Animated UI Transitions improve Usability and overall User Experience

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Abstract

With the development of computers, the avengement of more dynamic and interactive software applications, plus the will of providing state-of-art interactive and convivial system, user interface design becomes critical as for improving usability and user experience. Animated UI transitions have become a widespread technique that is claimed to enhance the "look and feel" of the software and attract more users to try new and engaging software products. In order to formally verify this statement and to better understand the relationship between animated UI transitions, usability and user experience, a little experiment has been conducted. The present document reports on the results of the experiment. The tested hypothesis is stated as follows: Animated UI transitions improve Usability and User Experience. The experiment targets Mac OS Snow Leopard and thus evaluates the impact of desktop animated transition effects on usability and user experience.

Keywords

Animated Transitions; Software usability; user experience.

1. Introduction

As stated early, the tested hypothesis is the following:

Animated UI transitions improve Usability and User Experience.

Before going further, it is important to define few key terms to set common understanding of the objective of this experiment:

- **Animated UI transitions** – Screen animation/effects occurring on system state transition
- **Usability** – Is understood here in terms of the ISO 9241-11 definition[1]: the extent to which *goals* are achieved with *effectiveness*, *efficiency*, and *satisfaction*.
- **User experience** – Is about the subjective perception of the user regarding his interaction with the system.

The null hypothesis is stated as follows:

Animated UI transitions do not improve Usability and User Experience.

2. Experiment Design

To test the precedent hypothesis, to see if animated UI transitions really improve usability and user experience, we needed to capture users interacting with a system where animated transitions were enabled; and another run where animated transitions will be disabled on the same system.

So we needed a system that can allow for enabling and disabling animated transitions.

2.1. Equipments used

After extensive research into looking for a suitable system which allows enabling and disabling transitions, and given the time constraints for this experiment, we had identified operating systems to be our best option. Indeed, operating systems usually feature the ability to activate or deactivate animation effects on transitions in the system as part of their performance management strategy. We then oriented our choice towards Mac system for their reputation regarding innovative design and UI practices.

A Mac Book Snow Leopard 10.6.6 system was thus used to drive this experiment. Mac OS X system features many animated desktop transitions effects. For the purpose of the experiment, we have restrained the set of animated UI transitions to a subset of the available ones.

2.2. Independent variables

For independent variables, we considered the state of the animations on transitions in the system, whether animations are disabled or enabled.

Now, a list of specific transitions to be used was considered.

List of transitions:

We used the following native UI transitions:

- Dock Magnification
- Animate opening applications
- Minimize windows in application windows

Settings for those transitions were directly available in the dock settings as shown below:

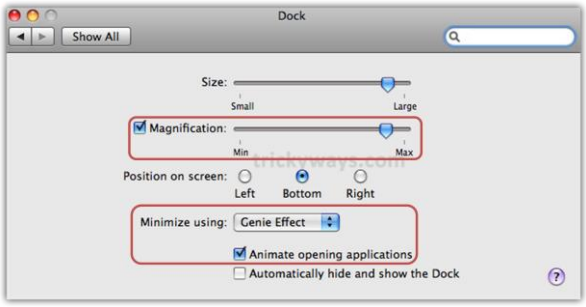

Figure 1 - Dock Settings on Mac

However, as we can see, the dock settings does not allow for manipulating the other interesting animations available on Mac. It was thus necessary for us to look for a way to have access to those features. We needed to have more animated transitions to base our experiment on. We then proceed into looking to third party tool for providing such an option. We found a tool called "**TinkerTool**" that allows for this.

Figure 2 - TinkerTool Application

So, here are the additional UI transitions that were provided by the TinkerTool software application:

- Disable sound effects
- Show animated effect when opening files
- Animate opening info panels and Desktop icons
- Animate selecting info panel categories

2.3. Dependent variables

To measure experiment outputs to evaluate usability and user experience, we adopted the following design:

We used user error counts, total task completion time and a user questionnaire to assess usability and user experience.

For the user questionnaire, we found the QUIS (Questionnaire for User Interaction Satisfaction).

