Card Sorting Tools

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706.041 Information Architecture and Web Usability WS 2020/21
Graz University of Technology

09 Dec 2020

Abstract

This survey serves the purpose of granting an overview of and comparing the major online tools that help in the process of creating and analyzing card sorting studies. Both tools that help in creating an online card sorting study, as well as tools that only focus on analyzing the results of card sorting studies were looked at in close detail. All in all a total of 8 tools were reviewed and assessed by a number of different metrics such as ease of use and the number of features provided. Finally, recommendations can be found in the last chapter of this survey.

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Chapter 1

Introduction

This chapter explains the differences between open, closed and hybrid card sorting and the different challenges that come with each method. Furthermore, this chapter will also include an overview of all the reviewed tools as well as a detailed description of our review process and which features we focused on.

1.1 Card Sorting

Card sorting is a type of usability test in which participants are asked to sort cards into different categories. Usually a distinction is made between open, closed, and hybrid card sorting. Open card sorting does not provide any predefined categories, and instead users create their own categories. Closed card sorting gives the participants a predefined list of categories into which the cards have to be sorted. Hybrid card sorting is a mix of the two previous models, where some categories are predefined, but users can create more. This survey focuses on the capabilities of tools to work with open card sorting studies.

Open card sorting comes with some additional challenges, since the number of categories created by participants is not limited, and in some instances sub-categories may be permitted. Furthermore, many of the categories defined by users will be extremely similar or the same, but may use different words to describe the same thing. These categories then have to be merged in an additional step before drawing any meaningful conclusions.

In case the reader is interested in learning more about card sorting, the book Card Sorting: Designing Usable Categories by Donna Spencer [2009] is strongly recommended. Alternatively, Card sorting: a definitive guide by Donna nad Todd Warfel [2004] provides a shorter overview of how card sorting works and its benefits.

1.2 Tools

This chapter lists the tools in the card sorting field that were reviewed in the process of this survey. These tools can be further grouped by their functionalities. One tool, kardSort, is only intended for the card sorting and offers no analytics at all. Some other tools are only able to analyze previous card sort experiments, but offer no sorting capabilities. Finally the remaining tools offer both sorting and analytic capabilities. An overview can be seen in Table 1.1.

More tools were previewed before coming to a decision as to which tools will be in the final survey. There were tools we were not able to review as they are no longer available or have been acquired by competitors. One tool, UserZoom [2020], offers no free version and did not answer to our inquiry for a review version. We listed all tools that we looked at but did not review below:

- [Ljajic 2016] (not buildable)

Card Sorting	Analytics	Both
kardSort	SynCaps v3	UXtweak
	Casolysis	ProvenByUsers
	CSA	xSort
		OptimalSort

Table 1.1: Summary of the tools reviewed.

- [UserZoom 2020] (did not respond to inquiry)

- UsabilityTools UXSuite (acquired by competitor)

- [SCS 2019] (discontinued)

- [usabiliTEST 2020] (acquired by competitor)

- ConceptCodify (acquired by competitor)

1.3 Review Process

The reviewing of tools was done in parallel by three different reviewers. In order to ensure streamlined reviews and produce comparable results a review process was defined. Each reviewer had to perform the same tasks and check for certain pre-defined features. These features are listed below:

- Participant limit

- Card limit

- Business model

- Availability of documentation

- Support for sub-categories

- Possibility for questionnaires

- Import data capabilities

- Export data capabilities

- User session playbacks

- Data preparation capabilities

- Types of analytical visualizations

Once a review had taken place. It was discussed in a meeting with the other reviewers and ratings were assigned in accordance with all members.

Each tool was tested with 2 datasets made up of two sets of cards. One dataset is made up of 10 animals and the second is a list of 55 car manufacturers. The cards were then used in open card sorting experiments by the reviewers. The datasets can be viewed in Table 1.2 and 1.3.

Dog	Elephant	Whale	Lion	Mouse
Cow	Bear	Butterfly	Snake	Badger

Table 1.2: The cards in the animal dataset.

Volkswagen	BYD	Ford	Infiniti	Rimac
Kia	Skoda	Cadillac	Mitsubishi	Jeep
Honda	Bugatti	Jaguar	Dodge	Lincoln
Toyota	Citroen	Aston Martin	GMC	Smart
Porsche	Hyundai	Chrystler	Lexus	Tesla
Seat	Nissan	Subaru	Range Rover	Lancia
Mazda	Saab	Lamborghini	Rolls-Royce	Dacia
BMW	Renault	Koenigsegg	Volvo	Lotus
Audi	Peugeot	Alfa Romeo	Suzuki	Mini
KTM	Ferrari	Fiat	Bentley	Lada
Mercedes-Benz	Chevrolet	Maserati	McLaren	

Table 1.3: The cards in the car manufacturer dataset.

Chapter 2

OptimalSort

OptimalSort is an online card sorting tool which is provided by the Optimal Workshop company. There are also tools for Tree Testing, First-click Testing, Online Surveys and Qualitative Research provided by them. OptimalSort is really intuitive to use for both the participants and the creator of the study. The nice structured overview of the studies can be seen in Figure 2.1. Unfortunately, there is a paywall for using all features of the tool, but also with the free plan the basic features of card sorting and analysis are available and it can easily keep up with all the other reviewed tools [OW 2020].

2.1 Business Model

As OptimalSort is provided by the Optimal Workshop company it is obvious that not all features of the tool are offered for free. For getting access to all features of all the tools of Optimal Workshop you have to upgrade your plan which is then $166 per month. There is no opportunity to pay possibly less to use card sorting only.

In the free version the number of cards is limited to thirty and the number of participants to ten. Furthermore you are not allowed to define a closing rule, use password protection, reflect your brand in the study and add screening questions at the start of the study. Also for using the free version registration is required. There it is also offered to sign in with an existing Google account. All created studies and participations are saved to your account on their server. This also means that it doesn't matter which device you use.

2.2 Card Sorting

Setting up a card sorting with OptimalSort is quite comfortable. At the beginning you land on the dashboard, which is very well designed. On this page you can also do tutorials, watch demos and use the resource center, where you can access help, reading through the new features and also give feedback.

The study creation process is very straight forward. They offer an import function for cards and categories (closed card sorting) with a spreadsheet, pre-defined editable welcome and thank you messages, a preview mode and automatic saving. Moreover you can edit the link of the study yourself.

In the paid version you can additionally create a questionnaire, define a closing rule, use password protection and also show your logo in the study.

Once, the study has been launched it is possible to share the study with other people via a link. Also when clicking on such a link and participating in a card sorting all the steps are very intuitive. At first the welcome screen with a short welcome message is shown. After clicking continue the instructions with 4 steps help you to get used to the sorting.

