Difference	0
df	4
t Stat	3.24425178
P(T<=t) one-tail	0.01577338
t Critical one-tail	2.13184679
P(T<=t) two-tail	0.03154675
t Critical two-tail	2.77644511

Graphical Representation of T-Test Analysis In Terms of Efficiency



Analysis

The p value of the two tails for (Effectiveness) is $0.03154675 < \alpha (0.05)$. Hence, we reject the null hypothesis for this factor as there is a significant difference between the efficiency of the DUI and the MUI. We have to therefore assess the alternative hypotheses:

The objective factors support the hypothesis that the desktop UI efficiency is greater than the mobile UI. Because the mean value for mobile UI effectiveness is 0.01245539 whereas the desktop UI effectiveness is 0.01545229

We can accept the Alternative Hypothesis II for null Hypothesis III: **The task efficiency of the Concordia website using the MUI is less than the task efficiency of the website using the DUI.**

Safety

Safety								
	Desktop				Mobile			
Student ID	Task 1	Task 2	Task 3	Average	Task 1	Task 2	Task 3	Average
40163636	1	1	0.888889	0.962963	1	1	0.909091	0.969697
40193024	0.833333	0.8	0.833333	0.822222	0.8	0.857143	0.785714	0.814286
40202192	1	1	0.9	0.966667	1	0.833333	0.9	0.911111
40201535	1	1	1	1	1	0.75	0.666667	0.805556
40198645	1	1	0.818182	0.939394	1	1	0.875	0.958333
Average	0.966667	0.96	0.888081	0.938249	0.96	0.888095	0.827294	0.891797