QUIS is an online questionnaire that can be used to evaluate subjective satisfaction of users about their interaction with a given system. QUIS was developed by the Human-Computer Lab of University of Maryland.

The QUIS questionnaire is a set of 27 questions with sub-questions, all divided in four categories:

- **Overall reaction to the software**: The user express his overall "feel" about its perception of the system
- **Screen:** The user rates the visual aspect (e.g. the way information is displayed) of the system
- **Terminology and system information:** The user rates the system about how the information is communicated.
- **Learning:** The user rates the ease of learning to use the system
- **System capabilities:** The user evaluates the general physical abilities of the system

Questions are in a 10-point Likert Scale format. The QUIS also consists of a comment section at the end allowing the user to express up to three major good points and three major bad points about the system he just interacted with.

For this experiment, we decided to use a lightweight version of the QUIS questionnaire. The latter does not include the sub-questions and only covers the high-level questions which look as below:

OVERALL REACTION TO THE SOFTWARE		0	1	2	3	4	5	6	7	8	9		NA
1.	terrible	○	○	○	○	○	○	○	○	○	○	wonderful	○
2.	difficult	○	○	○	○	○	○	○	○	○	○	easy	○
3.	frustrating	○	○	○	○	○	○	○	○	○	○	satisfying	○
4.	inadequate power	○	○	○	○	○	○	○	○	○	○	adequate power	○
5.	dull	○	○	○	○	○	○	○	○	○	○	stimulating	○
6.	rigid	○	○	○	○	○	○	○	○	○	○	flexible	○
SCREEN		**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**		**NA**
7. Reading characters on the screen	hard	○	○	○	○	○	○	○	○	○	○	easy	○
8. Highlighting simplifies task	not at all	○	○	○	○	○	○	○	○	○	○	very much	○
9. Organization of information	confusing	○	○	○	○	○	○	○	○	○	○	very clear	○
10. Sequence of screens	confusing	○	○	○	○	○	○	○	○	○	○	very clear	○
TERMINOLOGY AND SYSTEM INFORMATION		**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**		**NA**
11. Use of terms throughout system	inconsistent	○	○	○	○	○	○	○	○	○	○	consistent	○
12. Terminology related to task	never	○	○	○	○	○	○	○	○	○	○	always	○
13. Position of messages on screen	inconsistent	○	○	○	○	○	○	○	○	○	○	consistent	○
14. Prompts for input	confusing	○	○	○	○	○	○	○	○	○	○	clear	○
15. Computer informs about its progress	never	○	○	○	○	○	○	○	○	○	○	always	○
16. Error messages	unhelpful	○	○	○	○	○	○	○	○	○	○	helpful	○
LEARNING		**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**		**NA**
17. Learning to operate the system	difficult	○	○	○	○	○	○	○	○	○	○	easy	○
18. Exploring new features by trial and error	difficult	○	○	○	○	○	○	○	○	○	○	easy	○
19. Remembering names and use of commands	difficult	○	○	○	○	○	○	○	○	○	○	easy	○
20. Performing tasks is straightforward	never	○	○	○	○	○	○	○	○	○	○	always	○
21. Help messages on the screen	unhelpful	○	○	○	○	○	○	○	○	○	○	helpful	○
22. Supplemental reference materials	confusing	○	○	○	○	○	○	○	○	○	○	clear	○
SYSTEM CAPABILITIES		**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**		**NA**
23. System speed	too slow	○	○	○	○	○	○	○	○	○	○	fast enough	○
24. System reliability	unreliable	○	○	○	○	○	○	○	○	○	○	reliable	○
25. System tends to be	noisy	○	○	○	○	○	○	○	○	○	○	quiet	○
26. Correcting your mistakes	difficult	○	○	○	○	○	○	○	○	○	○	easy	○
27. Designed for all levels of users	never	○	○	○	○	○	○	○	○	○	○	always	○

Figure 3 - QUIS questionnaire

This is available online and provided by the HCI bibliography database among numerous other questionnaire techniques.

