

Eksamensopgave, Interaktionsdesign, Blok 3 2018-2019, Københavns Universitet

Forside

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Question 1

A. Activities and tasks

Norman distinguishes between activities and tasks by saying that activities are high-level behaviors consisting of a sequence of low-level tasks (Norman 2013, p. 232). Norman provides the driving of a car *as an example* of an activity composed of a set of tasks such as pulling the lever and managing the foot pedals (ibid., p. 232). Thus, Norman sees a *hierarchy of levels* of human action (ibid., p. 233). Determining the precise levels of behavior which define activities and task may not be possible: Norman notes that high-level activities may contain lower-level activities, and likewise low-level tasks are composed of *operations* (ibid, p. 233).

Similarly, Cooper et al. notes that “*activities and tasks are intermediate steps (at different levels of organisation) that help someone reach their goals.*” (Cooper et al. 2014, p. 14). For Cooper, activities and tasks are also part of a hierarchical structure of human action, but they are *motivated by goals* (ibid., p. 15). Molich uses the term task when describing Think Aloud Testing, and while he does not use it to describe cognition and behavior in general, it is worth noting that here these tasks can be completed in a couple of minutes (Molich 2003, p. 14).

B. 3 activities and 3 tasks

Tripadvisor.com is a website with information for travellers and it has a page just for Copenhagen.¹ From now it will be called *the website* or *the site*. 3 activities and 3 tasks are presented in which the website is involved. Based on the notion that tasks are components of activities, they are presented in *pairs*. *Scenarios* are used to provide a context to the activities and tasks (Molich 2003, p. 3). As noted, the levels of human behavior which may be called activities and tasks are not clear-cut. A reference which has been used is the following an *example* given by Norman: “*An activity is a high-level structure, perhaps “go shopping.”*” (Norman 2013, p. 232). A reference which has been used for tasks is the following example by Molich: “*Install Supercal on your pc.*” (Molich 2003, p. 5). Users are *assumed* to be “possible or actual travellers in or to Copenhagen.”

3 activities	3 tasks
<i>Activity 1:</i> Bob Newman (45) from London is on holiday in Copenhagen with his wife. It is Tuesday and Mr. Newman's activity is: <i>Take wife out for dinner.</i>	<i>Task 1:</i> Mr. Newman's task is to use TripAdvisor to find the rating of Restaurant Grønnegade which is located across the street.
<i>Activity 2:</i> Hans is 22 and from Hamburg, he is a backpacker on a budget. From Moscow, Hans arrives at Copenhagen ...	<i>Task 2:</i> Hans's task is to use TripAdvisor to find the 3 cheapest rooms in Copenhagen available to him that night.

¹ TripAdvisor Copenhagen, <https://www.tripadvisor.com/Home-g189541> [Accessed: April 5, 2019]

Airport around noon. Hans's activity is: <i>Find somewhere to sleep tonight.</i>	
<i>Activity 3:</i> Tasuku Honjo, 77, is an immunology researcher from Kyoto who has been invited to give a lecture at University of Copenhagen. Honjo's activity is: <i>Plan the trip to Copenhagen.</i>	<i>Task 3:</i> Hanjo's task is to find a flight from Kyoto to Copenhagen which departs June 13 using TripAdvisor.

C. Method

The *survey* is a research method which could be used to collect *empirical data* on the activities and tasks of users of the website (Lazar et al. 2014, p. 100). Surveys use a questionnaire which is a "*well-defined and well-written set of questions*" (ibid., p. 100). In this case, the *target population* would be users of the website and a *sample* would be studied (ibid., p. 102). Example questions could be the *closed-ended* question "Have you used TripAdvisor to find a hotel?" or an *open-ended* question like "How have you used TripAdvisor?" (ibid., p. 112)

Lazar describes various issues or obstacles with sampling which apply to this specific survey. For example, suppose the survey was available on the site, then users who use the site more *could* be more likely to respond and that *could* affect the *validity* of our investigation (Lazar et. al 2014, p. 106). Proper *stratification* could be play a part in adresssing this problem (ibid., p. 105). The *descriptive statistics* resulting from data *analysis* of the survey results could for example be used to identify the fraction of users who use the site to find a hotel (ibid., p. 121).

In McGrath's framework, the survey method is an *element* of the *methodological domain* and as all other methods, it is to be regarded as a *tool* which has its strengths and weaknesses (McGrath 1995, pp. 153-154). Using *multiple methods* to investigate the activities and task would be needed in order for our knowledge to hold *credibility* (ibid., p. 155). McGrath specifically argues, that if well-designed, the survey could excel in *generalisability* over the user base (ibid., p. 156). A reason for the survey being close to the *maxima* for generalisability could be the possibility of collecting large enough samples to make inferences about the population (Lazar et al. 2014, p. 106).

However, various features of the survey method contribute to lower *precision* and *realism*: McGrath argues that it is low on precision because the it is difficult to control the variables (McGrath 1995, p. 158). This idea of low precision is in agreement with Lazar's notion that surveys are "*good for getting limited "shallow" data from a large number of people.*" (Lazar et al. 2014, p. 101) The lack of *realism* of the survey method results from the *obtrusive* character of the method (McGrath 1995, p. 156): For example, it is not possible for users of TripAdvisor to answer questions about their activities *while* actually doing them. In McGrath's words "*responses are gathered under conditions that make the behavior setting irrelevant.*" (ibid., p. 158)

Question 2 (associated appendices: Appendix A, Appendix B)

A. Chosen method

As a method for an *analytic evaluation* of the usability of website, the *cognitive walkthrough* has been chosen. A cognitive walkthrough is a *usability inspection method* which focuses on *ease of learning* (Wharton et al. 1995, p. 107). This is done by assessing how users solve tasks consisting of a *sequence of actions* (ibid., p. 110): For each action the goal is to construct a *credible story* of how a hypothetical user might fail of succeed in this sequence of by using a simple *model of the cognitive processes* involved in problem solving (ibid., p. 110, 114; Lecture on Evaluation, p. 11).

There are two reasons why it has been chosen: The *first reason* is that it focuses on *tasks*, and if these tasks are realistic then the usability problems that are found will probably also be problems real users face (Wharton et al. 1995, p. 106). This need not be the case with a *heuristic analysis* which can identify usability problems which user will rarely meet (Lecture on Evaluation, p. 14). The *second reason* follows an argument made by Wharton et al., that making a walkthrough can help a developer gain knowledge which is relevant for designing follow-up products, which is relevant for later sections (Wharton et al. 1995, p. 109).

B. Planning of evaluation

The walkthrough has been planned by describing the *users*, constructing *tasks*, identifying the *correct action sequences* and *defining the interface* (Wharton et al. 1995, p. 109-111). These constitute the *preparatory phase of defining the inputs*. A basic description of *each step in the planning* follows:

Users have been described, first in general as “actual or potential travellers to or in Copenhagen”. Users of a system can described in general terms: Wharton et al. give the example of “people who use existing ATM machines” (Wharton et al., p. 109). However, in order to construct *credible* stories, further assumptions about users are useful and for this, *scenarios* are constructed for each task (ibid, p. 114). These scenarios are developed from the 3 scenarios in *the answer to Question 1*.

