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WEB INTERFACE SIGN INTERPRETATION ACCURACY AND TASK COMPLETION

- A Semiotic Work



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- A semiotic work

This Bachelor's thesis focuses on web interface and web interface signs as well as their importance. The main goal of the study is to find how the users' interpretation on the accuracy of interface signs affects the task completion performance in a website. A survey is conducted to collect data on icons and interpretation of signs (icons) by users on Google Calendar and to find out how well a user could find the relevant information on various activities performed on UI of Google Calendar. As the part of the survey, five users are selected and are presented with a set of tasks to be performed on UI of Google calendar. During the process, the information received from users are noted and later, analyzed for result and outcome. The information is compared with methods such as graphs, and flowcharts from which is concluded that the users' interpretation accuracy of interface signs affects the task completion performance in the website. The percentage of interpretation accuracy for all the signs of the studied website does not directly impact the performance of completing a particular task. And the percentage of interpretation accuracy for all required signs to complete a task in the website directly impacts the performance of completing that particular task.

KEYWORDS:

Semiotic, Usability, User-interface, Interface sign, Survey, Google Calendar.

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LIST OF ABBREVIATIONS

WWW	World Wide Web
UI	User Interface
GUI	Graphical User Interface
IE	Internet Explorer
UEM	Usability Evaluation Method
IT	Information Technology
TUAS	Turku University of Applied Sciences

1. INTRODUCTION

The Web interfaces are generally considered rich in the information presented in them with useful web icons such as symbols, short texts, thumbnails, command buttons, and images. The World Wide Web is a world where users easily get distracted and lost while browsing the needed information. Therefore, the web interface environment is a fundamental aspect for the flow of information using simple but informative icons. Selecting the correct icons on the web interface enriches a well-designed web user interface. A user-interface is expected to provide a flow of information in a practical and less complex way so that a visitor can find the information with few clicks and interpret the icons in the intended way.

There are three different scenarios when a user browses an interface:

- a user understands exactly what the interface designer would like to convey
- a user understands a possibly different meaning than a designer would like to project
- a user is confused with the signs or cannot interpret correctly and fails to get information. (Islam 2014)

In this thesis, Google Calendar has been used as a tool to get the interpretation accuracy by the users.

The structure of thesis is as follows:

Chapter 1 elaborates on the introduction part of the thesis, familiarizing the readers with the elements discussed in the thesis.

Chapter 2 introduces the importance of web signs used in web interfaces.

Chapter 3 discusses the study method and survey.

Chapter 4 is mainly about the survey carried out to find out the user's response while they view, explore and seek information on the web interface. It explains the composition of survey and outcomes with discussion.

Chapter 5 summarizes the results.

2. BACKGROUND

In 1989, the scientist Tim Berners-Lee invented the World Wide Web (www). The World Wide Web (www) is one of the most used applications throughout the whole world. Constantly, it is being used for internet marketing, online business, news, education, entertainment, information communication and collaborative work. In order to achieve this wide range on the web, the web is obliged to be crowded by the high volume of users from a wide field for wide context. This signifies that to design a well-defined and identical web interface for wide intended users is a complicated work (Cardenas 2011).

2.1 Importance of web interface signs

.A website is made of signs, icons, texts, colors etc. All these elements of a website altogether make the web user interface. The user interface is very 2important for any website. If the user interface is not user-friendly, the users face difficulties in accessing any information or the desired information on the website. A good user interface should be clear, familiar, consistent, responsive, attractive, and efficient. The main purpose of the user interface design is to allow people to interact with the system by communicating meaning and function (Fadeyev 2009). The design and signs of any user interface directly affect the users.

Design includes color combination, placement of the signs, text format etc. The color combination of the website should be well thought because a website is generally meant for different group of users. Some of the users might face difficulty with color. For example, a color blind person will find it difficult to perform any task in a red and green interface. The color combination of a website should be smooth so that the users do not feel any inconvenience because of their disability. The format of the text should also be easy to read. Word selection affects the users. Easy and commonly used words are recommended for any website.

The placement of the signs is important in a user interface. For Example, a user generally looks for the “Home” button in any website near the top left corner. However, if it is placed somewhere in the bottom, the user will face difficulty. If all the signs are placed meaningfully the users will feel comfortable to browse any website.

Anything that leads to another meaning is called a sign. A sign can be a picture, a text or a symbol. Signs indicate the users to perform any task on a website. All the signs on a user interface should be completely understandable, organized, and easily accessible. Otherwise, the users will end up dissatisfied and might leave the website without achieving their purpose. For example, a user wants to buy a certain product from an online store. To complete the whole procedure, he needs to use five signs. If he fails to understand any of these five signs or feels it is difficult to find it, this will lead him to a different interface. So, the user might leave the website after trying few times or he might ask for help. Figure 1 shows that the user needs to understand five signs (S1, S2, S3, S4, S5) to complete the purchase. But he does not know what S3 means. So, After S2, he clicks S6 and this takes him another interface. After trying few times, he might come back to S3 or he might end up clicking S7, S8 and so on. Therefore, it is very important that the signs on a web user interface are understandable to the users.

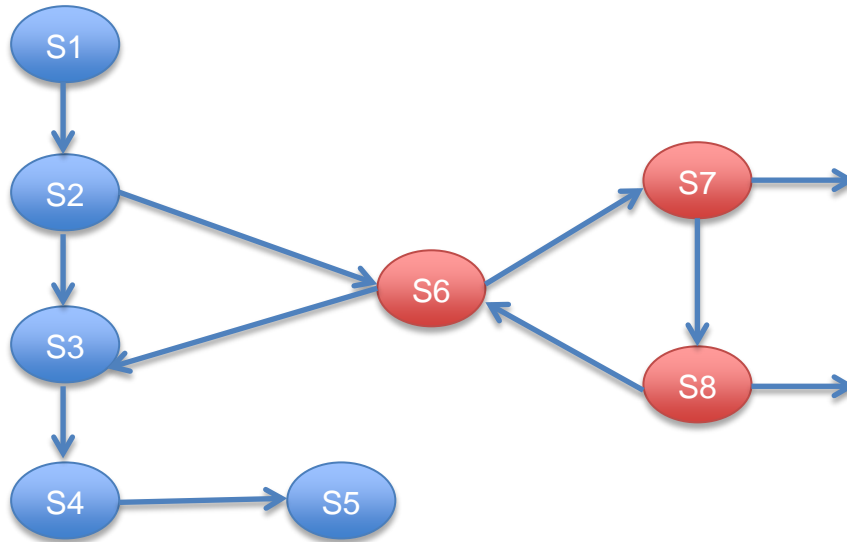


Figure 1 Problems occur when a user fails to understand signs

2.2 Semiotics and interface signs

The study of signs and significations is called semiotics (Liu 2000). It is also known as semiology. Semiotics refers to the study or research of signs/icons. In the context of this thesis as well, it refers to the detailed study of web signs, used get simplicity in the web world. Semiotics is first introduced by Joseph Goguen (1999). Semiotics refers to not only signs but also anything that means something else. It focuses on the way of creating a sign and how the users understand it. Even before a user begins viewing a web page, the platform such as a browser, uses a navigational metaphor that has a direct influence on the user experience (Cardenas 2011). Sometimes, two or more signs can lead to the same meaning. A web interface is normally surrounded with different signs, short context, icons, images etc. Normally, these are considered as interface signs. Figure 2 shows the interface signs marked with circles and a design of web interface.