2.4. Participants

Six participants were considered for the experiment: a mix of graduate students (1/6) and young workers (5/6) with age ranging between 21 to 27 years old (4 men and 2 women). Within this pool of participants, 3 are experienced in Mac and the three others are not. They were all selected from various backgrounds in which they are familiar with computer use: software engineering (4/6), journalism (1/6) and social sciences (1/6).

Some fact about the participant pool:

- The most Mac experienced user has 5 years of experience
- One user had never used a Mac before this experiment.
- Two users were impatient users.
- All users were familiar with general computer use.

2.5. User Task List

The users were asked to perform tasks related to the following generic computer use:

- Mouse hovering on dock items
- Opening common applications
- Files manipulation
- View info details on file
- Text editor experience (write text, save file)
- Locate opened application
- Delete created files
- Internet browser basic navigation

Now here is a typical sequence of the specific tasks the participants had to complete during the experiment:

1. Open the finder
2. Locate the “desktop” folder in finder and open it.
3. Right-click on a file on your choice (in the “desktop” folder) to view file info
4. Expand a file info section of your choice to view more details.

5. Open the “Firefox” application from the dock.
6. Type "user experience" on the browser’s Google search bar,
7. Open the first “usability” link on the new tab.

8. Open the “Open Office” application from the dock.
9. Open a text document in Open Office.
10. Type and save the text file as "test 1.odt" on the desktop
11. Open a new text document in Open Office.
12. Type and save the text file as "test 2.odt" on the desktop

13. Minimize everything windows that you currently have opened

14. Maximize the window of the first text document you created (called "test 1.odt")
15. Open the “Skype” application from the dock.
16. Go back to the “Firefox” browser
17. Type “http://www.youtube.com” in the browser URL.

18. Now, re-open the finder
19. Locate the “desktop” folder in the finder and open it.
20. Copy the “test 2.odt” file you have created to the "documents" folder.

21. Select the “test 1.odt” file you have also created.
22. Move it to the "documents" folder.

23. Now, delete both "test 1.odt" and "test 2.odt" files

24. Go back to your “documents” folder if you are not already there.
25. Re-organize the view into a “details” view.
26. Close all windows you have opened.

2.6. Procedure: Conducting experiment

Each user was met individually in a comfortable and appropriate environment. The location would change given the ability and preferences of each user. We explained to the user about the experiment and what was going to be his role in it. Then, the user was instructed to read and sign the consent form as an agreement.

Each user had to participate in two think-aloud evaluation sessions of 15 min max. each (30 min in total). One session was with transitions enabled and the other one, with transitions disabled. Ideally, for a given user, the two sessions should be separated of at least a day in time. To avoid bias in results, the users were unaware of the transitions selected for the evaluated and of their state (enabled vs. disabled). They were not told which session was with the system with enabled or disabled transitions.

Among the six participants, three started with a session where animated transitions were enabled, the three remaining started with animation effects on transitions disabled. More specifically, user1, user5 and user6 started on the system with non-animated transitions while user2, user3 and user4 started on the system with animated transitions.

During each session, the user was instructed to execute the list of tasks earlier presented, one at the time and at a paced speed.

Globally, he had to open the "finder" from the "dock", view info of a random file, open a browser, type some text, open a text editor, write something on the blank page, save it as a text file, create a new text file and repeat writing and saving a second text file. Then he had to copy the first text file to another directory and move the second text file to that same directory. The user was asked to comment about few transitions after he was done the related tasks. User errors were counted during the interaction. The session ended with the last task which was to reorganize a file view (icons, details, or view). Then, user was given the QUIS and was instructed to fill it. When the user was done, we will follow-up a bit with few conversations about his session experience and finally thank him for his work and time. Results were saved for later analysis.

2.7. Measuring dependent variables

- Error counts:

Error counts measure the number of user errors. This was measured during the user session, and revised through watching the video of the recorded session.

- Total task completion time:

This refers to the total time the user spent in order to complete his sequence of tasks. This was not measure during the actual session, but rather through watching the video log.