Graphical Representation of Measurement Data in terms of Safety

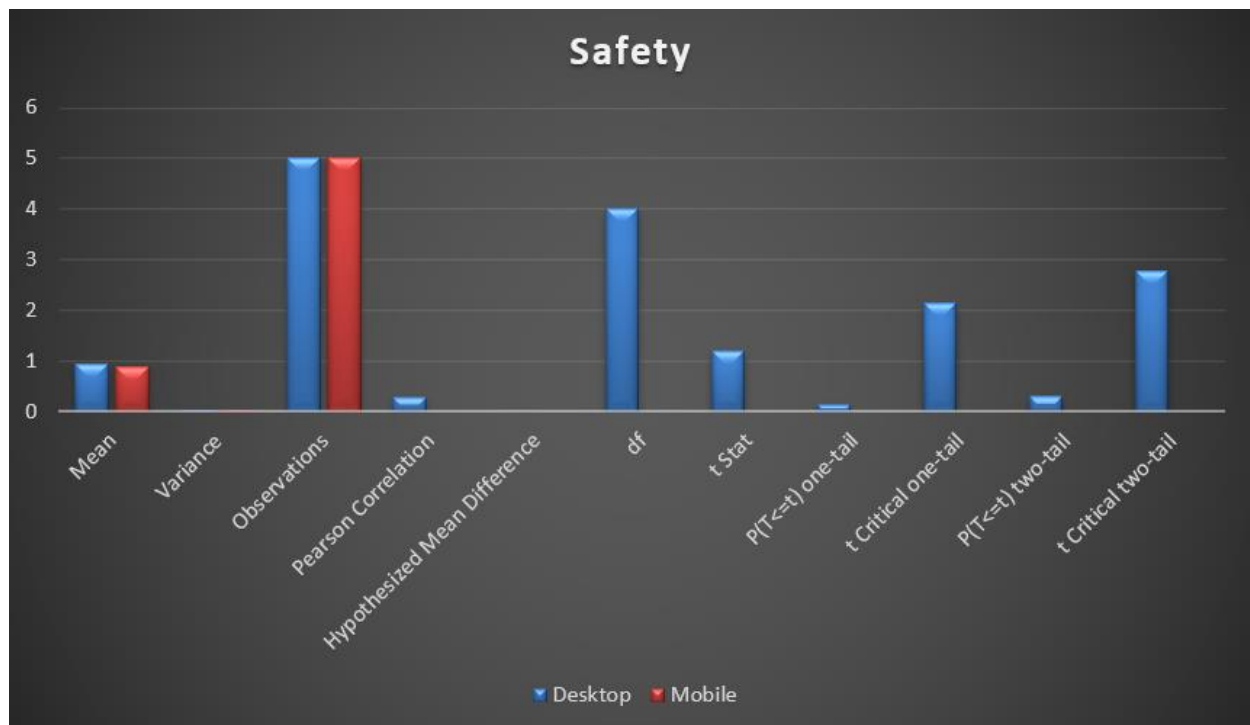


T-Test Results for Safety

	Desktop	Mobile
Mean	0.93824916	0.89179654

Variance	0.00467376	0.00607853
Observations	5	5
Pearson Correlation	0.2916544	
Hypothesized Mean Difference	0	
df	4	
t Stat	1.18811134	
P(T<=t) one-tail	0.15025617	
t Critical one-tail	2.13184679	
P(T<=t) two-tail	0.30051235	
t Critical two-tail	2.776445105	

Graphical Representation of T-Test Analysis In Terms of Safety



Analysis

The p value of the two tails for (Effectiveness) is $0.30051235 > \alpha (0.05)$. Hence, we cannot reject the null hypothesis for this factor as there is no significant difference between the safety of the DUI and the MUI.

We fail to reject the Null Hypothesis IV: **There is no significant difference between the quality of the Concordia website using the MUI versus using the DUI based on the safety of the website.**

Navigation

Navigation								
	Desktop				Mobile			
Student ID	Task 1	Task 2	Task 3	Average	Task 1	Task 2	Task 3	Average
40163636	1	0.75	1.285714	1.011905	1	0.8	1.375	1.058333
40193024	1.5	1	1.714286	1.404762	1.25	1.166667	1.555556	1.324074
40202192	1	1	1.25	1.083333	1	1.2	1	1.066667
40201535	1.25	0.666667	0.888889	0.935185	0.75	1.333333	0.545455	0.876263
40198645	1.25	0.8	1.571429	1.207143	0.75	0.666667	0.888889	0.768519
Average	1.2	0.843333	1.342063	1.128466	0.95	1.033333	1.07298	1.018771

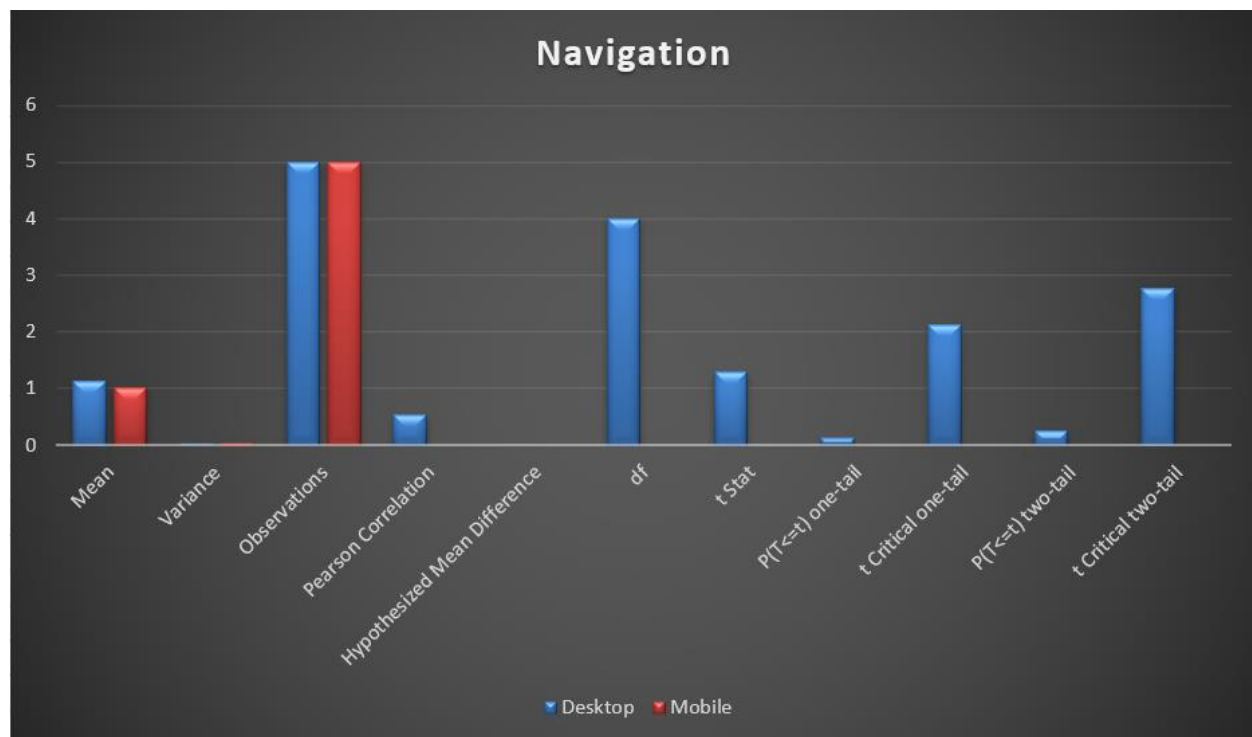
Graphical Representation of Measurement Data in terms of Navigation