Figure 2 Screenshot of the homepage of Turku University of applied Sciences.

3. STUDY METHOD

In the context of the thesis, a survey is carried out with 5 users of both IT and non-IT background. Some of them are Bachelor Studies students and some are Masters Studies students. Figure 3 represents the overview of the method. There are two tests for the participants. Test 1 is the interface signs' usability test. All the signs are used from the Google Calendar web page. Test 2 is conducted based on some tasks (table 1) about Google Calendar. There is no time limit to complete the task and an audio is recorded for each participant. There is no hidden camera to record the tests. The participants are allowed to ask questions.

Firstly, the interface signs (a total of 68), icons from the Google Calendar are selected and screenshot are taken with full context for Test 1 and the tasks (total 9 tasks) are made for Test 2. Secondly, the participants are selected and scheduled for the Test 1 and Test 2. Thirdly, all the data from Test 1 and Test 2 are collected and analyzed to find out the approach and the accuracy of the participants' interpretations on web interface. Both tests are carried out at different times. At the end, the study results are compared and analyzed.

Five participants are selected to conduct the tests. All of them are familiar with internet and web applications and they all have the facility to use it. They all know how to use a web browser and the basic knowledge to use a personal computer. The participants are selected randomly. They are all familiar with the online calendars and two of them have experience about Google Calendar.

The Interface sign usability test (Test 1) is conducted to understand the participants' explanation about different interface signs and to find out the accuracy of their explanation. Each participant is asked different questions separately and all the participants are given a short introduction about the purpose of the survey and all the interface signs are presented to them with the context (screenshot of the web interface). There is no time limitation. Their reactions are observed and their feedbacks are saved via audio recorder as

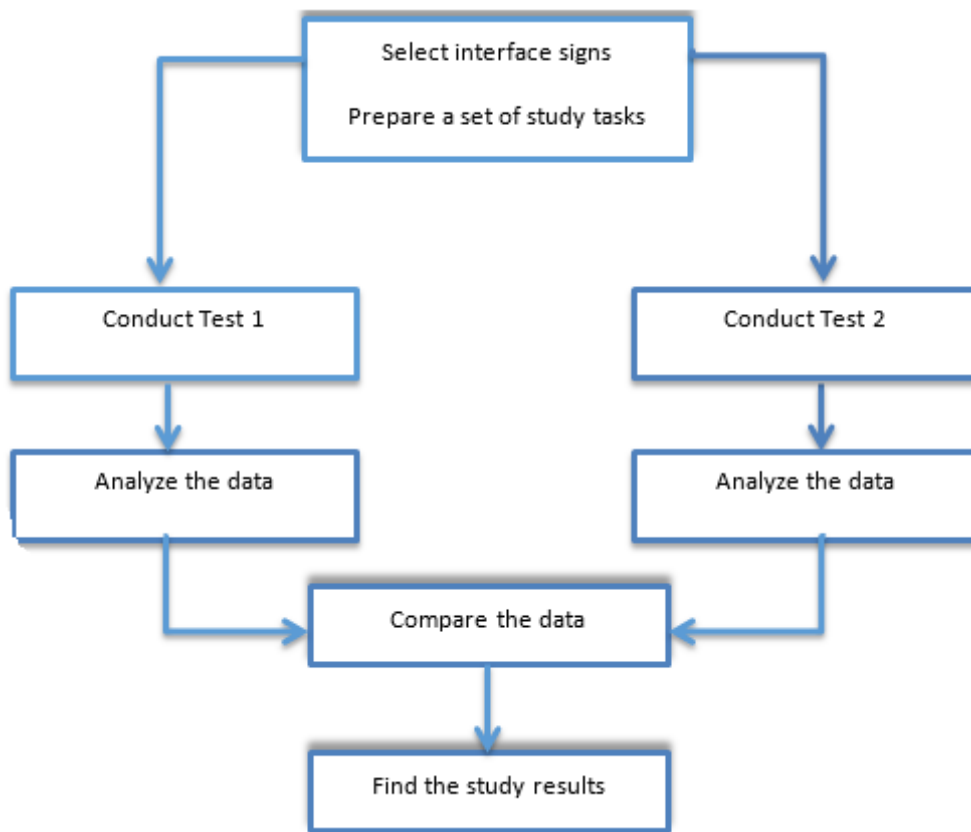


Figure 3 Overview of the study method.

some of them are not comfortable with the video recording. The actions of the participants are observed throughout the whole progress while they are completing the tasks and important notes are made. Later, the data is analyzed.

Usability test (Test 2) is conducted following the Think Aloud method to observe and evaluate the tasks performed by the participants. The Think Aloud method is developed originally by Clayton Lewis (Elizabeth 2003). The Think Aloud method is a process where the participants can speak aloud any word that comes in their mind while they complete the tasks.

Table 1 Overview of tasks of Test 2.

Phase	Phase no	Task no	Tasks
Log-in to Google Calendar	Phase 1	Task 1	Log-in to Google Calendar (information is provided)
Create and Search an event	Phase 2	Task 2	Create an event
	Phase 2	Task 3	Create an event with details
	Phase 2	Task 4	Search an old event that is created previously (information is provided)
	Phase 2	Task 5	Check weekly event list
	Phase 2	Task 6	Edit an event
Edit and Delete an event	Phase 3	Task 7	Delete a previously created event
	Phase 3	Task 8	Find the deleted event
	Phase 3	Task 9	Logout from Google Calendar

During the test also the discount usability evaluation method is followed. The discount usability method generally follows three techniques (Jakob 1994):

1. Scenarios
2. Simplified thinking aloud
3. Heuristic evaluation

The main goal of this test is to observe the participants' approaches to the tasks. A total of 5 participants are selected for this task. They are given a full introduction about the test procedure in the beginning and also a short

presentation about the tasks and the intention of the test. Then they are told to perform the tasks. The tasks are performed using Google Chrome web browser and a test user is logged in with a Google account on behalf of the tester. Each participant is given a total of nine tasks. Their activities during the completion of the tasks are observed and notes are made and an audio record is made during the same time. Total time spent on each participant for Test 2 is about 40 to 55 minutes. At the end, the collected data is analyzed. Table 1 shows the phases of survey and gives an overall idea of tasks related to each phase.

4. SURVEY ANALYSIS

The information from participants is collected from the Test 1 and Test 2. The intention of the first test is to find out the accuracy of users' interpretation on icons available at web interface while the second test is to find out the participants' ability and speed to complete certain tasks.

Coding used for each user during survey:

Participant 1: P1

Participant 2: P2

Participant 3: P3

Participant 4: P4

Participant 5: P5

Table 2 Participants' interpretation accuracy level.