- QUIS:

The user questionnaire for evaluating satisfaction and user experience where given to the user to be filled at the end of each session.

2.8. Experiment Model

The following diagram resumes our experiment model as for the variables taken into account and the expected results.

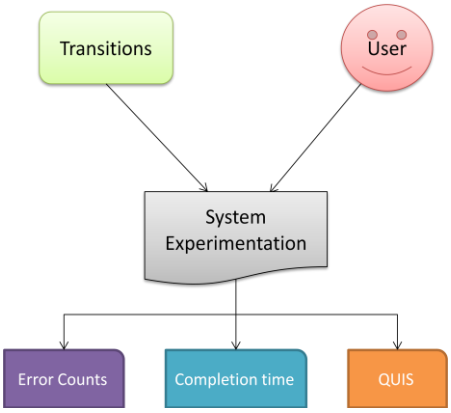

Figure 4 - Experiment Design Model

The system is put into test with a given state of animated transitions and with a selected user. Everything is conducted according to what was previously presented. Error counts, completion time and QUIS results are captured.

This is what has been done during this experiment. Now, let us have a look into the data results we got.

3. Experiment Results and Statistical Analysis

3.1. Error Counts

The following table presents the various error counts computed for each session:

Count Errors		
User	**Without transitions**	**With transitions**
User 1	4	2
User 2	1	3
User 3	4	4
User 4	3	5
User 5	6	3
User 6	5	2

Table 1 - Error Counts

Error counts for user range between 1 and 6. However, the behavior of the data is not

straightforward let's visualize this information graphically from various angles:

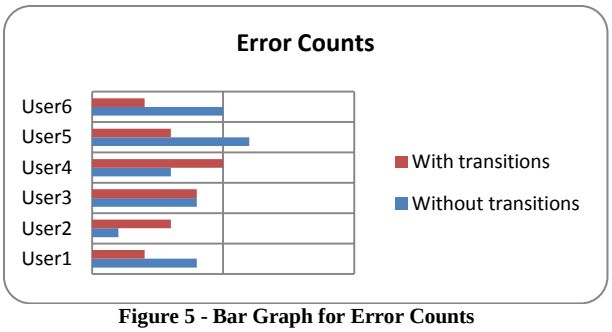

Figure 5 - Bar Graph for Error Counts

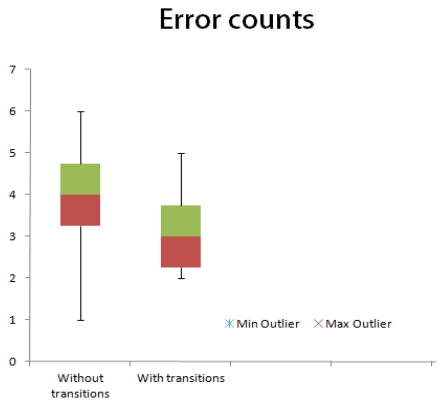

Figure 6 - Box Plot for Error Counts

If we look carefully at the bar graph, we can see that for 3 users over 6, the amount of errors during the session on the system with animated transitions is actually smaller than the one on the system without animated transitions. Those results are insufficient to conclude anything. An interesting situation occurs when for user3; the amount of errors during both sessions is equal. This can be explained by the fact that, with the state of activation of animated transitions changing between each session, the user usually tries a different way to complete a task, which can lead to errors. Another explanation more plausible is that disabling/enabling animated transitions might introduce or reduce errors.

When we look at the box plot graph, we can state that in general, the number of error counts for the sessions with animations on transitions are slightly less than the ones for the sessions without animation on transitions. Still, it is not strong enough for us to conclude. We need to look at other results.

3.2. Task Completion Times

The following table regroups total task completion time of each user for each session.

Completion time (in s)		
User	**Without transitions**	**With transitions**
User 1	450	591
User 2	451	309
User 3	467	342
User 4	638	452
User 5	341	478
User 6	320	623

Table 2 - Table 2 - Task completion times

Overall completion time ranges between 309 s (5min and 9s) and 638 s (10min and 38s). In some sessions, user would spend time really trying to figure out how to perform a given task. This explains the wide range of completion time values.