T-Test Results for Navigation

	Desktop	Mobile
Mean	1.12846561	1.01877104
Variance	0.03387761	0.04500102
Observations	5	5
Pearson Correlation	0.54703249	
Hypothesized Mean Difference	0	
df	4	
t Stat	1.28988795	
P(T<=t) one-tail	0.13330613	
t Critical one-tail	2.13184679	
P(T<=t) two-tail	0.26661226	
t Critical two-tail	2.776445105	

Graphical Representation of T-Test Analysis In Terms of Navigation



Analysis

The p value of the two tails for (Effectiveness) is $0.26661226 > \alpha (0.05)$. Hence, we cannot reject the null hypothesis for this factor as there is no significant difference between the navigation of the DUI and the MUI.

We fail to reject the Null Hypothesis V: **There is no significant difference between the quality of the Concordia website using the MUI versus using the DUI based on the task navigation of the website.**

Risks

The following risks can have negative effects on the validity of the results of the study:

Risk	Various Testing Environments
Description	Different experiences during testing across both mobile and desktop caused from differing testing environments.
Remedial Actions	<ul style="list-style-type: none">➤ By maintaining two constant testing environments for both the mobile and desktop, we minimize the impact of this risk.➤ We used similar phone models during the mobile segment, with the same operating system, and browser.➤ For the desktop segment we used the same computers, with the same operating system and browser.➤ Users were given clear and consistent directions on what to do within the web page.
Potential Remedial Actions	None Required – The risk has been managed by the present remedial actions

Risk	Improper Sample Population
Description	The experiment did not accurately represent the general population. There is an experimental bias because the experimental data was taken on university educated software engineering students. These students have technical knowledge which will skew the results favorably for both the mobile UI and the desktop UI.
Remedial Actions	None taken
Potential Remedial Actions	For more accuracy, the experiment should be performed on a testing group that more closely models the general population.

Risk	Insufficient Sample Population
Description	The amount of test subjects impacts the correctness of results. The sparsity of data can lead to unreliable results.
Remedial Actions	None taken
Potential Remedial Actions	At least 50 test subjects should have participated in the experiment

Risk	The Use of language
Description	The experiment did not accurately represent the mode of language to be used. The test subject can be diverse and can take comfort in their own preferred language and can impact user experience
Remedial Actions	None taken
Potential Remedial Actions	The test subjects could have been selected on the basis of their IELTS score or should have same level of proficiency in usage of english

Risk	Varying Internet Connection Speeds
Description	Since the mobile devices are no university's WIFI and desktop are connected to local network the test time for mobile units could have been increased because of a slower network speed. This would have skewed the results in favor of the desktop UI.
Remedial Actions	The test subjects were connected to the same wifi connection
Potential Remedial Actions	None Required – The risk has been managed by the present remedial actions

Dissemination and Decision-Making

To facilitate additional decision making we calculate percent difference between two in the below table.