Participants	Accurate	Inaccurate				Accuracy (%)	Inaccuracy (%)
		Moderate	Conflicting	Erroneous	Incapable		
P1	49	9	5	3	2	72.06	27.94
P2	47	10	7	1	3	69.12	30.88
P3	51	8	5	2	2	75.00	25.00
P4	38	17	4	4	5	55.88	44.12
P5	40	14	7	3	4	58.82	41.18

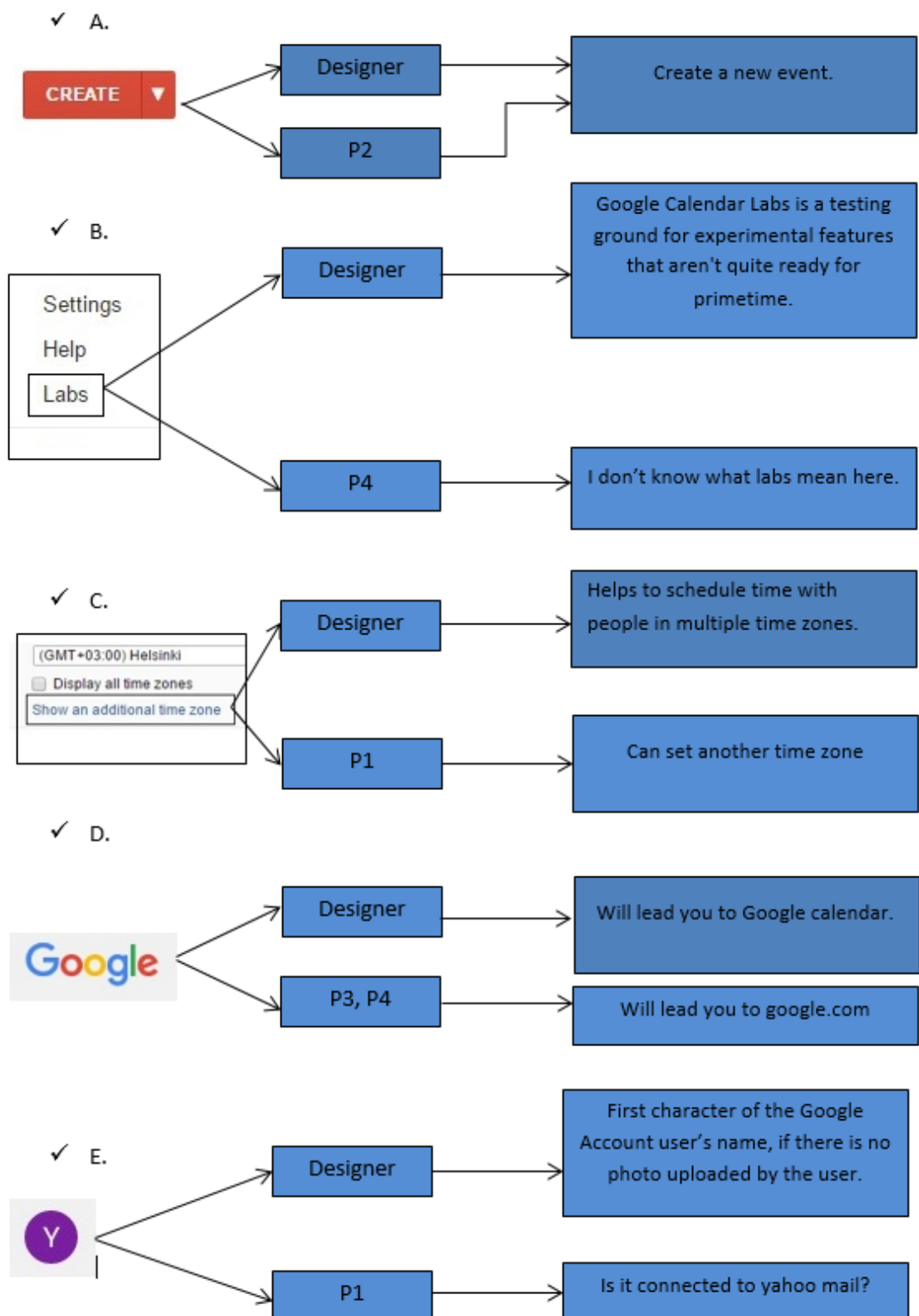
4.1 Test 1 Accuracy level of sign interpretation

The following information is collected from Test 1: Participants' explanations towards interface signs (total 68 signs). The collected data has been analyzed to get the result of Test 1. Table 2 shows the accuracy level of each user's interpretation of the signs. The categories are:

- a) accurate: the participants' explanation about the sign matches with the actual meaning of the interface signs,
- b) moderate: the participants' explanation about the sign refers to more than one meaning but one of them is the actual meaning
- c) conflicting: the participants' explanation about the meaning refers to more than one unknown meaning and the participants are confused to find out the actual meaning
- d) Participants' explanation about the sign is totally different than the actual meaning
- e) Participants are not able to explain anything about the signs (Islam 2014).

Table 3 shows some example of participants' interpretations during the Test 1. Some interface signs are very easy to explain for the participants and some are very difficult to interpret for them. But the result is not similar for all the users.

Table 3 Example of Test 1



For example in Table 3 row B, P4 cannot produce any meaning for the sign “Labs”. Here the participant totally fails. Again in Table 3 row E, the sign stands for the first character of user’s name if there is no photo uploaded by the user. P1 interpreted it totally wrong.

4.2 Test 2 Task completion

The information collected and observed for analysis from Test 2:

- The amount of time spent by a user for completion of each task.
- Feedback from users.
- Whether a user asked for help or not.
- Information received by a user through signs used on the interface.
- The number of clicks used by the participants to complete the task.
- The number of successful completed tasks.
- Accuracy in information interpretation during the survey.

Table 4 Percentage of successful task completion

User	Number of completed tasks	Number of failed tasks	Task completion (%)
P1	7 out of 9	2 out of 9	77.78
P2	7 out of 9	2 out of 9	77.78
P3	9 out of 9	0 out of 9	100.00
P4	6 out of 9	3 out of 9	66.67
P5	7 out of 9	2 out of 9	77.78

All the data and feedback from the participants are collected and analyzed to find out the accuracy of the participants' interactions for assigned tasks using interface signs. Table 4 shows the overall interpretation accuracy level percentage of each participant for the test. In the table failed task means that participants are unable to complete the whole task or they have done part of the tasks successfully. The number of completed tasks means the participants complete the tasks successfully with minimum required amount of clicks or more. Table 5 shows the time taken for the participants in each task. Table 5 shows that to complete the task 2 each participant took around 8 to 20 minutes. Here T1= Task 1, T2= Task 2, T3= Task 4, T4= Task 4, T5= Task 5, T6= Task 6, T7= Task 7, T8= Task 8, T9= Task 9.

Table 5. Overview of duration of designated tasks.