Tasks have been constructed and they are equivalent to *the 3 tasks in the answer to Question 1*. These are valid tasks for the walkthrough because they satisfy the requirements that the tasks be *concrete* and *realistic* (ibid., p. 110). They are concrete and realistic because they are complemented by hypothetical activities which again are based on scenarios.

Correct action sequences have been identified by using the website to solve the task and *attempting to find the best approach*. Based on the assumption that many users have no training with TripAdvisor, an in order to improve the detail of the walkthrough, the *level*

of action granularity has been made high (Wharton et al., p. 110). The interface has been defined and this is done by evaluating the reactions of elements in the interface as they relate to these correct action sequences.

Lastly, a scheme for *registering usability problems* has been chosen. The problems are registered with a title and an explanation together with *frequency*, *impact* and *persistence* which can be low, medium and high (Lecture on Evaluation, p. 10). Furthermore, each usability problem is assigned a *severity rating* according to a scale from 0 to 4 (Lecture on Evaluation, p. 10): 0. Not an error. 1. Cosmetic. 2. Minor. 3. Major. 4. Catastrophe. The usability problems are identified when for an action, no credible story can be made in which the user is successful.

C. Insights and obstacles

The *first problem* to be noted is that 3 walkthroughs did not provide a sufficient number of usability problems needed for answering the coming questions meaningfully. Thus, *additional less detailed walkthroughs* were conducted and even though a *failure story* is ignored at the next action in the sequence, the inspection also followed paths of failure in order to find problems (Wharton et al., p. 116). Since 3 walkthroughs have been completed according to the protocol, it can be argued that finding additional usability problems is unproblematic, as long as arguments are provided. This whole *problem relates to* the recommendation that the method be complemented by other usability inspection methods. (ibid., p. 108)

The second insight and problem was that external evaluators conducting a cognitive walkthrough cannot be *sure* of the correct action sequence if they are not the developers. They can only spend enough time learning the system to be confident that a specific sequence is optimal. This *insight relates to the notion* that “evaluators may have too much and too little knowledge about the application.” (Lecture on Evaluation, p. 14)

The third insight and problem is that without data on users, tasks may be constructed which are unrealistic. Since it has been argued that one of the advantages of the walkthrough over heuristic evaluation is that focus on user tasks results in real usability problems, this can be a problem. *This concern is similar* to the point that analytic evaluation can produce many false positives (Lecture on Evaluation, p. 14).

D. Results of evaluation

The primary result of the evaluation is a list of usability problems registered as described above which can be found in Appendix B. The 3 initial cognitive walkthroughs are detailed in Appendix A. Failure stories arose primarily based on 2 of the criteria described by Wharton et al. (Wharton et al. 1995, p. 112): Does the user try to achieve the right effect? Will the user associate the correct action with the effect trying to be achieved?

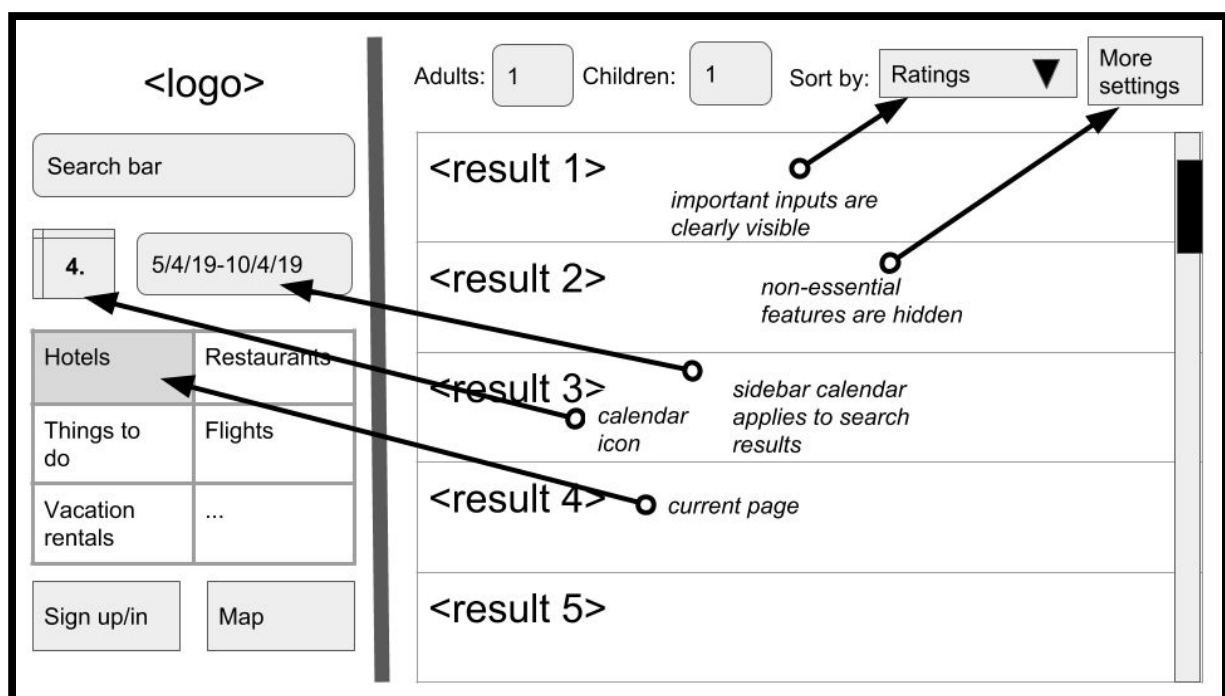
Question 3 (associated appendix: Appendix C)

A. Redesign

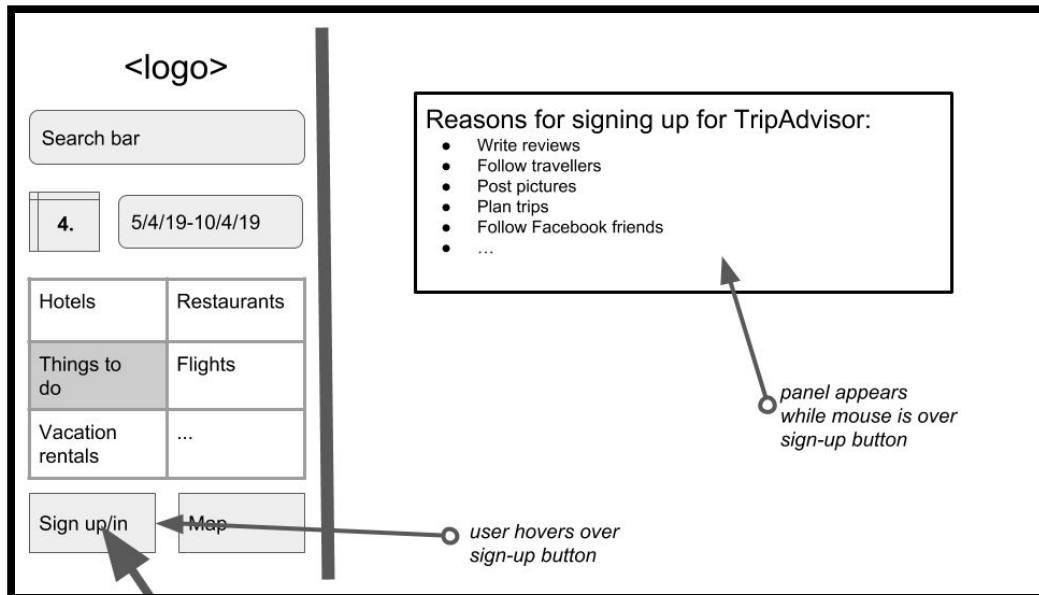
By using the *10+10 method* for *idea generation*, a process which is documented in Appendix C, a redesign has been developed (Greenberg et al. 2011, p. 17). The redesign is based on problems identified when answering Question 2, including problems with lack of synchronisation between calendars on different pages, excessive use of new tabs, misunderstanding of buttons with label “Search” and lack of ability to use keyboard for data entry.