After selecting the first item from the list and dragging it to the grouping area a new category is created

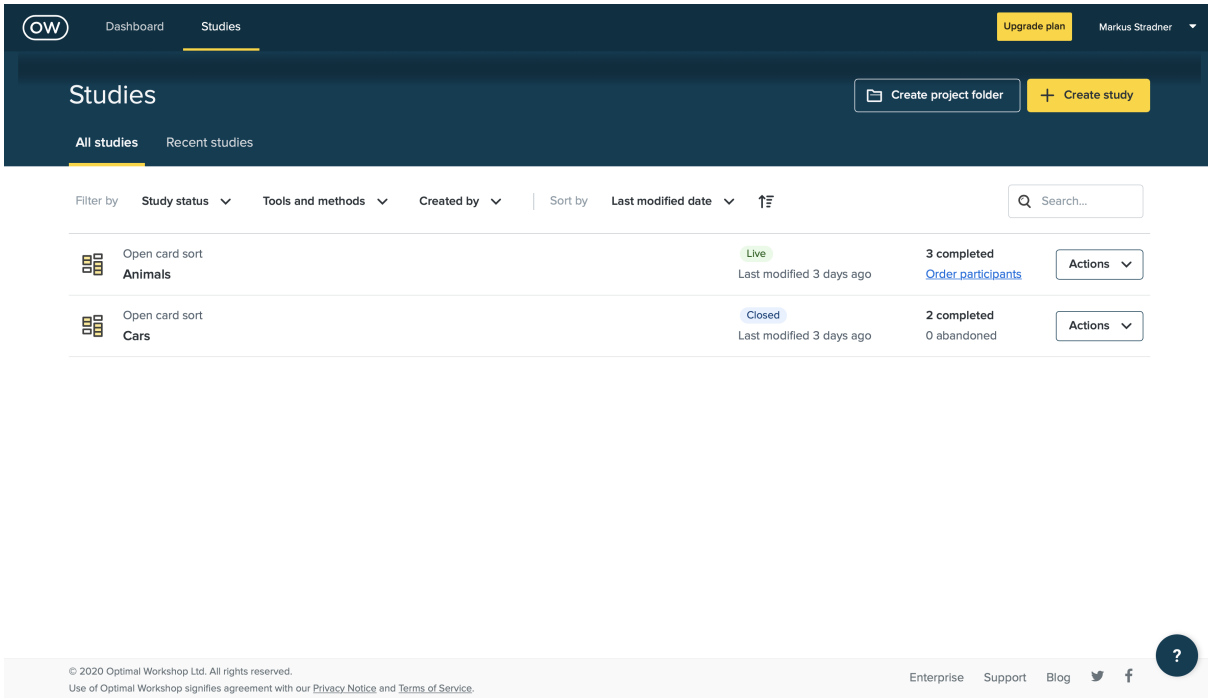**Figure 2.1:** The view of all studies in OptimalSort. It shows you an overview of all your studies and in the dropdown button "Actions" further actions can be performed. [Screenshot captured by Markus Stradner using OptimalSort [OW 2020] on Safari 14.0.1, 28.11.2020.]
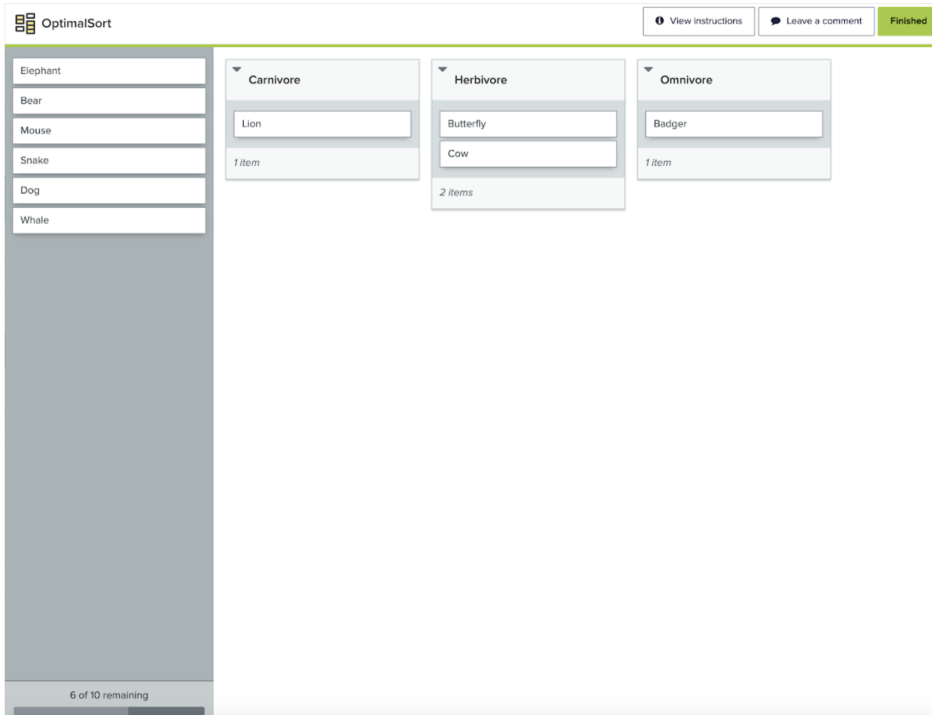

Figure 2.2: The online card sorting process in OptimalSort. [Screenshot captured by Markus Stradner using OptimalSort [OW 2020] on Safari 14.0.1, 28.11.2020.]

Figure 2.3: A dendrogram used for analytics. [Screenshot captured by Markus Stradner using OptimalSort [OW 2020] on Safari 14.0.1, 28.11.2020.]

at the open card sorting as you can see in Figure 2.2. At the closed card sorting the categories are fixed permanently.

In the bottom of each group a helpful counter of the items of the group is displayed. Also for the remaining cards a counter is shown in the bottom left corner. In the top right corner there are three options available during the study: view the instructions again, leave a comment and finish the study.

After assigning all cards and finishing the the study the thank you message pop up and you are done.

2.3 Analytics

OptimalSort offers a large variety of analysis tools. Beside an overview of the card and categories section it also offers a standardization grid, a participant-centric matrix, a 3D cluster view, a dendrogram, which is shown in Figure 2.3 and a similarity matrix, which you can see in Figure 2.4. You can also share the results of the study with other people by creating a link of the desired analysis method.

If you would like to save the data also in your local storage, OptimalSort offers an export for the following data:

- Raw data (.xlsx)

- Participants data (.xlsx)

- SynCaps data (.txt)

- Standardized data (.xlsx)

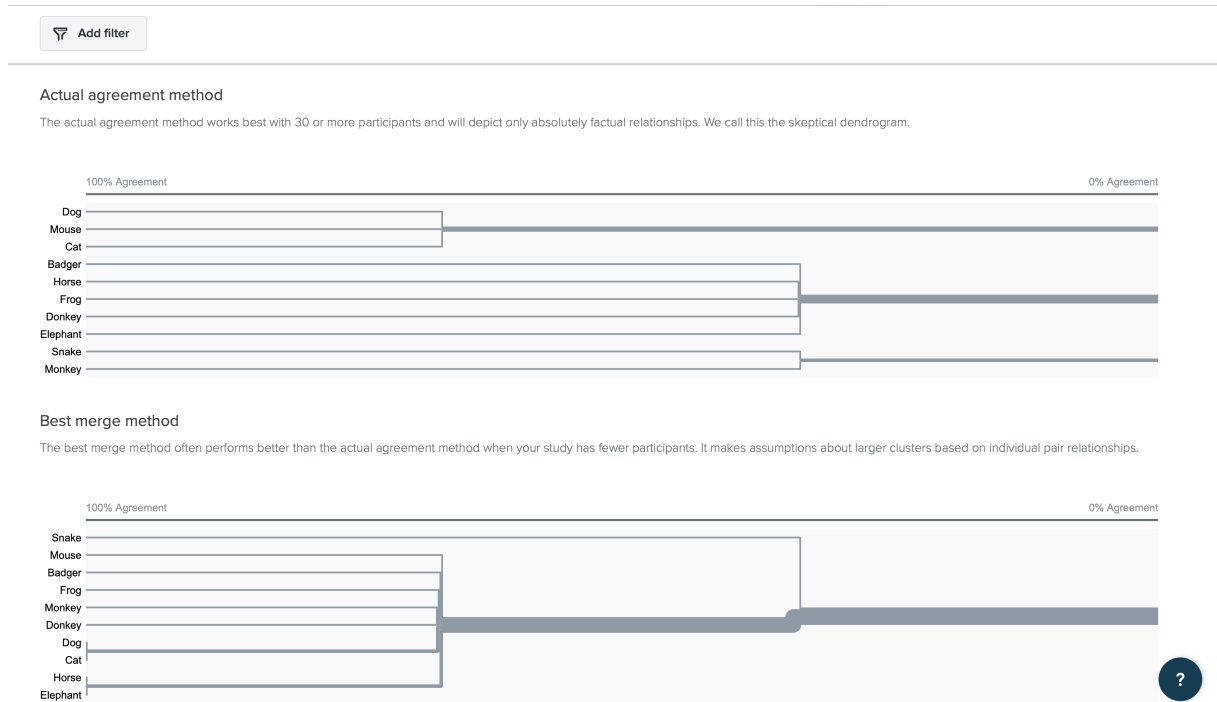- Similarity matrix (.csv)
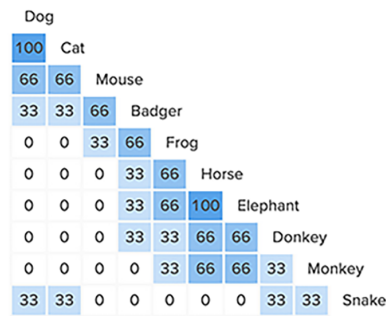
- Standardization grid (.csv)