User	Time taken for Phase 1 (sec)	Time taken for Phase 2 (sec)					Time taken for Phase 3 (sec)			Total Time (sec)
		T1	T2	T3	T4	T5	T6	T7	T8	
P 1	38	25	116	240	96	58	29	293	16	911
P 2	58	49	80	11	45	22	40	454	10	769
P 3	20	39	30	142	32	20	55	140	12	490
P 4	226	47	474	25	34	8	20	252	148	1234
P 5	42	28	107	223	88	32	32	275	74	901

Table 5 shows the task completion time (TCT) with each designated tasks. Figure 4 diagram shows that there is no linear relation of taken time among the

users while they are performing the tasks. For example, In T1, P4 has spent maximum time while he has taken minimum time to complete T7 and in T7, P1 has spent maximum time while he took minimum time to complete T1, T2, and T5.

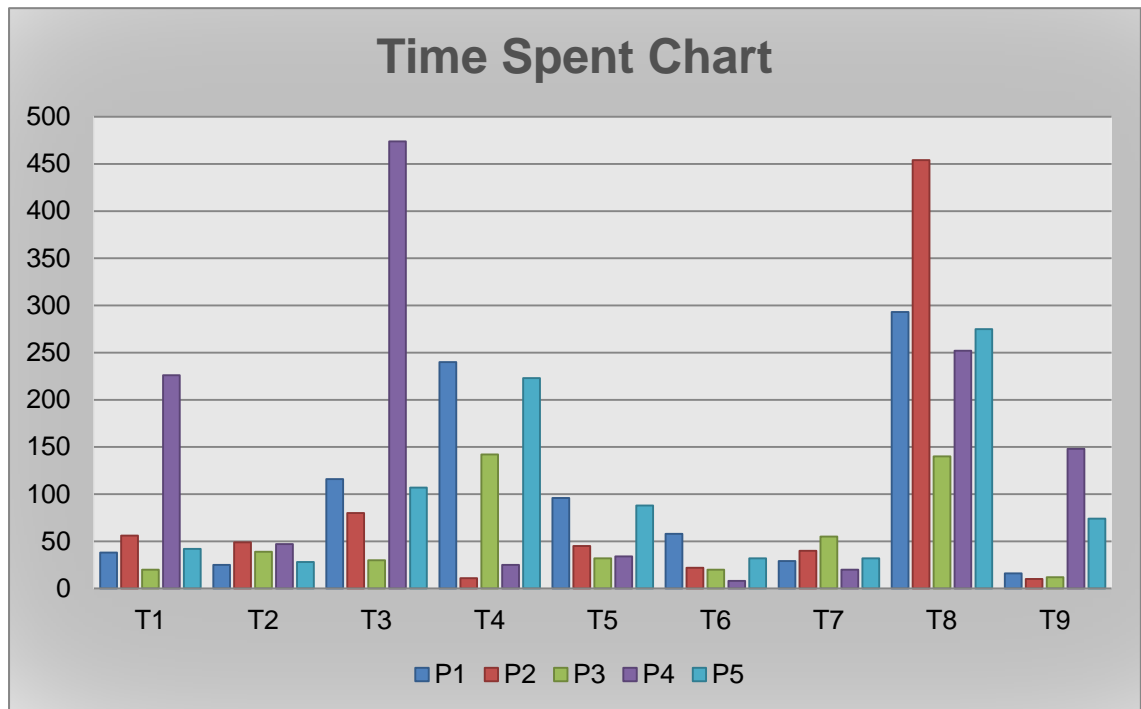


Figure 4 Comparison of spent time by the participants in each task

During the survey each participant's feedback and comments on difficulties faced while performing the tasks are recorded. Table 6 shows some of the feedback and confusion state of the participants during the test. The participants showed different reactions and gave different comments for each task.

Table 6 Comment / Feedback from users during Test 2

User	Task	Feedback / state/ comment
P1	Search for previous created event	Comment: No idea how to find one
	Find the deleted event	State: Tried but could find relevant place and asked for help.
	Create an event with details	Comment: I think the save button should be down so....
P2	Find deleted event	Comment: Does it go the email?
P3	Edit an event	Comment: Easy task
	Find deleted event	Comment: Have not done before. Not sure of if it is available
P4	Login to Google Calendar	Comment: How come I cannot go to google calendar
	Create an event	Comment: Why did it save three times? ...
	check weekly event list	Feedback: Easy task
	Find deleted event	Comment: This thing is bit tricky. This thing I don't know how to find.
	Logout / exit Google Calendar	Comment: Can I just logout from google calendar? State: confused
P5	Create an event	State: Confused initially
	Find the deleted item	State: Failed to find
	Create an event with details	Comment: I have never used google calendar before. So.....
	Search for previous created event	State: Failed to find and asked for help
	Logout / exit Google Calendar	State: Confused

The participants' attention could easily divert from the interface. This actually happened with various participants. They found it difficult to locate the deleted event from the Google Calendar and some of them did not know how to find a previously saved event although they are thinking it is very easy to find. One participant did not know how to log out from Google Calendar.

The screenshot shows the Google Calendar 'Create Event' interface. At the top, there are buttons for 'SAVE' (in red) and 'Discard'. Below this is a text input field for the event title, currently containing 'Untitled event'. The date and time are set to '10/4/2016' from '15:30' to '16:30' on '10/4/2016', with a 'Time zone' link. There are checkboxes for 'All day' and 'Repeat...'. Below this is a tabbed interface with 'Event details' selected and a 'Find a time' button. The 'Where' field contains 'Enter a location'. There is a 'Video call' link and a 'Calendar' dropdown menu set to 'Yasir Arafat'. A large text area is provided for the 'Description'. An 'Attachment' link is present. The 'Event color' section shows a row of colored squares with the first one (blue) selected. The 'Notifications' section has a dropdown set to 'Notification', a '30 minutes' dropdown, and an 'Add a notification' link. The 'Add guests' section includes a text input for 'Enter guest email address' and an 'Add' button. Below this, 'Guests can' options are listed: 'modify event' (unchecked), 'invite others' (checked), and 'see guest list' (checked). At the bottom, 'Show me as' is set to 'Busy' and 'Visibility' is set to 'Calendar default'. A small note at the bottom states: 'By default this event will follow the sharing settings of this calendar: event details will be visible to anyone who can see details of other events in this calendar. Learn more'.

Figure 5 Google Calendar UI to create an event

4.3 Comparison between Test 1 and Test 2 Data

Table 1 (Appendix) shows the data collected from Test 1 and Test 2 to find out the relation between both tests and the participants' interpretation accuracy about the signs and how it effects on performing the tasks. For Task 1 the participants needed to work with two signs. Some participants did the correct

interpretation of the signs and finished the task very easily while others found it difficult to understand the sign and perform the task. Those, who interpreted the signs correctly also took comparatively less time and used fewer clicks to complete the task. And in Test 1 their sign interpretation accuracy is comparatively higher than others. On the other hand, those who had low scores on Test 1 were also confused in Test 2 and could not complete all the tasks successfully and in some cases they asked help.