What is the substance of the redesign? It has a *global sidebar* which is common and constant for all pages. This bar has a large search bar, a calendar which applies to all pages, clear specification of the user’s location on the site and an icon with a map. Because of the bar, the redesign has more vertical space for search results. Search results are displayed in the top of the page without categories or recommendations first. Search results are loaded on the fly without reloading the entire page. Furthermore, when hovering over the sign up button a panel opens displaying reasons for signing up.

The user interacts with the site by using the sidebar as a frame of reference. Navigation is done by clicking on the desired menu item. The user interacts with the calendar system either by clicking the icon or by writing the dates in the textfield. In general, boxes which look like text fields facilitate keyboard data entry. When the user hovers the sign up button with the cursor, information about the reasons for signing up are provided. The user interaction happens without any update buttons, everything is updated automatically.



The sketches have been made on a computer with the awareness of concerns that this could cause focus to be on layout rather than on functionality (Lecture on Prototyping, p. 10). In an attempt to accommodate this, only gray colors have been used. The global sidebar is to the left of the black vertical bar. This sketch above shows the Hotel page. This sketch below shows that when the user hovers with the mouse over the sign-up button, a panel appears which provides reasons for signing up:



B. Improvements of usability

The first reason why the redesign could improve usability regards *efficiency* (Benyon 2019, p. 108). The amount of effort is reduced by having a single calendar, because the user will not have to enter dates multiple times and face usability problems with different designs for these calendars. Another reason why it could improve efficiency is that when having a task involving search, users will see the search bar instead of doing other actions first, as one of the cognitive walkthroughs showed a user doing.

The redesign also improves usability with regards to the *design principle of consistency* (Benyon 2019, p. 113, 117). By having a global sidebar, a part of the interface is consistent across different pages, thereby improving *learnability* (ibid., p. 117). By having a single calendar, the problem with lack of consistency between design of calendars is addressed.

Schneiderman & Plaisant presents guidelines for data display (Schneiderman & Plaisant 2004, p. 63). One principle is *efficient information assimilation by the user*. The redesign accords better to this principle, because it displays search results at the top of the page without recommendations or categories first, and so the results are presented in a way that relates to user tasks. Another such principle is *compatibility of data display with data entry* which the redesign accords to: One usability problem was that when finding hotels field for the number of guests could not be edited directly. As noted, the redesign make such fields editable by keyboard.

Question 4

A. Interaction technique

The term interaction technique has been interpreted as meaning the combination of input technique and output from the system which together facilitates the interaction: The website could be redesigned to use an interaction style which relies on natural language dialog (Jacko 2012, pp. 135, 137; Lecture on Input Styles, p. 43-45). An interaction technique based on natural language dialog would use speech recognition as input style. A user can speak in natural language to the system which recognises the words. The input style is *sensor-based* because it uses a microphone *input-device* as a sensor and it is *recognition-based* because it *classifies* words (Jacko 2012, pp. 100, 141, 133). Output from the system would be based on a speaker playing voice audio. This is used for *feedback* and *feedforward* (Norman 2013, p. 23, 72).

How does interaction happen? The system asks a question such as “What do you want to do? I can find hotels, restaurants, things to do and more.” The user would be able to say things like “I am looking for a cheap hotel.” The system would be able to provide immediate feedback by saying: “I am now looking for cheap hotels in Copenhagen. Do you have any requirements such as check-in date or number of guests?”. The user could answer: “It’s just me and I just want a room tonight”. Feedback would be important and so the system would repeat information when replying: “Okay, I am looking for a cheap room in Copenhagen for one adult checking in today.” One can imagine similar dialogues for other tasks, and the reader may see Appendix D.

One difference between the proposed and the existing interaction techniques is the *parts of the user’s body* which are used for input: Currently, they use their fingers either for *indirect-input* using keyboard or keyboard or *direct-input* if a smartphone is used for accessing the website (Jacko 2012, p. 137). In the new system they use their voice. *Another difference* regards the output from the system to the user and which of the *user’s senses* are used in the interaction: Currently, they use their sight to see a screen which facilitates input and feedback simultaneously: For example searching will deliver results while writing. In the new system they use hearing and the dialogue format of interaction excludes the possibility of simultaneous input and output. This is because the attentional capacity of humans is a limited resource, according to Kahneman (Benyon 2019, p. 515). More importantly, the output from the system would have to be remembered using the *articulatory loop* of the user’s working memory (ibid., p. 507).

B. Advantages

The first advantage of the new interaction technique is that it focuses on user *tasks* (Gould & Lewis 1985, p. 300). By using natural language dialogue, it will be able to apply *feedforward* to guide the user through the operations needed to complete the tasks.

Another advantage of this system relates mostly to specific user bases: A component of goodness in interaction is *accessibility* which concerns the *abilities* of users and the possibility that they are excluded from access to interactive systems (Benyon 2019, p. 104). Following the discussion about the differences between the techniques, the existing system could limit the accessibility for people with blindness or bad sight. A principle of *universal design* is *perceptible information* in which the design should communicate information regardless of “*the user’s sensory abilities*” (Benyon 2019, p. 105). Likewise, physical features of hands and arms could reduce the ability to use a keyboard, mouse or touchscreen. A system with natural language dialouge will also be advantageous for people with limited reading skills or people simply preferring hearing to reading, which relates to another principle of universal design, namely *flexibility in use* (ibid., p. 106).

C. Experiment

An experiment could be conducted which compares the novel interaction technique to the original as the *baseline* (Hornbæk 2013, p. 316). The *design* of the experiment is a *between-subjects* experiment with regards to the *independent variable* of whether the system used is the original or novel. This variable has been chosen because it makes it possible to compare the systems. The between-subjects choice has been made to address the concern that the test subjects would perform better on one interaction technique after having tried the other first, thus affecting the *internal validity* of the experiment (ibid., p. 320). For the other independent variables a *within-subjects* approach would be used in order to limit the number of subjects needed (ibid., p. 321). The experiment would *control* the *factor* of previous experience with TripAdvisor, by only recruiting subjects with no previous experience (ibid., p. 330). *Randomization* would be applied to the subjects over the independent variables (ibid., p. 320).

The second independent variable is the *task*, the tasks being those presented in response to Question 1 and used for the cognitive walkthrough. This variable has been chosen because it makes it possible to make a more nuanced comparison of the interfaces, and avoid what Hornbæk calls a *win-lose setup* (Hornbæk 2013, p. 309). Since the novel system is specifically designed to accommodate tasks, the tasks should be carefully crafted not to favor one technique and thus gain unsurprising results. *Other dependent variables* that could be included is mother language, since speech recognition works better for some languages, or age.