Figure 2.4: A similartiy matrix used for analytics. [Screenshot captured by Markus Stradner using OptimalSort
[OW 2020] on Safari 14.0.1, 28.11.2020.]

Feature/Characteristic	Availability in OptimalSort
Card Sorting	Open, closed and hybrid.
Card Limit	Free version: 50, paid version: unlimited
Participant Limit	Free version: 10, paid version: unlimited
Analytics	Overview of cards/categories, standardization grid, similarity matrix, dendrogram, participant-centric matrix, 3D cluster view.
Documentation	Demos, tutorials, webinars, instructions during card sorting.
Business Model	Free version (imited cards, participants and features) and paid version ($166 per month) with all features.
Import formats	provided spreadsheet for cards and categories, pre-defined editable welcome and thank you messages.
Export formats	.xlsx, .txt, .csv
Sub-Categories	No.
Playback of user-sessions	No.
Data preparation	Only by hand through export files.

Table 2.1: The features and characteristics of OptimalSort.

2.4 Summary & Ratings

To sum up OptimalSort you have to mention the nice dashboard with studies, demos, instructions, 10-step-tutorial and the resource center. Importing and exporting data is also very simple and convenient. All the analysis tools are really cool and helpful and are shown in nice charts, tables and diagrams. Setting up the study and also participation is very intuitiv and easy to handle. The disadvantages were only that you need an account and that there is a paywall to get all features. A detailed summary of features can be viewed in Table 2.1.

The ratings for the tools can be found in a short overview in Table 2.2 and range from 0 to 5.

Simplicity	Documentation	Features	Business Model	Average
4	5	5	3	4.25

Table 2.2: Ratings for OptimalSort including the average rating.

Chapter 3

xSort

xSort is an offline card sorting tool which only provides a local version for macOS. In contrast to other modern tools it is not up to modern standards. Both the design and the handling are no longer up to date, as you can see in Figure 3.1. Because of being free of charge it is still an alternative for local card sorting on macOS. Furthermore also the few existing analysis tools can be used completely free of charge [EP 2020].

3.1 Business Model

The tool is fully free of charge, so no features are hidden behind a paywall. It was created by the Enough Pepper company and is currently not maintained. As it is a local program you don't need to create an account.

3.2 Card Sorting

The setup process of a card sorting is quite simple and works well. As you can see in Figure 3.2, all the settings can be made on one site. You can also type in welcome and thank you messages. The cards and categories (for closed card sorting) can be imported via .csv file. Also names for different user profiles can be set.

In the exercise mode which is the mode to run through the study you have to select your profile, your gender and have to type in your age. After that you can change between the table view and an outline view during the whole sorting. In the table view you have to pick up the cards in the bottom right corner and assign it to the desired group. If you would like to use the outline view you have to drag the card items on the left side to the desired group item on the right side.

At an open card sorting you have to create the categories yourself, which is also not so convenient. Because there is no auto-alignment of the groups and the cards, the clean up tool exists to align all the elements on a grid via the gearwheel button where you can also restart the card sorting.

xSort also offers a zooming tool to zoom in and out of the grouping area. But this is not very practical, because you have troubles with scrolling and seeing all the elements if you zoom in.

One feature no other tool has is that it is possible to group in sub-categories. This is allowed in both the table view and the outline view. Sometimes errors occur during sorting. Then no more cards can be moved. This occurs especially in the outline view, which is shown in Figure 3.3.
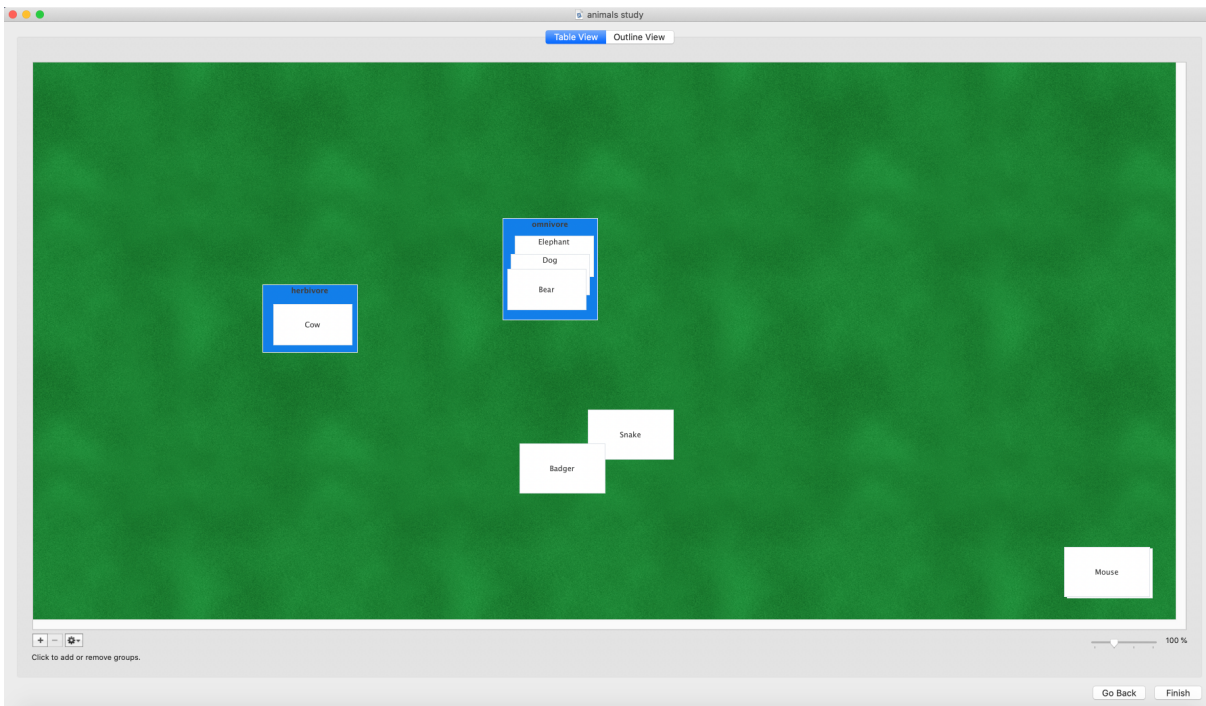
Figure 3.1: A sort in progress in the table view of xSort. [Screenshot captured by Markus Stradner using xSort [EP 2020] on macOS Catalina 10.15.7, 28.11.2020.]