Let us visualize these data:

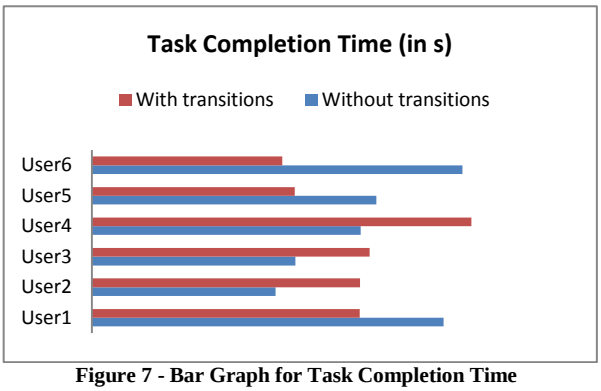

Figure 7 - Bar Graph for Task Completion Time

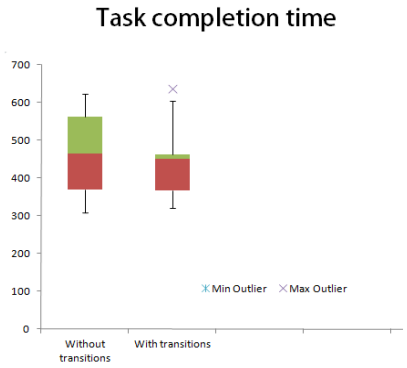

Figure 8 - Box Plot for Task Completion Time

We can see we obtain results similar to what we got with the error counts. Three users over 6 (50%) completed their tasks faster in session with animations

on transitions compared to the ones without transitions. And the box plot graph again, shows a slightly better behavior for the completion times of the sessions done with animations on transitions. Thus, so far, we cannot infer anything for our hypothesis.

We have to look at our last piece of information: the QUIS results.

3.3. QUIS Results

QUIS results have been recorded in the Table 4 - QUIS Results. Given the size of that table, it has been relocated in the Appendix.

If we look at that table, we see that some questions were discarded when they did not apply to our experiment. They were marked with the value "N/A". More precisely, the questions 4, 12, 13, 14, 16, 18, 21, 22 and 25 have been judged irrelevant to our specific experiment. This also helps us not to have too much data where some will not be useful and will actually prevent us from analyzing correctly our results.

Nevertheless, the QUIS results are still a lot of data to analyze and we needed to manipulate them in such a way that we can easily visualize them. So, we decided to compute the average score as a QUIS single score for each session's set of results we had. Given the fact that the section called "Overall reaction to software" was our most important section in the QUIS, we also decided to have an average score only for the questions related to that section. This gives two perspectives at conducting analysis.

Now, here is the table containing the computed results:

	Overall reaction to software		QUIS in single score value	
User #	Without transitions	With transitions	Without transitions	With transitions
User1	8.5	5	7.5	5.83
User2	4.5	4.75	4.83	5.25
User3	8.5	6.75	8.58	7.58
User4	7.5	7	7.67	6.5
User5	7.75	8.75	7.92	8.42
User6	6.75	3	6.58	4.58
Mean	7.25	5.88	7.18	6.36

Table 3 - QUIS Results Table Summary

We then plugged those data into bar chart graphs:

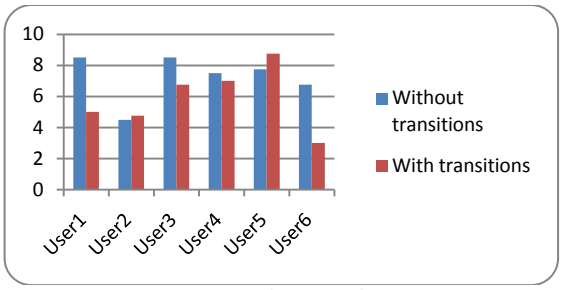

Figure 9 - Bar Graph for QUIS first section

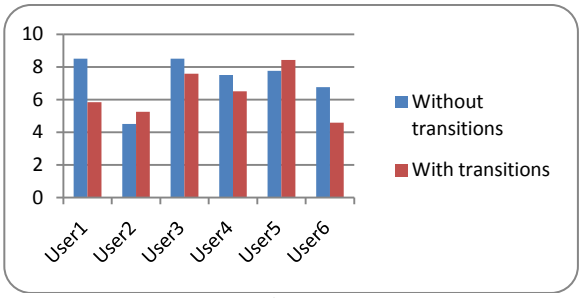

Figure 10 - Bar Graph for QUIS Single Score

As a general tendency, the behavior of the data in both charts is consistent with each other for a given user. Only for two users, the QUIS scores are better for session with animated transitions. So, this is a success of just 2/6 (about 30 %). So again, we do not get the results expected.

Let us look at the box plot graph representative of those data:

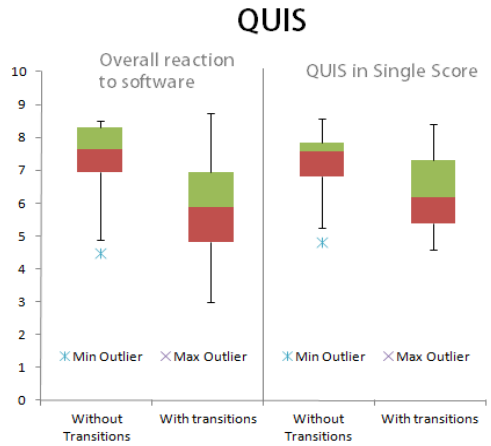

Figure 11 - Box plot for QUIS

The graph clearly shows that the score for the "overall reaction to the software" and the QUIS single score are both lower in the system with animations on

transitions activated. This is contrary to our expectation. We would have expected the scores to be higher as a sign of better user satisfaction in the case of the system featuring animations on transitions.

Like presented earlier, the QUIS questionnaire also features the availability for the participants to provide three major good and three major bad points they observed during each session. Here are the most relevant facts reported by users regarding their experience (and provided as written by users):

- Bad Points
  - × Cutting and pasting is still annoying have to open a second window and drag and drop the file to the targeted folder
  - × Magnifying elements on dock, don't like it.
  - × Not clear when I wanted to move a file by right clicking on the targeted folder couldn't find the action I was looking for (paste item)
  - × I found it strange that to delete a file you cannot simply use the delete button
  - × Animation in the menu bar interferes when scrolling a window
  - × Animation in the menu does not add any value in my opinion
  - × Hard to determine whether you are making a mistake or the system is frozen when performing an illegal action
  - × Open folders do not occur at the same position
  - × You still need to be creative and smart to guess some operations
  - × A little difficult to use when you have used windows for a long time
  - × Too different from my life experience with Microsoft
  - × Alt+F4 is unrecognizable

- Major Points
  - ✓ Easy to remember steps
  - ✓ System responds as expected most of the time
  - ✓ The speed was good
  - ✓ System was smooth
  - ✓ Easy to use once you've taken the time to learn the product

4. Discussion

When we look at all those data results, we do not seem to see indications that our hypothesis is valid. The data do not show, in a sufficient way (less 50% of success), that results in sessions with animations on transitions are better and that they improve usability and overall user experience. In fact, the relationship between the state of animations on transitions and the impact of transitions on usability and user experience is rather unclear. For some users, it worked, and for others, it did not (still, with a rate of about 50%). Is it possible that enabling or disabling animations on transitions did not have any effect on usability and user experience during our experiment? Or worse, is it possible it degraded it? The data analysis is not conclusive enough to corroborate any of the two questions.