The first dependent variable is the time it takes before the task is completed. This has been chosen because it is a commonly used indicator of *usability*, specifically *efficiency* (Benyon 2019, p. 108; Lecture on Principles of Good Interaction, p. 4). The *second dependent variable* is the resulting score from the *System Usability Scale*, which subjects would fill out after completing the tasks (Benyon 2019, pp. 113-115). It has been chosen in order to include *both subjective and objective measures* in the experiment and because it is easy to apply.

References

- [1] Benyon, D. (2019). *Designing User Experience: A guide to HCI, UX and interaction design*, 4th Edition. Pearson.
- [2] Cooper, A., Reimann, R., & Cronin, D., & Noessel, C. (2014). *About face 4: the essentials of interaction design*. John Wiley & Sons.
- [3] Greenberg, S., Carpendale, S., Marquardt, N., & Buxton, B. (2011). *Sketching user experiences: The workbook*. Elsevier.
- [4] Hornbæk, K. (2013). Some whys and hows of experiments in human–computer interaction. *Foundations and Trends in Human–Computer Interaction*, 5(4), 299-373.
- [5] Jacko, J. A. (Ed.). (2012). *Human computer interaction handbook: Fundamentals, evolving technologies, and emerging applications*. CRC press.
- [6] Lazar, Jonathan, Jinjuan Heidi Feng, and Harry Hochheiser. *Research methods in human-computer interaction*. Morgan Kaufmann, 2014.
- [7] McGrath, J. E. (1995). Methodology matters: Doing research in the behavioral and social sciences. In *Readings in Human–Computer Interaction* (pp. 152-169). Morgan Kaufmann.
- [8] Molich, R. (2013). User Testing, Discount User Testing. Unpublished manuscript. Dialog design.
- [9] Norman, D. (2013). *The design of everyday things: Revised and expanded edition*. Basic books.
- [10] Shneiderman, B., Plaisant, C. (2004). *Designing the user interface: strategies for effective human-computer interaction*. Pearson.
- [11] Wharton, C. et al. (1994). The cognitive walkthrough method: A practitioner's guide. In Nielsen, J. & Mack, R. (Ed). *Usability inspection methods*. John Wiley and sons.

Lectures

The pages specified in the references to lectures refer to the page number in the PDF files on Absalon. The references may be to content on the slides or something the lecturer said, which as been recorded in the author's lecture notes.

- [12] Interaktionsdesign Lecture on Principles for Good Interaction. Hornbæk, K. 2/5/19
- [13] Interaktionsdesign Lecture on Input Styles. Bergström, J. 2/27/19
- [14] Interaktionsdesign Lecture on Prototyping. Hornbæk, K. 3/5/19
- [15] Interaktionsdesign Lecture on Evaluation. Hornbæk, K. 3/12/19

Appendix A: 3 cognitive walkthroughs

These cognitive walkthroughs uses the detailed example provided by Wharton et al. pp. 118-123 as a template.

Walkthrough 1 - Restaurant search

Preparatory phase:

Users: The whole user base includes all potential or actual travellers to or in Copenhagen. The assumption is that all user have accessed a website before and have experience using a search engine. For the following walkthrough the user which the evalutaor will have in mind is Bob Newman (45) who is married to Margareth. They are middle-class school teachers living together for themselves in London. For his age, Bob has average experience with interactive systems and uses a computer for work. The scenario from Question 1 is that the Newmans are on on holiday in Copenhagen, it is Tuesday afternoon and Bob finds a restaurant nearby.

Task: Mr. Newman wants to use TripAdvisor to find the rating of Restaurant Grønnegade which is located across the street.

Action sequence:

1. Enter the website and dismiss the welcome dialog if it appears.
2. Click on the search bar in the top left corner.
3. Enter the search term (*Restaurant Grønnegade*) in the search field. The user does not need to press enter.
4. Click on the appropriate item (the first item, Restaurant Grønnegade).

Interface definition:

The interface is accessed through a browser and interaction happens using keyboard, mouse and screen. First time visitors may be faced with a large welcome dialog which has a Get Started button and can be dismissed by clicking on the cross in the top left corner of the dialog. The start page contains a large horizontal menu which includes an item for *Restaurants*. In the top left corner there is a search bar. When clicked, the search bar will open a large white panel with a search bar. Writing in this search bar will start a search where results are delivered dynamically. If the user hits enter a static page with search results for the query.

Step-by-step analysis phase:

1. Enter the website and dismiss the welcome dialog if it appears.

Failure story:

- *Criterion:* Will the user be trying to archieve the right effect?
Since the user is specifically asked to “Get started”, the user will click on get started. There is no indication that “Get started” means to create a user

and so the site does not give the user a good *conceptual model*, because there is no signifier telling the user that in order to complete tasks such as finding a restaurant, they should click on the cross.

- *Criterion*: Will the user know that the correct action will achieve the desired effect?

Even though the user will know that a cross *signifies* closing of a window, how will the user know what will be left when closing the dialog?

2. Click on the search bar in the top left corner.

Failure story:

- *Criterion*: Will the user be trying to achieve the right effect?

The *label-following strategy* will make the user click on the Restaurant item in the large menu in the middle of the screen. This item is much more clearly visible than the search bar.

3. Enter the search term (*Restaurant Grønnegade*) in the search field. The user does not need to press enter.

Success story:

The search bar is clearly visible on the screen and there is a cursor blinking, which will make the user to know that it is an active text field, based on experience. However, the user might not realize that search results are displayed dynamically. If the connection is slow and thereby causing slow feedback or if the user is not proficient in writing on a keyboard while looking at the screen, this part of the action would be a failure.

5. Click on the appropriate item (the first item, Restaurant Grønnegade).

Success story:

The users are assumed to have experience with searching on the web and so will understand what a search result is and that by clicking on the item, further information will be displayed. There might be guidelines however, which could be used to argue that the lack of underlining makes it difficult for the user to know that it is a link.

Walkthrough 2 - Finding a cheap room

Preparatory phase:

Users: The whole user base includes all actual or potential travellers to or in Copenhagen. The assumption is that all user have accessed a website before but not TripAdvisor. For the following walkthrough the user which the evaluator will have in mind is Hans who is 22 and from Hamburg. He is a backpacker on a budget having previously worked on McDonalds. Touring the world, Hans departed from Moscow this morning and arrives at the Copenhagen Airport around noon. Hans' activity is: *Find somewhere to sleep tonight*.

Task: Use TripAdvisor to find the 3 cheapest rooms available tonight for one adult.

Action sequence:

1. Select the Hotel item in the horizontal menu in the middle of the page.
2. Select a check-in date.
3. Select check-out date.
4. Select 1 adult only
5. Sort by lowest price by selecting this option from the drop-down menu to the right.