Figure 3.2: The setup view of xSort. [Screenshot captured by Markus Stradner using xSort [EP 2020] on macOS Catalina 10.15.7, 28.11.2020.]

Figure 3.3: The outline view of xSort. [Screenshot captured by Markus Stradner using xSort [EP 2020] on macOS Catalina 10.15.7, 28.11.2020.]

3.3 Analytics

The tool also includes a few analysis tools. But the extent of these is not comparable to that of OptimalSort for example. It just offers a cluster tree, general statistics like unclassified cards, number and average duration of the participations and a distance table.

With xSort, however, the age, gender and profile can also be taken into account in the evaluation. You can filter the results by those user attributes and create a report accordingly, which you can then save as a PDF or print directly. But also in that area the design is very bad and except the cluster tree no graphics are displayed, as you can see in Figure 3.4.

For generation of such a report you have to choose the desired components. You can select the following ones: Problem Information, cards, groups, profiles, sessions, unclassified cards, cluster tree, marks. If you would like to generate a cluster tree you can select a single linkage, average linkage or complete linkage and you can also differ to flatten groups or use sub groups.
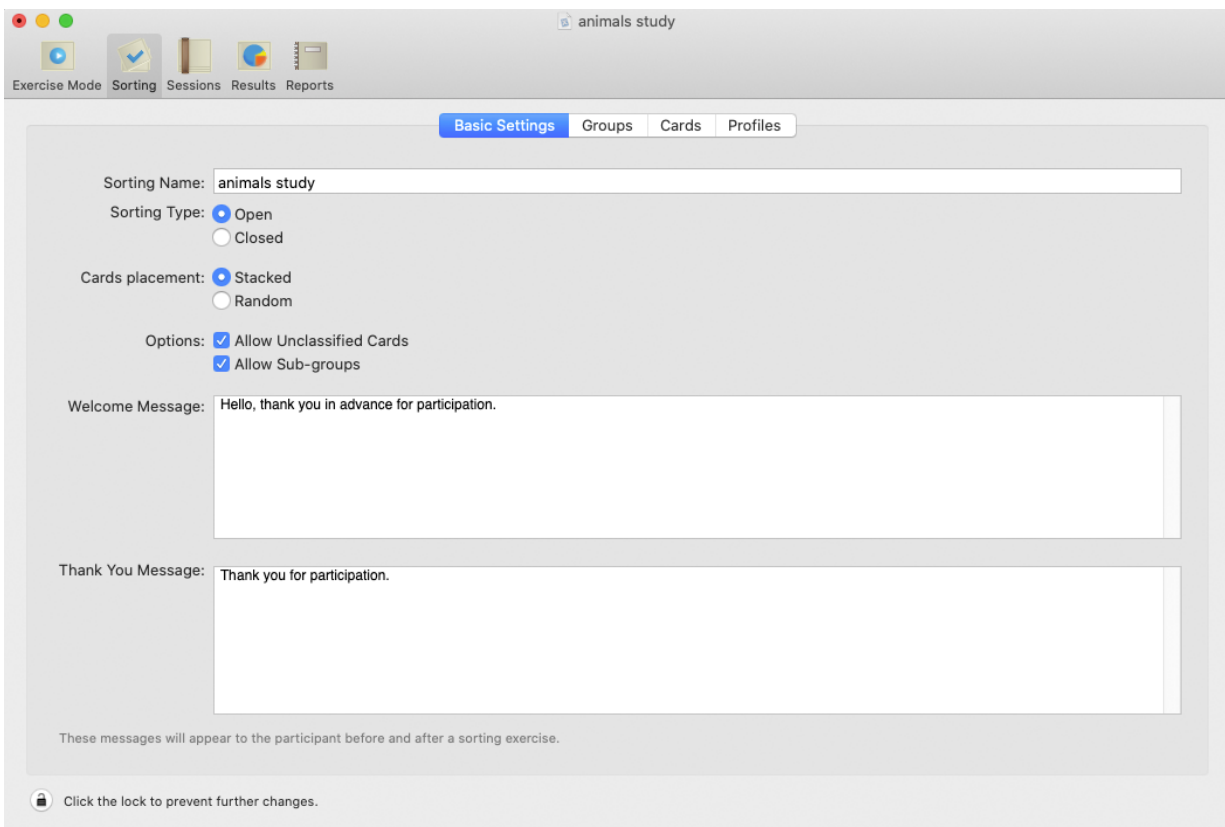
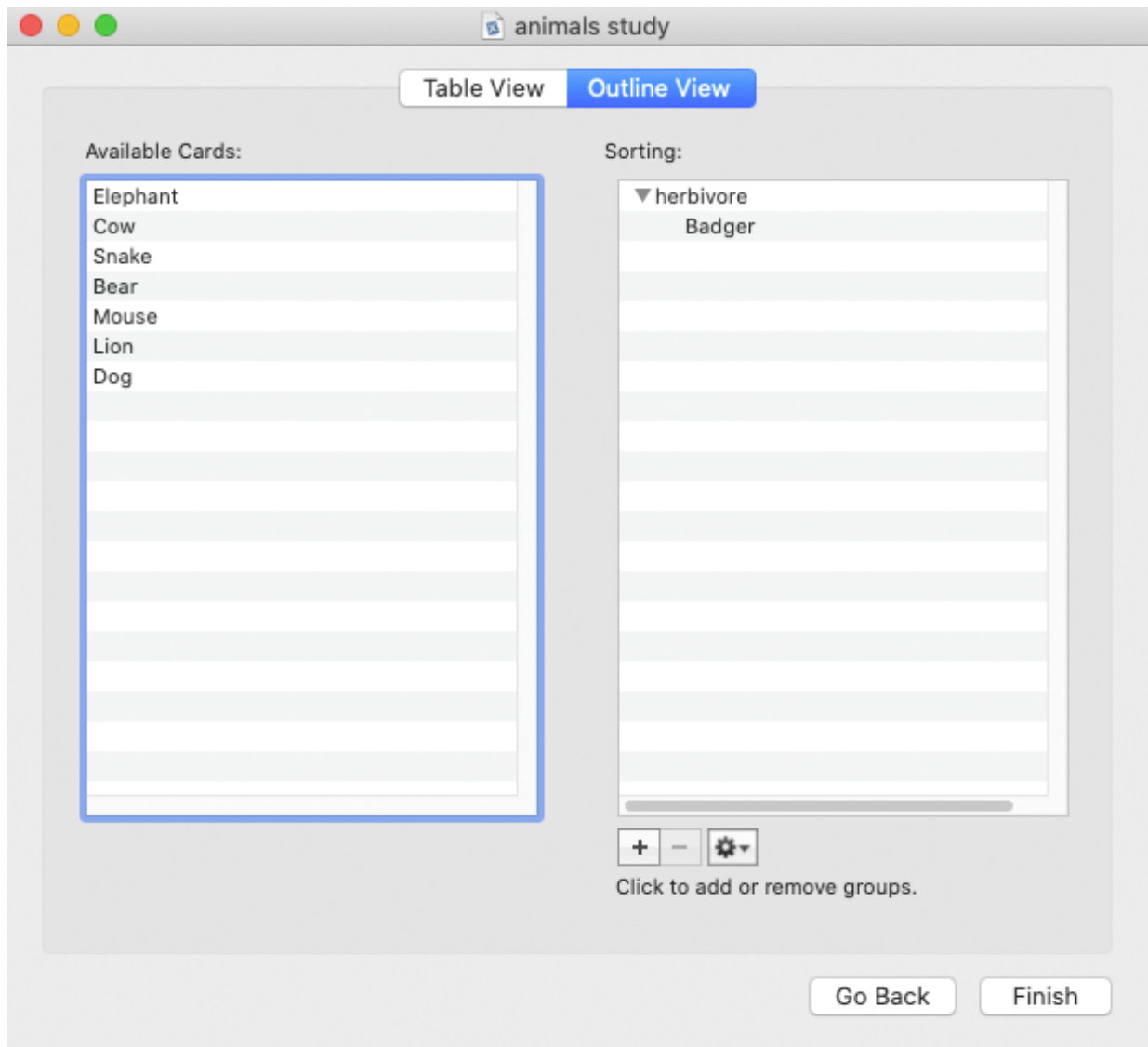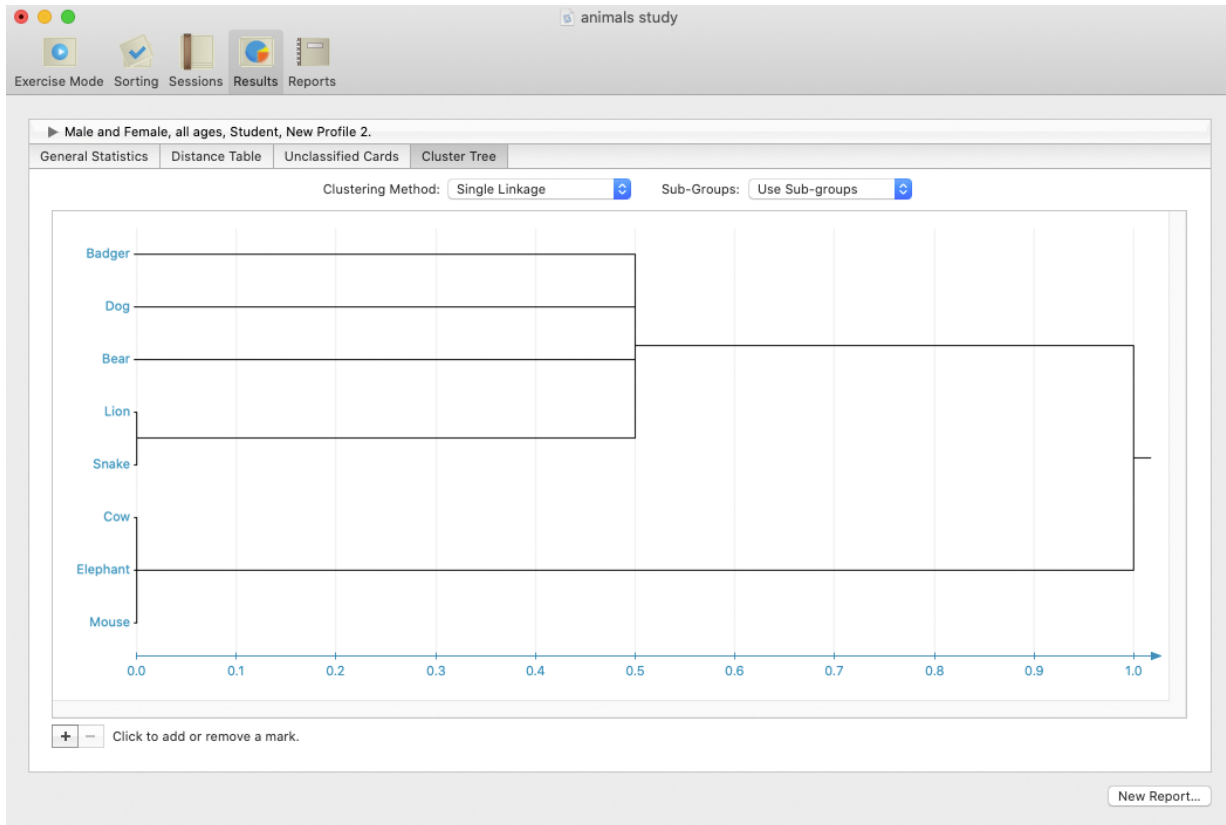**Figure 3.4:** A cluster tree in the results section of xSort. [Screenshot captured by Markus Stradner using xSort [EP 2020] on macOS Catalina 10.15.7, 28.11.2020.]