Table 1 in the Appendix provides a general idea of the participants' activities during the survey. Separately, all the tasks provide more detailed information. In Figure 6(a), the histogram shows that when the percentage of sign interpretation accuracy is higher, the users take less time to complete the task and click less time. Here P2 and P4 who could not complete the Task 1, took comparatively more time and used many clicks to find the solution and asked for help. For example, since P4 had lower percentage of accuracy (56%) in Test 1, it is predictable that P4 could not complete the Task 1. On the other hand, P2 had the almost same accuracy (69%) level as P1 and P3 but could not complete the Task 1. So, the Test 1 result is not effective to determine the result of Test 2 for Task 1. This case is also true for T9.

Figure 6(b) shows that although the percentage accuracy in Test 1 is different for each participant, they took almost the same time and used exactly the same numbers of click to complete the Task 1. Here the accuracy percentage of Test 1 did not make any difference for users to complete the task successfully in Test 1 although one participant had 75% (maximum) of accuracy while others had 56% (minimum) of accuracy. This case is also true for T5, T6, and T7.

In Figure 6(d), P4, who had the lowest score in Test 1, completed Task 4 successfully using fewer clicks, while P1 and P5 could not complete the same task and used the maximum number of clicks though they had a better score (72% and 59%) in Test 1.

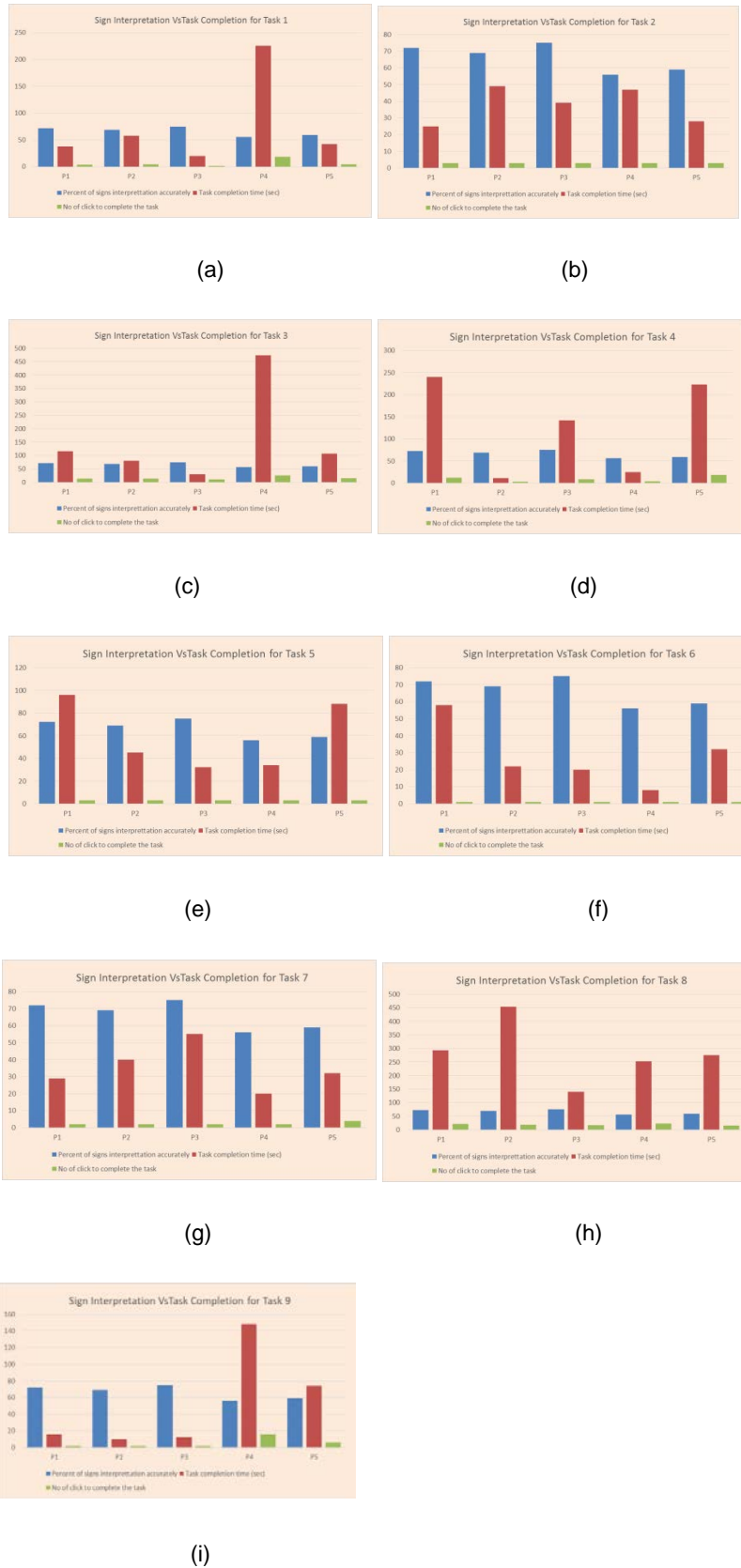


Figure 6 Sign Interpretation accuracy in Test 1 VS time spent in Test 2

For T3, all the participants kept a relation with the accuracy level of Test 1. They comparatively took less time and fewer clicks to finish the task while P4, who had the lowest score (56%) in Test 1, took more time and used more clicks to perform the task. In task T3, both P4 and P5 asked for help.

In T8 only P3 is able to complete the task and still clicked so many times looking for the answer while the task needed only 3 clicks.

This study shows that seven out of nine tasks' result did not have any influence on the result of Test 1. The percentage of interpretation accuracy for the signs of the studied website does not directly impact the performance of completing a particular task.

Considering only the accuracy of the task related signs by each participant the conclusion is that in Test 1 and Test 2 the participants' interpretation accuracy level does not have a linear relation task completion. All the figures in Figure 7 concern the percentage of sign interpretation accuracy for each task by the participants. Figure 7(a) shows that when the participants understand all the task-related signs correctly, they take comparatively less time and use fewer clicks to complete the task than the participants who understand the task-related signs partially or fail to understand it. In Task 1, only P3 had complete sign interpretation accuracy while P1 and P5 had 50% task-related sign interpretation accuracy and P2 and P4 completely failed to interpret the signs. Here P3 took less time than other participants and used the minimum number of click. P3 also looked confident while performing the task. As P1 and P5 had 50% task-related sign interpretation accuracy, they took more time and used comparatively more clicks than P1 and they looked slightly confused in the beginning of the task. P2 and P4 had no idea about the task-related signs. They took the maximum amount of time and used more clicks than others to perform the task. They were totally confused about the task and also asked for help.