Desktop UI vs. Mobile UI Percent Difference

Effectiveness

Effectiveness	Desktop	Mobile	Percent Difference
Task 1	0.8533333333	0.92	-7.518796992
Task 2	0.77	0.747619048	2.949482272
Task 3	0.816565657	0.443203463	59.27470161
Average	0.813299663	0.703607504	14.46260682

Productivity

Productivity	Desktop	Mobile	Percent Difference
Task 1	0.109834621	0.069285565	45.27580821
Task 2	0.07640626	0.081991342	-7.05197743
Task 3	0.103609279	0.08734955	17.02956546
Average	0.09661672	0.079542152	19.3854192

Efficiency

Efficiency	Desktop	Mobile	Percent Difference
Task 1	0.020452187	0.020219371	1.144857617
Task 2	0.016226174	0.012424242	26.54014775
Task 3	0.009678521	0.004722552	68.82777413
Average	0.015452294	0.012455389	21.47727828

Safety

Safety	Desktop	Mobile	Percent Difference
Task 1	0.966666667	0.96	0.692041522
Task 2	0.96	0.888095238	7.781499614
Task 3	0.888080808	0.827294372	7.087246741
Average	0.938249158	0.891796537	5.076662466

Navigation

Navigation	Desktop	Mobile	Percent Difference
Task 1	1.2	0.95	23.25581395
Task 2	0.843333333	1.033333333	-20.24866785
Task 3	1.342063492	1.072979798	22.28396445
Average	1.128465608	1.018771044	10.2172776

Questionnaire Analysis

Raw Measurement Data – Nominal

Stud. ID	Q1		Q2		Q3		Q4		Q5	
	Deskt.	Mob	Deskt.	Mob	Desktop	Mobile	Desktop	Mobile	Desktop	Mobile
40163636	Easy	Easy	Excellent	Good	Average	Somewhat efficient	Good	Fair	Average	Average
40193024	Easy	Difficult	Excellent	Good	Somewhat efficient	Somewhat efficient	Good	Fair	Satisfied	Average
40202192	Easy	Easy	Good	Good	Very efficient	Average	Very Good	Fair	Average	Dissatisfied
40201535	Easy	Easy	Good	Good	Very efficient	Somewhat efficient	Good	Fair	Satisfied	Average
40198645	Easy	Easy	Good	Good	Average	Very efficient	Good	Good	Average	Average

Conversion from Nominal to Ordinal

Student ID	Q1		Q2		Q3		Q4		Q5	
	Desktop	Mobile	Desktop	Mobile	Desktop	Mobile	Desktop	Mobile	Desktop	Mobile
40163636	4	4	5	4	3	4	3	2	3	3
40193024	4	2	5	4	4	4	3	2	4	3
40202192	4	4	4	4	5	3	4	5	3	2
40201535	4	4	4	4	5	4	3	2	4	3
40198645	4	4	4	4	3	5	3	3	3	3
Median	4	4	4	4	4	4	4	2	3	3

Decision-Making

Overview

The results clearly show that the desktop UI is better than the mobile UI in every aspect. Both UIs are almost equal in terms of all the characteristics where DUI edge out MUI by a very small value. This means the user experience is almost similar for both DUI and MUI. The only significant difference observed during experimentation was in terms of task efficiency where the Concordia website accessed through Mobile UI was observed to be less efficient than Desktop UI. The lower efficiency causes the user to take more time to finish a desired task. This characteristic had the highest percentage difference of ~21.48. The safety characteristic had the lowest difference percentage of ~5.077 which means it maintain its uniformity across both the platforms and requires least review as of now.

Concrete suggestions

Task 1 had the highest percentage difference was in terms of productivity where the difference between DUI and MUI was of ~45.28. To improve the productivity for task 1 a hotlink on the homepage for undergraduate admission can be added as it one of the most popular pages and the users can avoid taking multiple page visits and reduce the number of incorrect actions. The difference can also be the result of typing speed which searching for “undergraduate admission”. Generally, it takes lesser time to type in desktop than in mobile. In that case typeahead search can help in increasing productivity.

In task 2 the biggest percentage difference was in terms of efficiency. This can be due to unavailability of hover option for mobile devices as it is an infeasible option. In order to improve efficiency, similar hotlink option and typeahead search option will help.

For Task 3 the highest percentage difference was again efficiency and then of productivity. This can be improved by adding a FAQ section that will reduce the number of call-t-action that users have to take to ask a question on the Concordia’s page. The time that it takes on loading the relevant data on a particular page can also be improved by using appropriate caching technique that will reduce the time spent by the user on a page and hence improving productivity and efficiency.

With above suggestions and review of the UI/UX with the design team can help improve the performance of MUI in the corresponding tasks.