3.4 Summary & Ratings

In comparison with more modern card sorting tools like OptimalSort, in xSort there is a password security possible, it has a zooming tool, a clean up tool and the biggest advantage is, that it's free of charge.

The main disadvantages are that it can't be used for online studies, the design is very bad and not up to date, there are also small bugs in it. The documentation stuff can only be found online and while assigning the cards, the groups don't align with the grid. So there is a mess after assigning more cards and you have to use the clean up tool very often. A detailed summary of features can be viewed in Table 3.1.

The ratings for the tools can be found in a short overview in Table 3.2 and range from 0 to 5.

Feature/Characteristic	Availability in xSort
Card Sorting	Open and closed.
Card Limit	No.
Participant Limit	No.
Analytics	Cluster tree, general statistics and distance table.
Documentation	Instructions can be found online.
Business Model	Fully free of charge.
Import formats	.xml, .csv
Export formats	.xml, .csv, .html, .pdf
Sub-Categories	Yes.
Playback of user-sessions	No.
Data preparation	Only by hand through export reports.

Table 3.1: The features and characteristics of xSort.

Simplicity	Documentation	Features	Business Model	Average
2	2	3	4	2.75

Table 3.2: Ratings for xSort including the average rating.

Chapter 4

UXtweak

Uxtweak offers a number of different usability tests, as well as analysis tools. Not only do they allow users to create card sorting studies, but also tree tests and replay tests on other websites. All of their products can be accessed for free, however there are a number of limitations that should entice users to upgrade to a premium membership. This review will only focus on the card sorting capabilities of UXtweak

4.1 Business Model

As mentioned before, most of the offered features can be accessed for free after creating an account. However, there are a number of restrictions when using a free account. The most notable restriction is that the number of cards per card sorting study is limited to 20 and the number of respondents is limited to 10 per study. This means that, for most users who want to test larger navigation structures, it is necessary to upgrade to a premium account in order to get unlimited cards and respondents per study. Additional features that a users gets for purchasing a premium membership include: branding options, support and an unlimited number of .pdf reports (instead of one every 48 hours).

Currently, the price for a monthly subscription is €140.- per month. Alternatively, one can purchase a years worth of premium subscription for €1,176.-. In case a more custom plan is required, they also advertise the option to contact them and negotiate a custom plan. It is also worth mentioning that UXtweak offers a 5-day free trial for their premium membership. A screenshot of the dashboard can be seen in figure 4.1.

4.2 Card Sorting

The card sorting itself is easy to set up, as UXtweaks menus are highly intuitive and their written documentation is extremely detailed. Once a user creates a new card sorting study, they are prompted to go through all the different customization options UXtweak has to offer. These options are structured in several different tabs and users can go back and forth between them in whichever order they prefer. At any point there is the option to look at a preview of the study and, in case any field is unclear, there are little helper icons that give a more detailed explanation about the information required. Overall there is an extensive number of different customization options, especially when it comes to creating questionaires before or after the study.

When using an account with a premium membership it is also possible to customize the colors and style of the study, as well as include logos or other branding tools. After a study has been launched, participants can either enter via a URL link or by clicking a widget that can be copied from UXtweak and embedded in another website. A screenshot of the card sorting process can be seen in figure 4.2.