Thus, we kept looking at the data and after a while we noticed some interesting facts. Let us re-visualize our data, but this time, they will not be group into two groups of "without animations on transitions" and "with animations on transitions" but rather, they will be separate in terms of the data from the first user session, and the data from the following user session (So in the chronological order the sessions have been conducted). This is what we get:

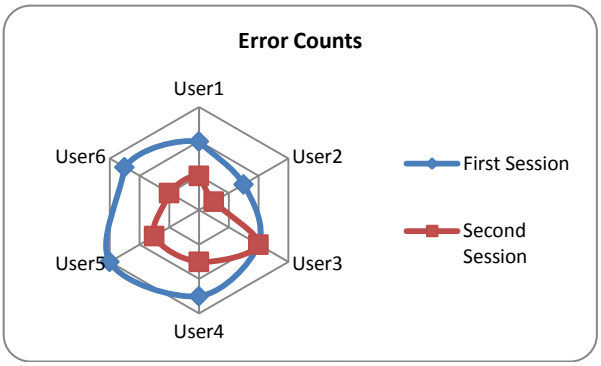

Figure 12 - Radar graph for Error Counts

We can identify a common behavior among the data: the number of error counts for each user during the second video session was always less or equal than the number of error counts that occurred in their first session. This also expresses a natural situation where the user is prone to make more mistakes the first time, and is more likely to remember how to do things on the second encounter. However, sessions with the same user were separated by at least a day in mean. We would also minimally shuffle the order of the task executions. This partially explains why users were still making errors during the second session. The other cause is that, sometimes, the user will try to complete the task a different way. And as we saw some animations on transitions might lead the user on making errors while some will prevent him from it.

Now, if we do the same for the total task completion time per session, this is what we get:

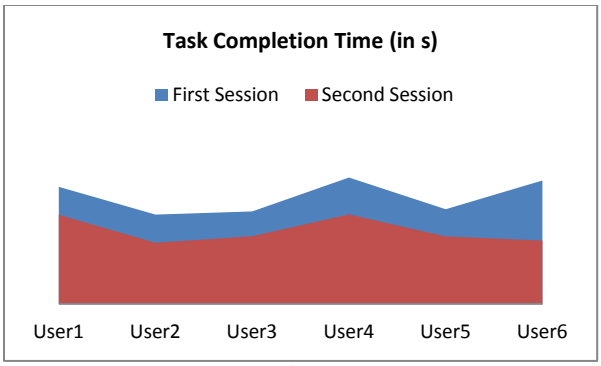

Figure 13 - Area Graph for Task Completion Time

For the task completion time as well, we can see the behavior is validated. The task completion times were better for the second session conducted with users, and this is, without consideration of the state of animations on transitions.

So what all is telling us is that. Animations on transitions seem to have an effect on usability and user experience. However, that effect might be positive or negative depending on the nature of the animation itself and how it integrates and occurs in the system itself. Now, it also tells us that that impact of animated transitions can be out-shadowed by the results of the task themselves. The idea is that for an animation on transition to really improve usability and overall user experience, it needs to have a direct and significant impact on the context for which it has been intended. This is why it is also probably worth to perform experiments in isolation of one animation on transition against one single task to get more usable results. At the same time, the idea behind this experiment was really to test everything in a "bulk", giving the hypothesis that numerous transitions effects enabled at the same time in a system environment where the user is interacting will definitely positively affect usability and overall user experience. But, the results of the experiment indicate that the hypothesis is wrong and thus, validate the null hypothesis. In fact, what it tells us is that positive impact of animated transitions depends upon what tasks the users are performing and how positively significant, is the impact of those animated transitions on those tasks. In other words, if animated transitions do not have significant impact on the realization of a given task, then the results will solely depend upon the task itself.

Finally, another possible behavior to explain those results is that some animations transitions might be conflicting, thus lowering their impact on tasks. In this experiment, this has never been the case.