Interface definition:

The start page has a large horizontal menu with the leftmost item being “Hotels”. When clicked, the user is taken to a new page called “Copenhagen Hotels and Places to Stay”. A calendar automatically opens below a box with the label “Check-in”. The calendar has two visible months and other months are selected by clicking continually on an arrow next to the name of the months. When a check-in date is selected, a new calendar appears instead for check-out. The user can click outside the calendar panels to close the calendars. If a check-out date is selected, a last panel will appear, where the user can select the number of adults, children and rooms by clicking buttons which increase and decrease the numbers of these. The resulting hotels are presented in a list which the user can scroll through. At the top of the list to the right, the user can select criteria for sorting from a drop-down menu.

Step-by-step analysis phase:

1. Select the Hotel item in the horizontal menu in the middle of the page.

Success story:

The horizontal menu is large and placed in the middle of the screen. By the assumption that users apply the label-following strategy, they will also click on this item, even if they want to find hostels instead of hotels. When hovering mouse over the item, the color changes slightly, signifying the affordance of clicking.

2. Select a check-in date.

Failure story:

- *Criterion:* Will the user try to achieve the right effect?

The user may expect the default date to be the current date and so there will be a mismatch between the right effect and the expectations of the user resulting from a limited *conceptual model*. While it may be inaccurate to file this problem under this criterion, it is arguably the best fit.

- *Criterion:* Will the user associate the correct action with the effect trying to be achieved?

The term check-in date is quite common but a small group of users who have never booked at hotel before, could be unaware of the meaning.

3. Select check-out date.

Failure story:

- *Criterion:* Will the user try to achieve the right effect?

The default check-out date will be the next day. If the user wants to check-out the next day they will have to click on it again, which could feel unnatural. As a consequence the user might try to close the calendar, but there is no cross to close it. To close it, the user will have to click outside the calendar, but there is no signifier indicating that possibility.

4. Select 1 adult only.

Success story:

The panel has clear labels for Rooms, Adults and Children and the “+” and “-” are clear signifiers of the possibility of increasing and decreasing the number of guests. The field specifying the numbers look like text fields, and if the user would like to increase the numbers significantly and attempt to write another number, the user would face a problem.

5. Sort by lowest price by selecting this option from the drop-down menu to the right.

Success story:

By the assumption that users have used search engines previously, the concept of sorting the results by some criterion would be meaningful from experience. The sort-by field is located close to the elements which the user has just interacted with. However, some strata of users might expect results to be sorted by price by default. In such a case the failure would fall under the criterion *Will users try to achieve the right effect?*

Walkthrough 3 - Finding a flight to Copenhagen

Preparatory phase:

User: The whole user base includes all potential travellers to or in Copenhagen. The assumption is that all user have accessed a website before and have experience using a search engine. For the following walkthrough the user which the evaluator has in mind will be Tasuku Honjo, 77, from Kyoto. Honjo is a researcher in immunology and has been invited to give a lecture at University of Copenhagen. Honjo’s activity is to plan the trip to Copenhagen. Honjo has many contacts in Europe and might not want to do a simple round-trip.

Task: Use TripAdvisor to find flights from Kyoto to Copenhagen departing June 13.

Step-by-step analysis phase:

1. Click the Flights item in the horizontal menu.
2. Click on the label “one-way”.
3. Click on the textbox with the label “From:” and write the city of departure (Kyoto).
4. Click the the box with the label “Depart”. Select June 13 from the calendar by clicking on the rightpointing arrow next to the month name a sufficient number of times and selecting the date.
5. Click on the box with the label “1 Person, Economy”, increase the number of seniors by clicking on “+” and then decrease the number of adults by clicking on “-”.
6. Click the yellow button with the label “Find flight”.

Interface definition:

The interface is accessed through a browser and interaction happens using keyboard, mouse and screen. The start page has a large horizontal menu with the middle item being “Flights”. When clicked, the user is taken to a new page with the headline “Find the best flight to Copenhagen”. By default, the type of flight is “round-trip” and other options are possible by clicking the appropriate label. 5 white boxes on the page can be used to select the details of the flights, such as dates, departure, destination, the number of passengers and the class. A large yellow button with the label “Find flights” starts the search.

Action sequence:

1. Click the Flights item in the horizontal menu.

Success story:

Since the Flight item is located in the middle of the screen it is accessible and visible in accordance with the intentions of the user. By assuming the label-following strategy, the user will click on it.

2. Click on the label “one-way”.

Failure story:

- *Criterion:* Will the user associate the correct action with the effect trying to be achieved?

The labels for “round-trip”, “one-way” and “multi-city” are not clearly interactive. All the other options are made by clicking on the white boxes which are all on one line. Therefore the user might overlook this and go straight to the next step.

3. Click on the textbox with the label “From:” and write the city of departure (Kyoto).

Success story:

By the assumption that user’s have used the web before, white boxes will be perceived as affording writing. The user has the specific task of finding a flight from Kyoto and the interface provides a means for doing that.

4. Click the the box with the label “Depart”. Select June 13 from the calendar by clicking on the rightarrow next to the month name a sufficient number of times and selecting the date.

Success story:

The user has a specific date in mind and the calendar view is similar to many physical calendars. The problems with data-entry has already been noted. Having to click the right arrow many times can be frustrating but will not cause failure.

5. Click on the box with the label “1 Person, Economy”, increase the number of seniors by clicking on “+” and decrease the number of adults by clicking on “-”.

Failure story:

- *Criterion:* Will the user try to achieve the right effect?

Since the label says “1 Person, Economy”, the user might assume that everything is okay and click *Find flights*. Since Mr. Honjo is 77 years old, he is regarded as a senior, however.

- *Criterion:* Will the user associate the correct action with the effect trying to be achieved?

The user will understand that clicking “+” is necessary, but for many users

it would be natural to decrease the number of adults first since it appears first in the list. This is not possible however and could lead the user to think that a senior is not allowed to fly alone. If the action is understood as a whole “first increase the number of seniors then decrease the number of adults” then it is a failure by this criterion.

6. Click the yellow button with the label “Find flight”.

Success story:

The user has filled out all the relevant information and all the major boxes have been used. Therefore the user applies the label-following strategy, and the yellow button is large and a label which corresponds to the user’s intentions.

Appendix B: List of usability problems

NOTE:

- The *Re:* in the titles are simply abbreviations of *regarding*.
- It could be argued that the usability problems are too detailed, but the argument for this level of detail is that the list will not be used in practice, and that the arguments are important to show the reasoning made by the evaluator.

Problem 1 - Re: Welcoming dialog

Explanation: First time users of the website may meet a welcoming dialog when entering this site. On the basis of a given task, it is not easy for the user to know whether to click *Get started* or close it by clicking the cross. This is a problem.

Frequency: Frequent. Even though it occurs only the first time

Impact: Low impact. The problem is not a bug. The dialog leads to a sign up panel, which can be entered by other means. Likewise, the panel can be closed at any time.

Persistence: Not persistent. The dialog will only appear the first time.

Severity rating: 2. Minor usability problem. The problem is not cosmetic since it relates to user tasks, but it merely limits *effectiveness* (Benyon 2019, p. 108).

Problem 2 - Re: Button with label “Find a restaurant”

Explanation: Users might expect the button “Find a restaurant” to allow the user to search for a specific restaurant. Instead it updates the search criteria based on selection of date time and number of people which are placed next to it.

Frequency: Difficult to assess, probably low.

Impact: Middle impact. The user will get feedback saying “Updating” and will update their conceptual model based on this. Presumably the search bar in the top left corner will be identified.