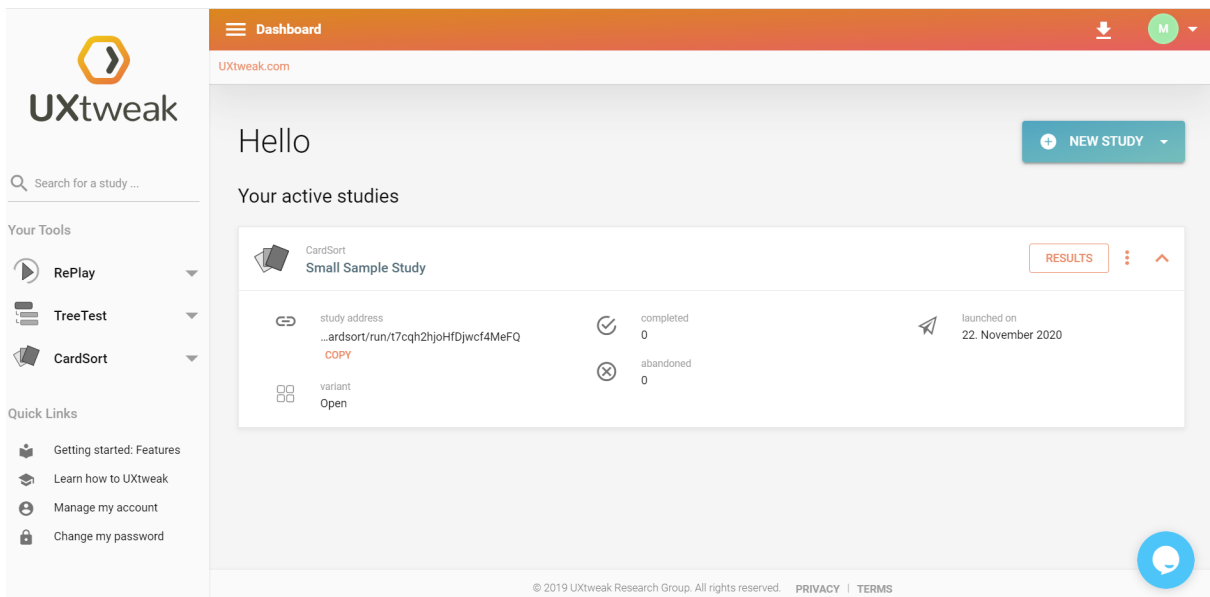**Figure 4.1:** The base view in UXtweak, showing the currently active studies in the center with some information such as the launch date and the study address link. [Screenshot captured byMarkus Ruplitsch using UXtweak [UXtweak 2020] on Google Chrome 84.]
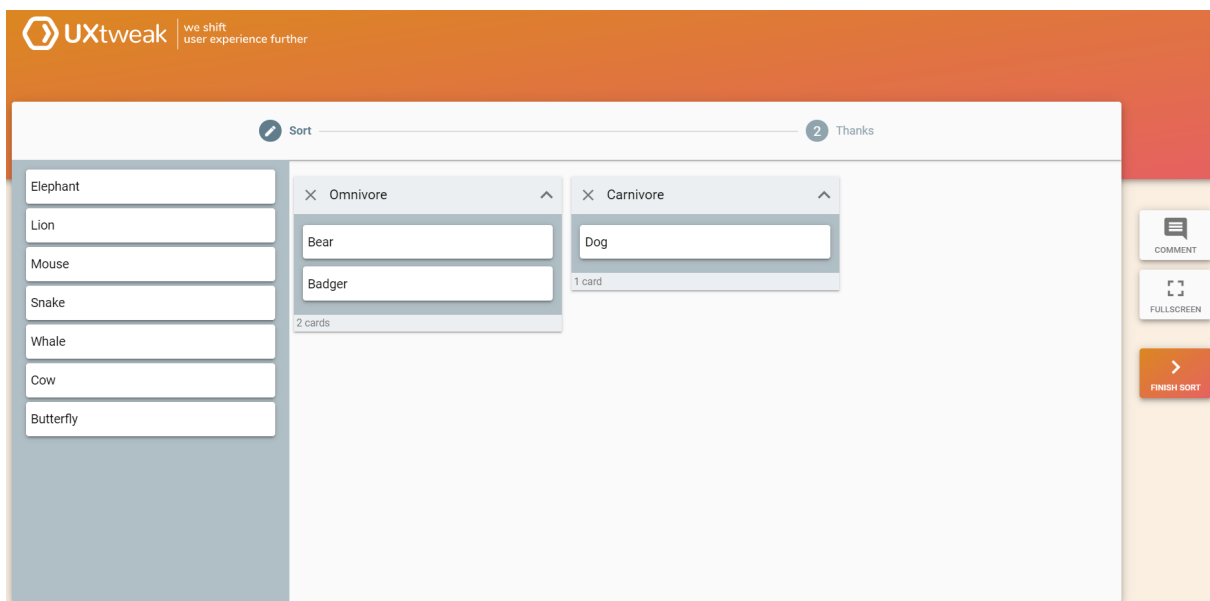

Figure 4.2: The card sorting process in UXtweak. [Screenshot captured by Markus Ruplitsch using UXtweak [UXtweak 2020] on Google Chrome 84.]

Feature/Characteristic	Availability in UXtweak
Card Sorting	Open, closed and hybrid.
Card Limit	20 with a free plan, unlimited with a premium plan.
Participant Limit	10 with a free plan, unlimited with a premium plan.
Analytics	standardization grid, similarity matrix, dendrogram, respondent-centric analysis
Documentation	Extremely detailed written documentation with a number of screenshots
Business Model	Free or €140.- per month / €1176.- per year
Import formats	.csv
Export formats	.csv and .pdf, results can also be shared online
Sub-Categories	No.
Playback of user-sessions	No.
Data preparation	Allows filtering and exclusion/includsion of specific users.

Table 4.1: The features and characteristics of UXtweak.

Simplicity	Documentation	Features	Business Model	Average
5	4	4	3	4.0

Table 4.2: Ratings for UXtweak including the average rating.

4.3 Analytics

Even if the card sorting study has not yet concluded it is possible to view the current results and analytics online. UXtweaks study review shows information about the number of participants, their locations, time taken and how many cards they sorted. It is possible to filter or sort the participants and their information by any of these criteria, and to include or exclude them in the remaining analysis. Their analysis shows which cards have been sorted into which categories and vice versa. They offer a results matrix a similarity matrix and participants can leave comments during their card sort that can late be reviewed. Additionally, they offer a dendrogram and a standardization grid.

All of these analytics can be exported as PDF (only one .pdf export every 48 hours with a free plan) or CSV. Results can also be shared online via URL link and can be partially hidden to users with a URL link unless they have a password, which can be set manually. An overview of all features can be seen in table 4.1.

4.4 Summary & Ratings

Since UXtweak is so easy to use and offers a detailed documentation it is possible to quickly create a card sorting study while still having a large number of customization options. The user interface is extremely friendly and the resulting study looks professional, even without including custom branding options. The analytics view offers a lot of different analysis tools and all results can be shared via a number of different ways. All in all, UXtweaks has a lot to offer when it comes to card sorting, even to non-paying users.

The only significant downside to using UXtweak is that the limitations that come with using a free plan, make it impossible to conduct larger studies without upgrading to a premium membership. And, while there is a free trial, for €140.- a month it might still be worth considering a different option. The ratings can be found in table 4.2 and range from 0 to 5.

Chapter 5

ProvenByUsers

Proven By Users is another online card sorting tool that allows users to quickly create studies and export the resulting data. Their user interface is minimalistic but adequate and their analysis tools are quite extensive.

5.1 Business Model

All of their features can be accessed freely after creating an account, with the only limitation being that only 3 results can be collected per survey. Since 3 results are usually not enough, this means that a premium membership is necessary for most purposes.

Proven By Users offers 3 different options for purchasing the option to have more than 3 participants per study. The first one costs $39.95 for 30 days, the second one costs $69.95 for 60 days and the last option costs $399.95 for one year. A screenshot of the dashboard can be found in figure 5.1.

5.2 Card Sorting

Creating a card sorting study is relatively simple when using Proven By Users. Users are presented with a number of different fields that can customize options. They are sorted into different categories than can be accessed via a menu bar to the left and can be filled out in any order.