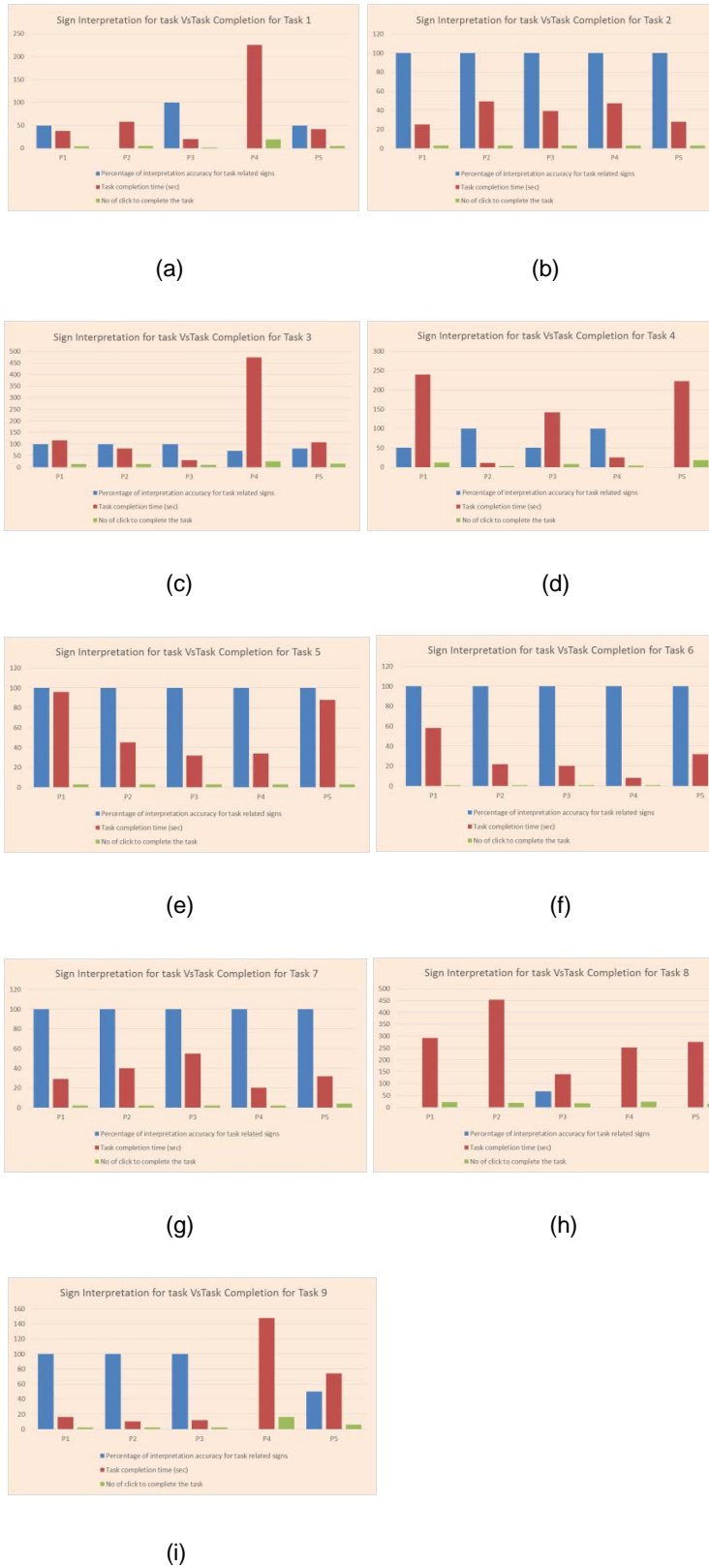


Figure 7 Accuracy for each task VS completion time in Test 2

Figure 7(b) shows that when the percentage of sign interpretation accuracy of the participants is same, they all take almost same time and use almost the same number of clicks to complete the task. In Task 2, all participants had 100% task related sign interpretation accuracy and they took 56 to 75 seconds to complete the task and all used the same number of clicks to complete the task. They all are very comfortable and looked confident during the task completion. All the figures above in Figure 7 show almost the same result as Figure 7(a) and figure 7(b).

This study shows that the percentage of interpretation accuracy for all required signs to complete a task in the website directly impacts the performance of completing that particular task.

5 RESULTS AND CONCLUSION

The results of the study provide that:

- The users' interpretation accuracy of interface signs affects the task completion performance in the website.
- The percentage of interpretation accuracy for the signs of the studied website does not directly impact the performance of completing a particular task.
- The percentage of interpretation accuracy for all required signs to complete a task in the website directly impacts the performance of completing that particular task.

This is a limited study with only five users based on Google Calendar. However, the result might be applicable to other similar type of websites and tasks but should be verified with large user group and different websites.

Web Interface signs are very important for the users to browse any website. It should to be easily understandable to any group of users to perform any task on various web interfaces. Confusions of interpreting any sign will lead the user to a different web interface and the purpose of the sign will fail.

This study endeavors to encourage the developers to create a more user-friendly web interface. These days, mobile devices and applications are very popular and they are functioned mostly with signs. Therefore, it is very important to create user intuitive web interfaces.

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APPENDIX

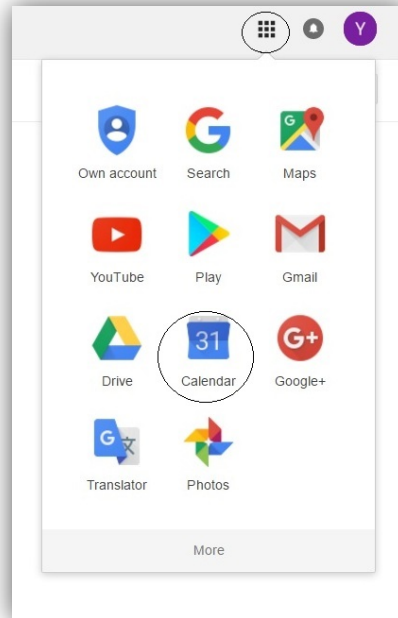
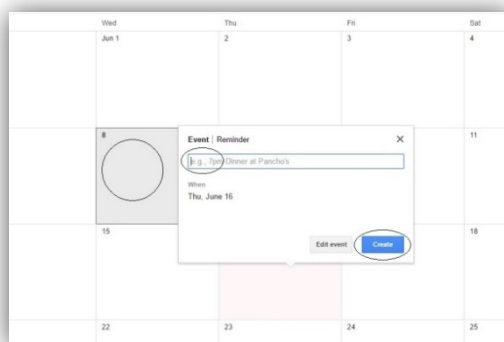
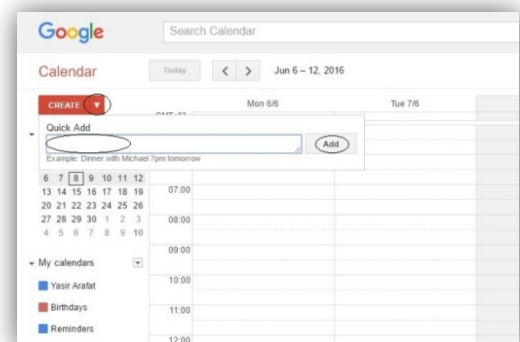


Figure1: Test2, Task1. Total signs (or clicks) need to complete the task are marked with oval.