Persistence: Not persistent. If the user understand the meaning of the button, it is unlikely they will continue to use the button the wrong way.

Severity rating: 2. Minor usability problem. It is not cosmetic, but because of the low persistence and the availability of the search bar, users can still complete their tasks.

Problem 3 - Re: Hostel check-in data entry

Explanation: Dates for check-in and check-out does not facilitate data entry using keyboard, the user has to use the calendar view.

Frequency: Low. Few users will get the impression that the check-in field is a text box.

Impact: Low. The calendar is immediately visible to use instead.

Persistence: Low. The only case in which the error will persist is if the user has a very strong habit of inputting dates by the use of keyboard.

Severity rating: 1. Cosmetic. The problem is not strictly cosmetic, in the sense that it is a usability problem, but since its frequency, impact and persistence is low, it should not be prioritised highly.

Problem 4 - Re: Calendar exit cross

Explanation: The calendar which is used when selecting a check-out date does not have a cross. The menu can still be closed by clicking outside calendar.

This is a problem because there is an affordance which is not being signified.

Frequency: Medium. Users who are looking for hotels for one night might not think of clicking on the night they are checking out, since it is already red and so they will look to close the calendar.

Impact: Low. It is a common feature of desktop environments that clicking outside a box, panel or window will hide the window, and so the user will find a solution.

Persistence: Low. If the user finds a way to exit, they will probably remember it next time.

Severity: 2. Minor usability problem. Many users could be looking for hotels for just one night.

Problem 5 - Design of calendars and buttons are inconsistent

Explanation: The design of calendars are inconsistent in the sense that on some calendars, fx the Restaurant calendar, the change of months happens by clicking a circle with an arrow, while on the Hotel calendar, the user clicks an arrow without a circle. These calendars are also of different sizes. Likewise with buttons for increase and decrease of values on hotels, flights and attraction pages.

Frequency: High. The use of calendars is a major part of the interaction.

Impact: Low. All calendars and buttons are consistent in functionality.

Persistence: High only in the sense that users will continue to use the calendars and buttons.

Severity rating: 1. Minor usability error.

Problem 6 - Re: Selecting one-way, round-trip or multi-city

Explanation: When selecting flights, the option of selecting the category of flights (one-way, round-trip etc.) is not clear, because it is not styled as an input.

Frequency: Medium.

Impact: Medium. The user will presumably discover that the current mode is a round-trip when seeing the option for selecting a return date.

Persistence: Low.

Severity rating: 2. Minor usability problem.

Problem 7 - Re: Search bar is a button, not a textfield

Explanation: When the user clicks the search bar, they will most likely expect to be able to write in the field. Instead it opens a panel with a larger search field.

Frequency: High. Many users will use the search bar to find content and the expectation is natural because of experience with search bars on other websites.

Impact: Low. The searching can still be done.

Persistence: Medium. User's will always see the textbox and may continue to have the expectation.

Severity rating: 2. Minor usability error.

Problem 8 - Re: Default check-in date

Explanation: The default check-in date is not the current date, which reduces efficiency for users who quickly want to find available rooms the current night. They have to move through the process of selecting check-in and check-out dates.

Frequency: High. On average the current night or the next would presumably be the most common nights that users would want to book.

Impact: Medium. If users expect that the results are for a specific date then they might make large decisions based on that.

Persistence: Low. Most users would probably recognise this, but it is not given.

Severity rating: 2. Minor usability error

Problem 9 - Re: Decreasing number of adults for flight

Explanation: The default number of passengers is one adult. The button for decreasing the number of adults is deactivated until an action has been made. This can cause confusion in cases such as flights for only one senior.

Frequency: Medium. Most searches would include at least one adult, but many seniors travel alone.

Impact: High. The problem could cause users to believe that the search engine is unable to find flights for just seniors and thus stop using it, causing low utility.

Persistence: Unknown.

Severity rating: 2. Minor usability error.

Problem 10 - Re: Default label for passengers for flight

Explanation: The default label for passengers is "1 Person, Economy". Seniors could believe that everything is ok, but this 1 person is an adult, not a senior.

Frequency: Medium. Most searches would include at least one adult, but many seniors travel alone.

Impact: High. The problem could cause users to believe that the search engine is unable to find flights for just seniors and thus stop using it, causing low utility. They could also end up finding a wrong flight.

Persistence: Medium. Presumably a user could use the functionality many times without realising it.

Severity rating: 3. Major usability error. The main reason is the high impact which could involve money.

Problem 11 - Re: Feedback for valid email address on signup

Explanation: When the user enters an email address and password, they do not receive immediate feedback if the email is valid, only if it is invalid.

Frequency: High. This happens everytime a user signs up by email.

Impact: Low. The user will get feedback after clicking the join button.

Persistence: Low. The user will only need to sign up once.

Severity rating: 2. Minor usability problem. The frequency is high and immediate feedback is a core usability principle.

Problem 12 - Re: Email addresses with domains starting with "tut"

Explanation: For email addresses hosted on a domain starting with “tut” followed by 3 characters or less, the user will get the message “Did you mean tut.by instead of <domain>? Please verify.” Since it is presented with a red message, it is not clear to the user whether an error occurred or if the user is merely asked to assure themselves that the email address is correct.

Frequency: Low. The fraction of email addresses hosted on such domains is low.

Impact: Medium. The user might stop the sign-up process because the user thinks an error occurred.

Persistence: Low. The user will only sign up once.

Severity rating: 2. Minor usability problem. If the user stops signing up, they might not complete their task.

Problem 13 - Re: Many steps in signing up

Explanation: When signing up, the user is asked to choose user names, get local suggestions, follow travellers and friends on Facebook. For some users these actions may be add odds with non-social reasons for creating an account, such as bookmarking a page.

Frequency: High. Presumably, there are many users which make account without the intent of using these functionalities.

Impact: Medium. Unnecessary steps in the sign-up process is contrary to the usability principle of efficiency.

Persistence: Low. Users will only sign up once.

Severity rating: 2. Minor usability problem.

Problem 14 - Re: “Top attractions” on “Things To do” page

Explanation: The user will have to scroll down far on the “Things to do” to see the top attractions in Copenhagen, even though this is presumably the most important content of the page. Because of the other content the user might not even realise that the list of top attractions is there.

Frequency: Medium. There are 5 rows of other content before the list appears which could cause many users not to discover the list.

Impact: Medium. This list is presumably a major feature of the site.

Persistence: Medium. If the user discovers the list, the error would not repeat itself, but if the user does not discover it, the problem will persist.

Severity rating: 3. Major usability error.

Problem 15 - Re: Opening pages in new tabs

Explanation: A lot of content on the site such as attractions or restaurants open in new tabs. When going back, some users will change tabs without closing and might end up with a lot of tabs which will cause slow performance on the computer.

Frequency: Medium. The phenomenon appears on most of the main pages, so most user will experience it.

Impact: Low. Many users will not consider it a problem, but a feature. Tabs can be closed to regain computer performance.

Persistence: High only in the sense that users cannot disable it.

Severity rating: 1. Minor usability error. Even though frequency is medium and persistence is high, there are valid reasons for choosing this design.