The only notable problem that was encountered during the creation of a study, was that it is not possible to import the cards or categories as files, but rather have to be copied and pasted into a text field. This is especially unintuitive if one wants to create a study with several layers of sub-categories as the text has to be in a specific format.

However, that was the only problem and their documentation has a very detailed explanation of all the fields that have to be filled out. Overall, there are a lot of customization options, including questionaires before or after the survey, color and style choices and a number of messages that can be displayed at varying points before, during or after the survey. A screenshot of the card sorting process can be found in figure 5.2.

5.3 Analytics

Even before a study has closed, it is possible to review the results of every person who has participated in the study so far. Proven By Users allows users to view the data in a number of different ways.as well as some more analytical tools such as a similarity matrix, a dendrogram and a maximum agreement table. Users can be individually included or excluded in all of these results and all results, except the dendrogram, can be exported as either CSV or Syncaps file format (see chapter 7). A detailed summary of features can be viewed in table 5.1

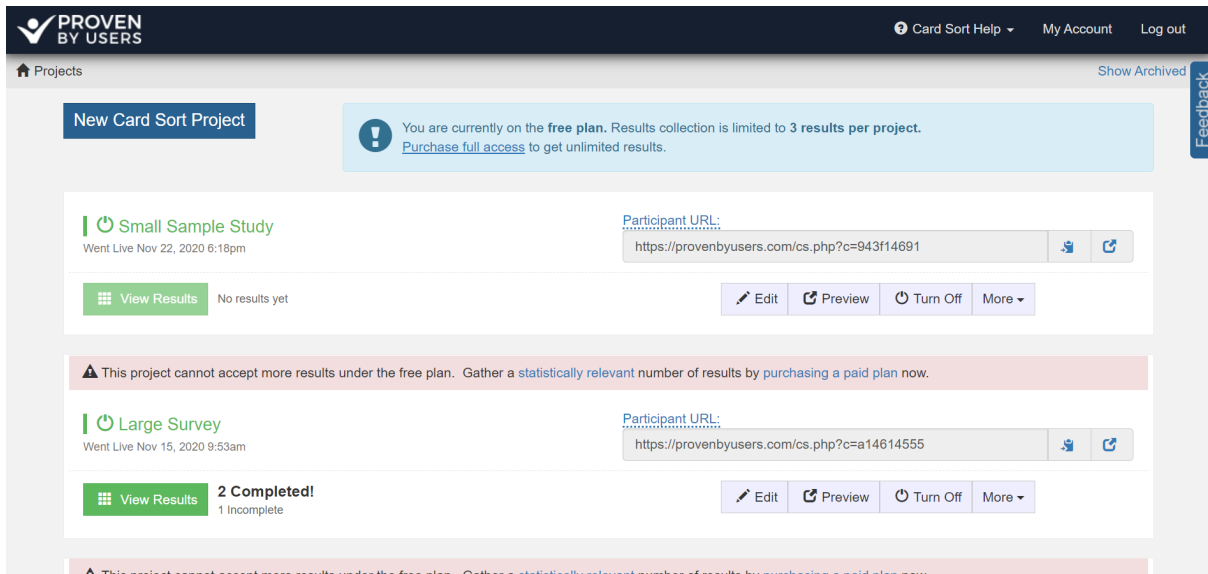**Figure 5.1:** The base view in Proven By Users, showing an overview of current and previous studies as well as the option to create a new study. [Screenshot captured by Markus Ruplitsch using Proven By Users [PBU 2020] on Google Chrome 84.]
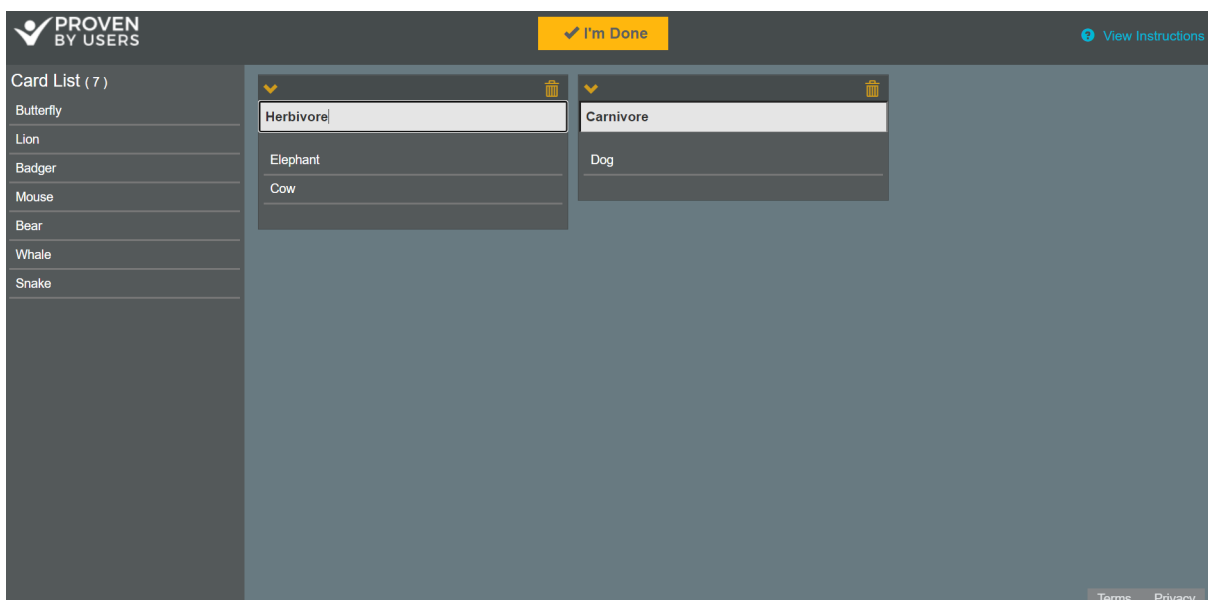

Figure 5.2: The card sorting process in Proven By Users. [Screenshot captured by Markus Ruplitsch using Proven By Users [PBU 2020] on Google Chrome 84.]

Feature/Characteristic	Availability in Proven By Users
Card Sorting	Open, closed and hybrid.
Card Limit	None.
Participant Limit	None.
Analytics	similarity matrix, dendrogram, maximum agreement table
Documentation	Extremely detailed written documentation with a number of screenshots
Business Model	Free or $ 39.95 for 30 days / $ 69.95 for 60 days / $ 399.95 for one year
Import formats	None. All data needs to be entered by hand or copied as text.
Export formats	.csv and SynCaps file format
Sub-Categories	Yes.
Playback of user-sessions	No.
Data preparation	Allows inclusion / exclusion of specific users

Table 5.1: The features and characteristics of ProvenByUsers.

Simplicity	Documentation	Features	Business Model	Average
4	4	4	1	3.5

Table 5.2: Ratings for Proven By Users including the average rating.

5.4 Summary & Ratings

Proven By Users is relatively easy to use and offers a very detailed written documentation. There are numerous customization options when creating a study, as well as a good number of analysis tools.

As with UXtweak [2020], there are no major downsides to using this tool, but because they only allow 3 participants per study, it is basically required to buy a premium membership. This time however, it is not possible to conduct smaller studies without paying, as 3 participants simply is not enough to make any statements with high confidence. The ratings can be found in table 5.2 and range from 0 to 5.

Chapter 6

kardSort

kardSort is an online card sorting tool that was created by a single developer as their master's thesis. It is a very intuitive and simple tool that is easy and rewarding to use. That being said it does lack in some features in comparison to its peers and might be a little too simple for some users [Balachandran 2020].An overview of the tool can be viewed in Figure 6.1.