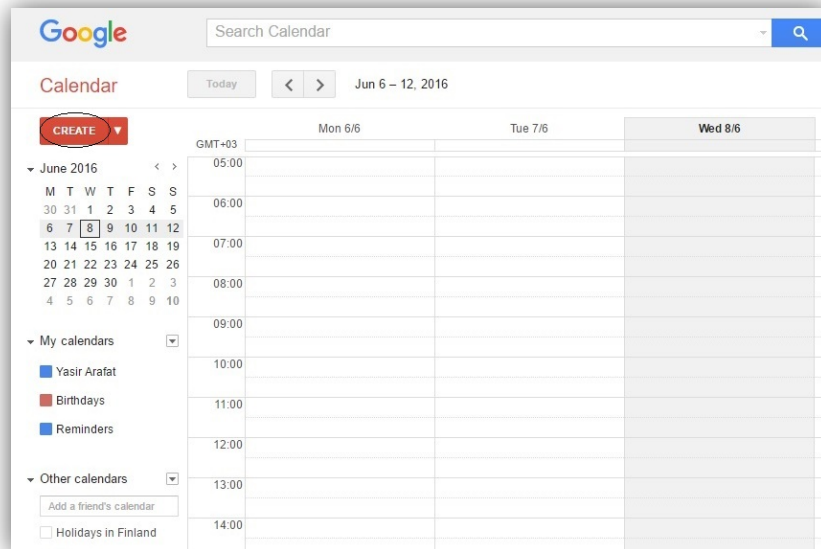


(a)

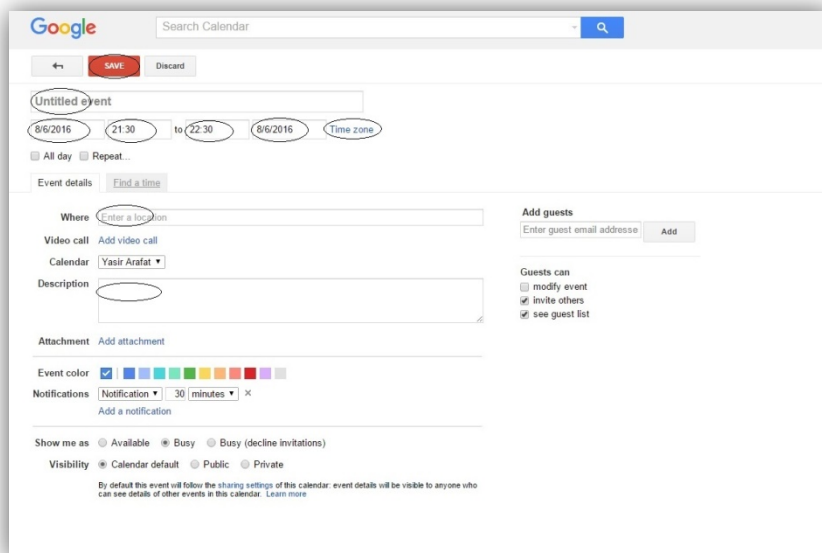


(b)

Figure2: Test2, Task2. Total signs (or clicks) need to complete the task are marked with oval. The participants can follow either (a) or (b).



(a)



(b)

Figure3: Test2, Task3. Total signs (or clicks) need to complete the task are marked with oval in figure (a) and (b).

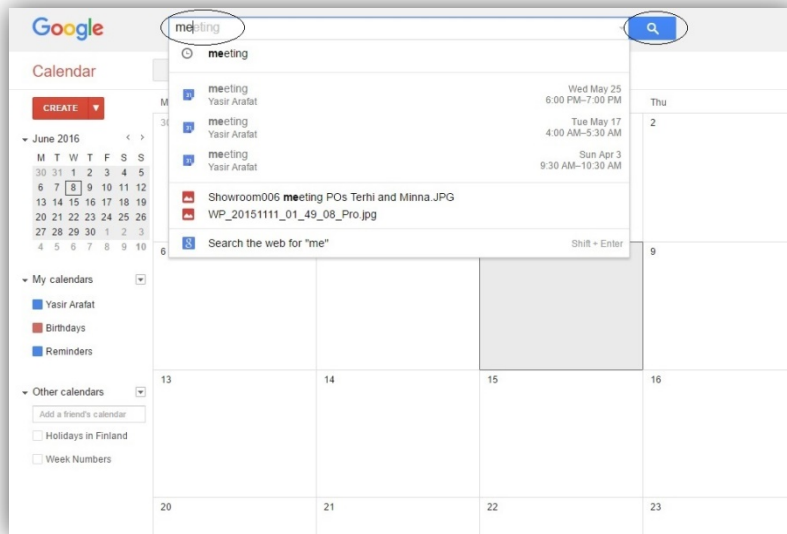


Figure 4: Test2, Task4. Total signs (or clicks) need to complete the task are marked with oval.

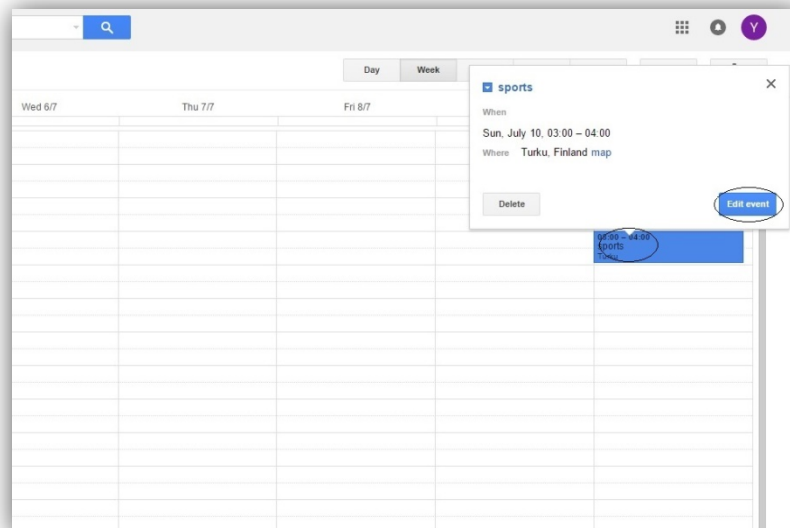


Figure 5: Test2, Task5. Total signs (or clicks) need to complete the task are marked with oval.

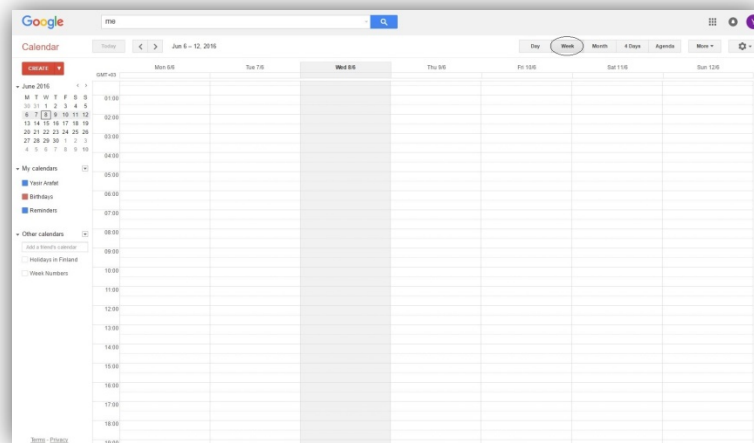


Figure6: Test2, Task6. Sign (or click) need to complete the task are marked with oval.