Appendix C: 10+10 idea generation

Design challenge:

Make a redesign of the website based on the problems identified in the answer to Question 2.

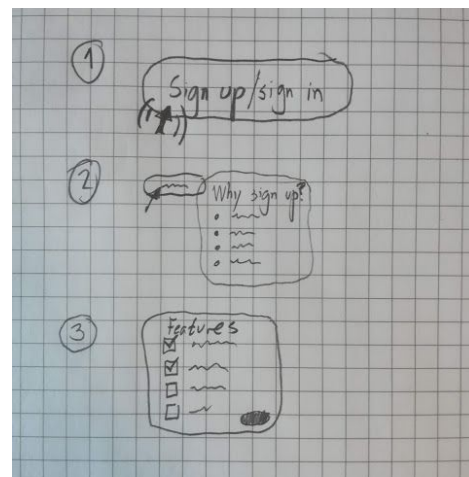
10 design concepts of a system that addresses this challenge

(OBS: The distinction between *motivation* and *concept* is not described by Greenberg et. al. but seemed reasonable in order to highlight how the ideas are based on usability inspection.)

1. Simple and comfortable sign-up process

Motivation: Currently, users might unvoluntarily enter a sign-up process by for example clicking the get started button. The sign-up process involves a lot of steps and does take into account the different reasons why users sign up.

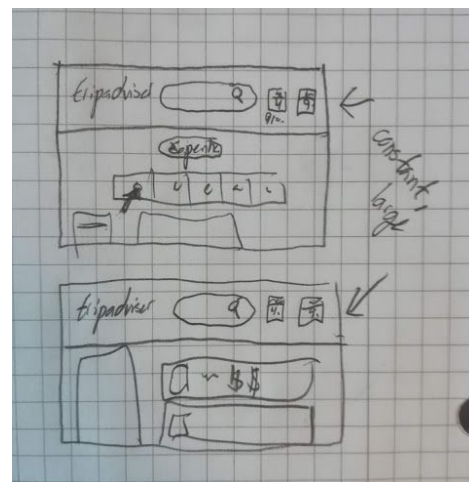
Concept: In this concept the sign-up process would be made transparent to users, for example by displaying information when user hovers over the sign-up button or by allowing the user to opt in for specific features instead of having to go through different steps.



2. Global header with search bar and global dates

Motivation: Currently, many pages on the site uses calendar entries and while some of them are synchronised that may not be clear to the user. Pages like "Things to do" have buttons with the label "Search" which a user might expect to open a search window.

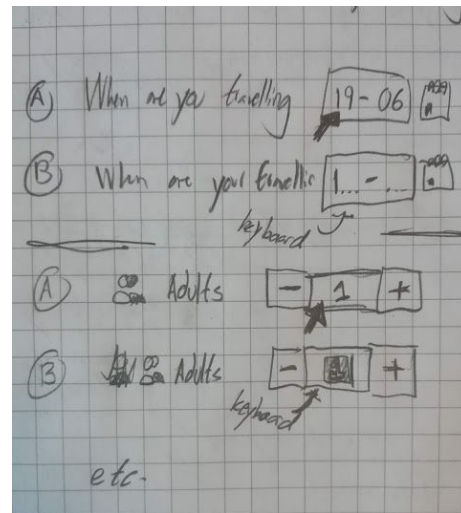
Concept: The concept is inspired by websites like Facebook which feel like *applications* rather than simply websites because there is not a clear distinction between pages. This concept has a header which is global for the different pages. The header has a larger search bar and calendar entries which are clearly shared between sites.



3. Data entry by keyboard

Motivation: Currently, many elements on the website involved with user input look like they are textboxes where the user can use the keyboard as input style. Examples are selection of number of adults when finding hotels and date entries.

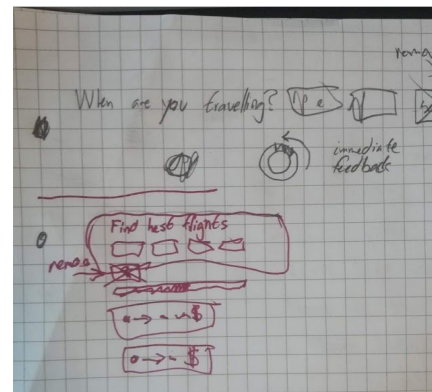
Concept: This concept makes as many input tasks as possible available by keyboard and makes date entry by calendar available by clicking an icon.



4. Immediate feedback and automatic search results

Motivation: Currently, the pages for “Restaurants” and “Things to do” have buttons which may be misunderstood to open a search window. Currently, immediate feedback for email-addresses on signup is not present.

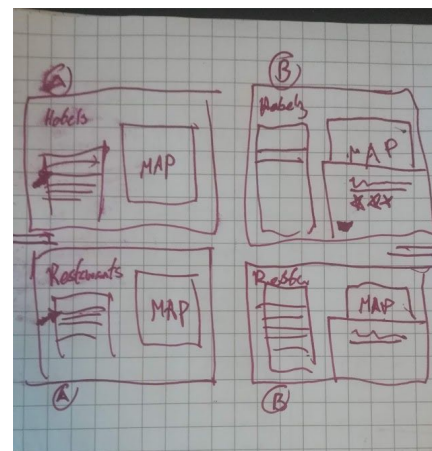
Concept: Add immediate feedback to every type of input by and display search results dynamically everywhere.



5. Focus on location and maps

Motivation: A large group of users are probably in Copenhagen and may want to find restaurants and attractions nearby. Currently, the possibility of using the map is not clearly visible to the user and the map functionality does not allow for search simultaneously.

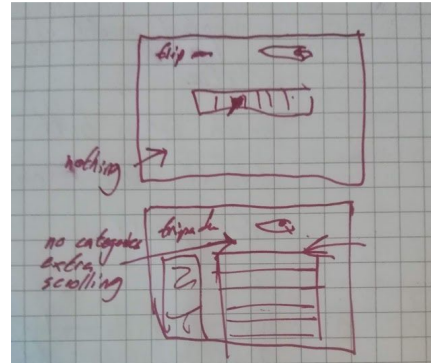
Concept: Make maps take up more space on relevant pages and improve integration with search results.



6. Simple pages with minimal elements

Motivation: Pages like “Things to do” contain many categories at the top of the page and the user will have to scroll to see top results. This is inefficient and may cause frustration.

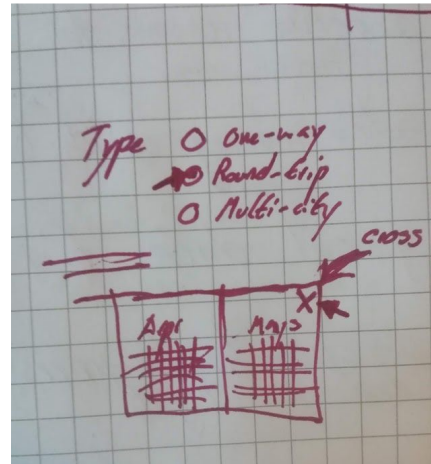
Concept: Make pages simple by removing content and only display it when user might want to see it, fx when logged in.



7. Consistent, quality and guideline-following design for inputs

Motivation: There calendars with different designs, when finding a flight, users might overlook the possibility of selecting “one-way”. Values which can be increased or decreased will be inconsistent in using circles or squares.