5. Conclusion

In conclusion, our original hypothesis has really been contradicted. It is not systematic that animated UI transitions improve usability and user experience. This is the result of the experiment we have conducted. Now, we also have to understand that Usability and User experience from the point of view of the user depend on how he can assess the system he interacts with. For example, if that interaction is purely visual (e.g. watching a video on the computer), then the usability and user experience appreciation are derived from the "visual interaction". And thus, again, animated transitions need to have significant impact on this visual interaction to affect the user point of view. There are few points that might the validity of our experiments. The fact that some participants were concerned about their image definitely adds some bias to results. In that, we also have to add the significant side-effect impact of the nature of tasks performed by the user had on their satisfaction. We also have to understand that Mac systems are generally used by their owners with specific preferences. It is possible that we did not get conclusive results because we did have the animated transitions set the way, for example, the experienced users were used to in their specific environment. This brings in a question of user preferences we should probably be considered as an independent variable for the experiment to get more conclusive results. There is then also the question of fine tuning the animated transitions. Maybe, we just had settings for animated transitions that were not adequate for our pool of participants. And finally, we have to say that the number of subjects we used for this experiment is insufficient to really generalize our results.

Nevertheless, the important rationale this whole experiment tells us is that animations on transitions should be carefully thought, designed, reviewed. If this is not enforced, it could result in beautiful animations on transitions that still produce low impact on user functionalities; thus, causing significant loss of money and time to companies. Transitions should be built and targeted against specific valuable user activities. At least, this is what this experiment told us. And actually, we have to clarify that those thoughts are more of novel hypothesis that we are deriving from this experiment which need to be tested. Thus, new experiments need to be conducted to further clarify our understanding regarding the relation between the state of animations on transitions in a system, and usability and user experience.

6. References

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7. Annexes

QUIS													
		Without transitions						With transitions					
Questions		Usr1	Usr2	Usr 3	Usr 4	Usr 5	Usr 6	Usr 1	Usr 2	Usr3	Usr 4	Usr 5	Usr 6
OVERALL REACTION TO THE SOFTWARE													
1	terrible – wonderful	9	5	8	8	8	7	5	5	8	7	9	5
2	difficult – easy	9	3	9	7	7	7	5	4	7	7	8	2
3	frustrating – satisfying	7	5	8	7	8	6	4	5	6	6	9	2
4	inadequate power – adequate power	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5	dull – stimulating	8	5	9	7	9	5	5	5	7	7	9	3
6	rigid – flexible	9	5	9	8	8	7	6	5	6	8	9	3
SCREEN													
7	Reading characters on the screen is easy	7	8	9	8	9	7	9	8	9	8	9	3
8	Highlighting very much simplifies task	7	2	8	8	8	7	6	5	8	6	9	5
9	Organization of information is very clear	7	5	9	8	7	7	6	5	7	6	8	6
10	Sequence of screens is very clear	5	3	9	8	8	7	5	2	7	8	9	6
TERMINOLOGY AND SYSTEM INFORMATION													
11	Use of terms throughout system is consistent	8	7	9	8	9	6	5	6	8	8	9	6

12	Terminology always relates to task	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
13	Position of messages on screen is consistent	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
14	Prompts for input is clear	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
15	Computer always informs about its progress	7	7	8	8	7	5	5	7	8	7	8	3
16	Error messages are helpful	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
LEARNING													
17	Learning to operate the system is easy	5	2	9	7	8	7	7	4	8	6	6	6
18	Exploring new features by trial and error is easy	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
19	Remembering names and use of commands is easy	5	5	8	8	7	7	6	5	8	5	8	6
20	Performing tasks is always straightforward	9	3	8	7	7	8	5	4	7	4	8	6
21	Help messages on the screen are really helpful	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
22	Supplemental reference materials is clear	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SYSTEM CAPABILITIES													
23	System speed is fast enough	9	7	9	9	9	8	9	7	8	8	9	7
24	System is strongly reliable	9	7	9	7	9	8	5	7	8	7	9	7
25	System tends to be quiet	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
26	Correcting your mistakes is easy	9	5	8	8	8	7	7	6	7	5	9	4
27	System is designed for all levels of users	5	3	8	7	7	2	5	5	9	4	7	2
	Session Score AVG	7.5	4.833333	8.533333	7.666667	7.916667	6.533333	5.833333	5.25	7.583333	6.5	8.416667	4.583333

Table 4 - QUIS Results