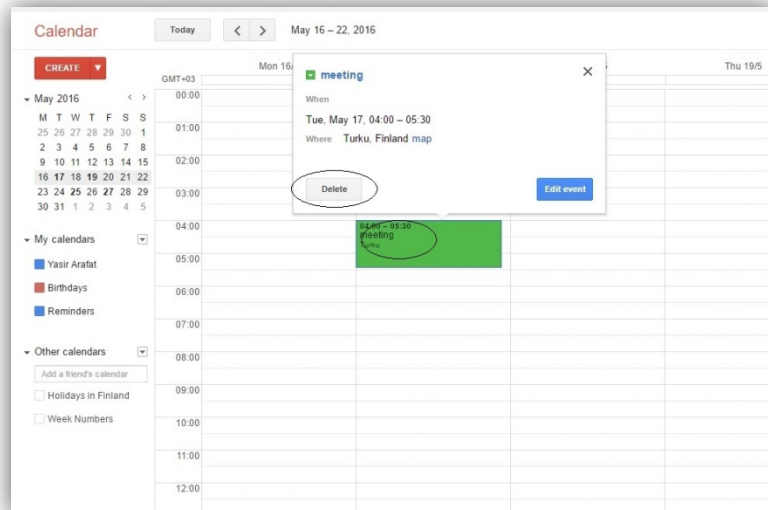


Figure7: Test2, Task7. Total signs (or clicks) need to complete the task are marked with oval.

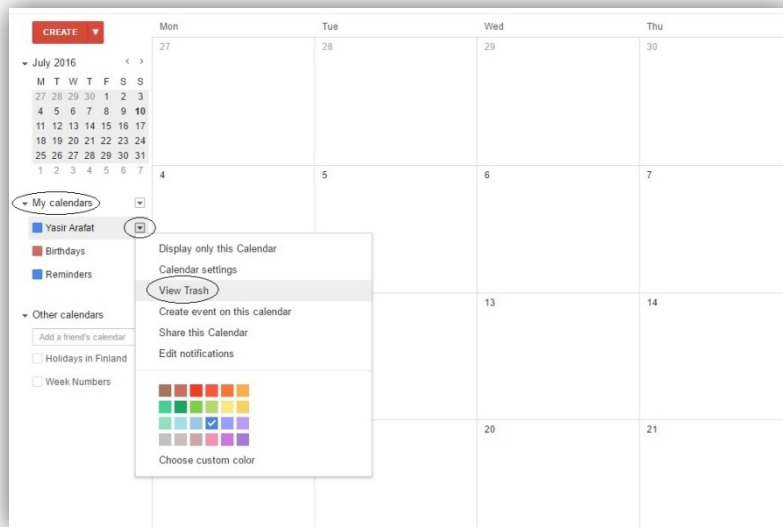


Figure8: Test2, Task8. Total signs (or clicks) need to complete the task are marked with oval.

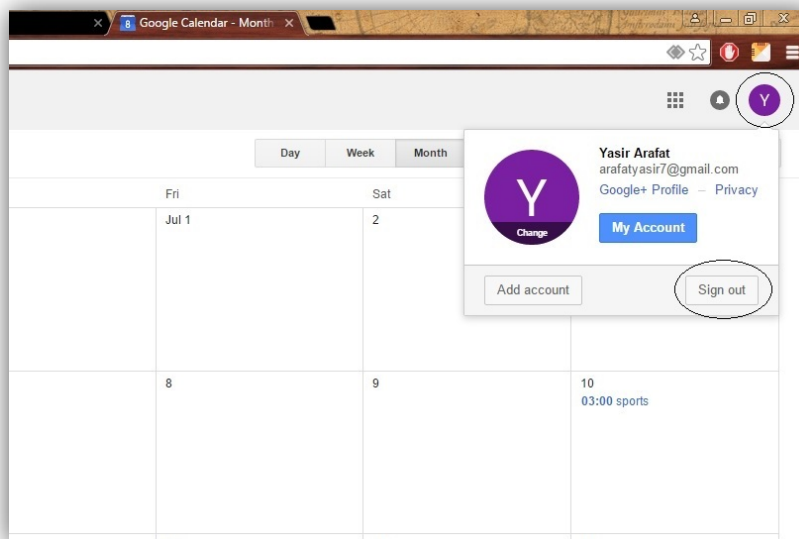


Figure9: Test2, Task9. Total signs (or clicks) need to complete the task are marked with oval.

Table 1 Individual data for each participant in Test 1 and Test 2

Participant s	Tas k	No. of signs (or click) required to complete the task	No of signs interpreted correctly by the Participants for each task	Percent age of interpretation accuracy for task related signs	Percenta ge of overall signs interpretation accuracy from Test 1	Askin g help Y=Ye s, N=No	Task completion time (sec)	No. of click used to complete the task Bold= Failed
P1	T1	2	1	50	72	N	38	4
P2			0	0	69	Y	58	5
P3			2	100	75	N	20	2
P4			0	0	56	Y	226	19
P5			1	50	59	N	42	5
P1	T2	3	3	100	72	N	25	3
P2			3	100	69	N	49	3
P3			3	100	75	N	39	3
P4			3	100	56	N	47	3
P5			3	100	59	N	28	3
P1	T3	10	10	100	72	N	116	14
P2			10	100	69	N	80	13
P3			10	100	75	N	30	11
P4			7	70	56	Y	474	26
P5			8	80	59	Y	107	15
P1	T4	2	1	50	72	Y	240	12

P2			2	100	69	N	11	3
P3			1	50	75	N	142	8
P4			2	100	56	N	25	4
P5			0	0	59	Y	223	18
P1	T5	3	3	100	72	N	96	3
P2			3	100	69	N	45	3
P3			3	100	75	N	32	3
P4			3	100	56	N	34	3
P5			3	100	59	N	88	3
P1	T6	1	1	100	72	N	58	1
P2			1	100	69	N	22	1
P3			1	100	75	N	20	1
P4			1	100	56	N	8	1
P5			1	100	59	N	32	1
P1	T7	2	2	100	72	N	29	2
P2			2	100	69	N	40	2
P3			2	100	75	N	55	2
P4			2	100	56	N	20	2
P5			2	100	59	N	32	4
P1	T8	3	0	0	72	Y	293	22
P2			0	0	69	Y	454	18
P3			2	67	75	N	140	17
P4			0	0	56	N	252	23
P5			0	0	59	Y	275	16
P1	T9	2	2	100	72	N	16	2
P2			2	100	69	N	10	2

P3			2	100	75	N	12	2
P4			0	0	56	Y	148	16
P5			1	50	59	N	74	6