Concept: Redesign the site by designing a set of input methods such as radio buttons, a single design for calendars, increase-decrease buttons and other inputs.



8. Focus on navigation and hierarchy of pages

Motivation: Using the website may result in many different open tabs which can slow the computer and hinder navigation.

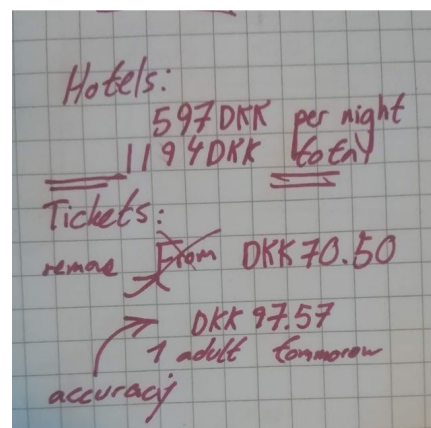
Concept: Make the already existing indication of location in the hierarchy larger and find other ways to improve the navigational character of the interaction.



9. Displaying prices in careful and trustable manner

Motivation: The site contains a many of price tags on different pages and buttons saying “Book now”, which may not be relevant to the user yet.

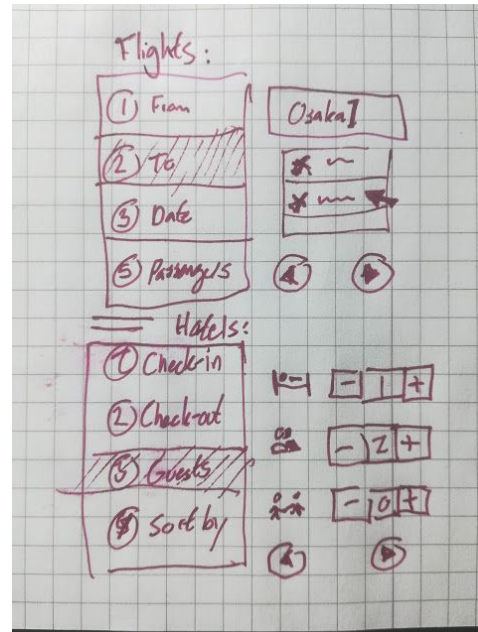
Concept: Make prices reliable by displaying them for the current date, add hotel prices both per night and total and display prices when relevant to user tasks.



10. Guided input processes

Motivation: Usability problems have been found for tasks of finding hotels or flights where a lot of information is required from the user.

Concept: Make guided processes, where only a limited number of input tasks are visible at the same time. This addresses the limited attention of users and reduces errors caused by overlooking input elements which need to be filled out.



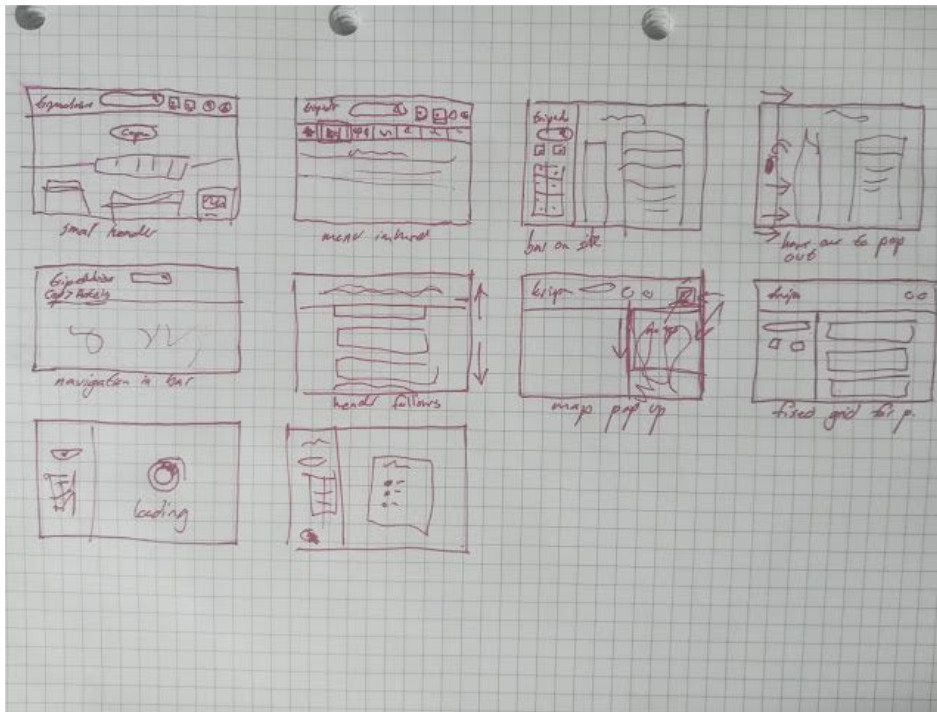
Reducing the number of design concepts and choose the most promising design concept as starting point

While the ideas above are diverse, they are not fully competing and some relate to only small parts of the site. Thus some of the ideas may be combined, such as idea 10 and idea 3 or idea 2 and 8. Some ideas are limited in scope. Idea 2, a global header, has been chosen as the most promising concept.

Produce 10 details and/or variations of a particular design concept

1. Add a small header in the top which follows the user.
2. Include the menu from the start page in the header.
3. Put a bar on the side to increase vertical space needed for search results.
4. Hover over area to make bar or header appear.
5. Include navigation in bar, ala idea 8.
6. Make header follow user when scrolling
7. Include a map icon in the header which pops down when clicking or hovering.
8. Extend the global header to include a fixed grid which makes pages consistent
9. Display information about sign-up when hovering over button
10. Combine constancy in sidebar with dynamic on-the-fly loading of search results

Small details for the design concept can be seen below:



Some of the above ideas were used to make the redesign. Aspects of the original 10 ideas and other considerations about usability were also included, even though this is not precisely how Greenberg describes the method. It has been concluded that this was unproblematic, since the 10+10 protocol has been fully used and that the main reason for using it is to generate a plurality of ideas, which has been done.

Appendix D: Dialogues for tasks

Task 1 - Mr. Newman

System: "What is your task? I can find hotels, restaurants, attractions and more."

User: "What is the rating of Restaurant Grønnegade."

System: "I am looking up Restaurant Grønnegade. Please wait"

System: "Do you mean Restaurant Grønnegade on the adress Groennegade 39 in Copenhagen?"

User: "Yes"

System: "This restaurant has a rating of four point five out of five. It has over 400 reviews. One reviewer notes that it has a quote great international atmosphere in a romantic old building. Feel free to ask me to book a table"

Task 3 - Mr. Honjo

System: "What is your task? I can find hotels, restaurants, attractions and more."

User: "I need to find a flight."

System: "I can do that. Where are you going?"

User: "To Copenhagen from Kyoto"

System: "Okay, from Kyoto to Copenhagen. Just one-way or round-trip?"

User: "One-way"

System: "Okay one-way. I assume it is just you going then."

User: "Yes"

System: "Okay, just you. Are you below than 65?"

User: "No, I am 77"

System: "Okay you are older than 65, now I will search for a flight for you."