6.1 Business Model

As to be expected from a master's thesis project the tool is fully free of charge. All features are accessible immediately and there are no extra features hidden behind some paywall.

The only prerequisite for using the tool is to create an account, either explicitly for the site or using an existing Google account. The account make sure all the work within the tool is saved and can be accessed again even after the session has been terminated. This also enables access to the experiments, regardless of device or geo- location. All experiments and data are saved in a cloud that is provided by kardSort.

6.2 Card Sorting

The card sorting in kardSort is very straight forward. There are no special gimmicks or features that make it stand out from other tools. They offer open, closed and hybrid card sorting. It is possible to include a welcome message and instructions for every experiment.

A feature that is quite handy at times, is the possibility to include a customizable questionnaire for an experiment. This questionnaire can be made up of any number of single line text, multi line text, check box or radio button questions and is displayed right before the actual sorting.

In terms of limitations during card sorting, there are two issues that arose during the review process. Firstly it is not possible to perform an experiment with more than 50 cards. This is a hard limit set during development that offers no workaround by a user. If this is a deal-breaking limitation, it could be possible to contact the developer about it and request more cards per experiment, as the tool does have a feature request page. Secondly it is quite exhausting working with more than five categories, as the way the tool is defined, it adds new categories at the very right of the previous categories. Therefore a lot of horizontal scrolling is involved when browsing larger number of categories.

A detailed summary of features can be viewed in Table 6.1. Furthermore a screenshot during the card sorting process can be viewed in Figure 6.2.
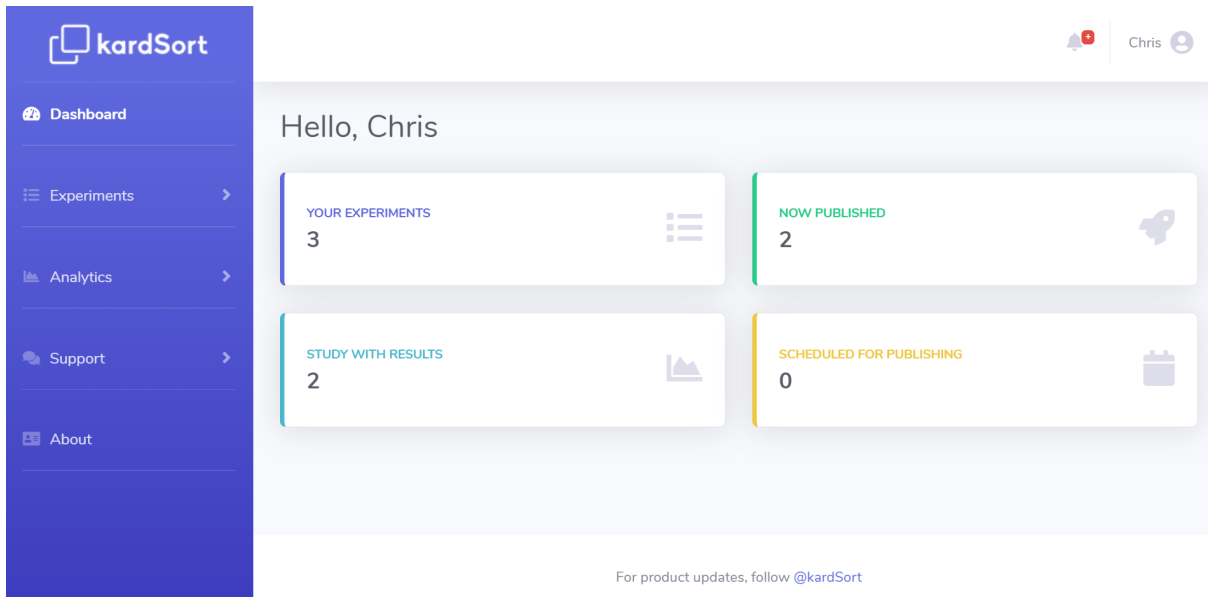
Figure 6.1: The base view in kardSort, showing an overview of experiments and in the side menu all further actions which are available. [Screenshot captured by Christopher Oser using kardSort [Balachandran 2020] on Google Chrome 84.]
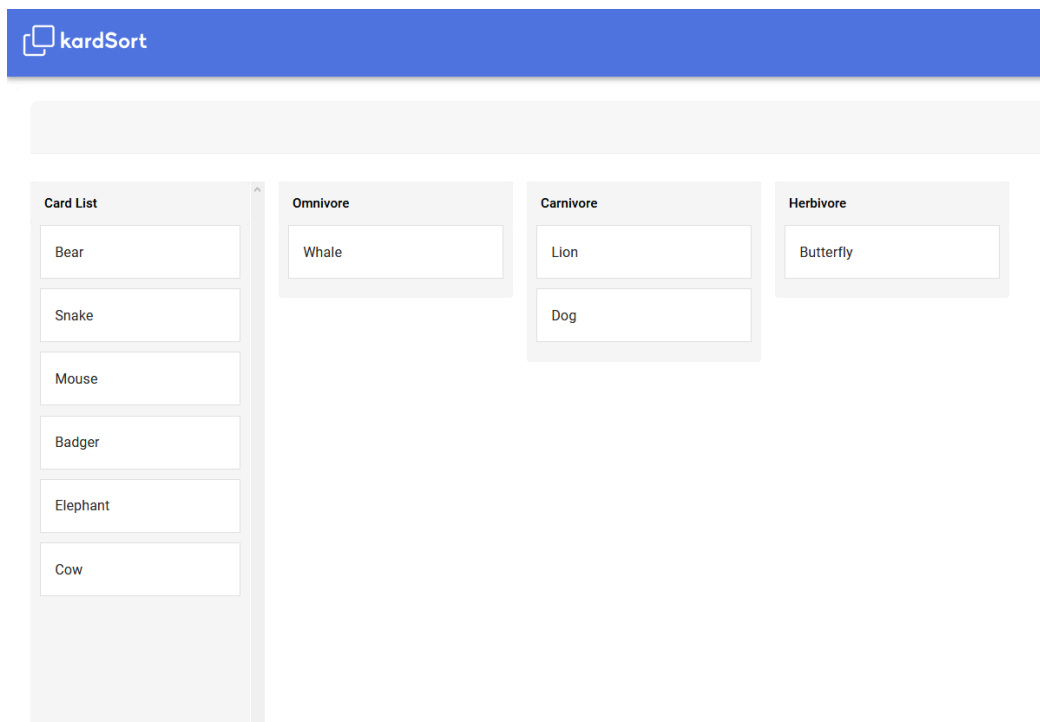

Figure 6.2: The card sorting process in kardSort. [Screenshot captured by Christopher Oser using kardSort [Balachandran 2020] on Google Chrome 84.]

Feature/Characteristic	Availability in kardSort
Card Sorting	Open, closed and hybrid.
Card Limit	50
Participant Limit	None.
Analytics	Only export for Casolysis and SynCaps. No in-tool analytics
Documentation	None, but tool explains itself very well. No documentation was needed during review.
Business Model	Free.
Import formats	None. All data needs to be entered by hand.
Export formats	.csv for everything plus formats matching Casolysis and SynCaps.
Sub-Categories	No.
Playback of user-sessions	No.
Data preparation	Only by hand through export files.

Table 6.1: The features and characteristics of kardSort.

Simplicity	Documentation	Features	Business Model	Average
5	1	1	5	3.0

Table 6.2: Ratings for kardSort including the average rating.

6.3 Analytics

This is the caveat of kardSort, the part where it is truly lacking, because it does not offer any type of analytics for its experiments. There is the possibility of exporting all the relevant data of an experiment to .csv files for manual analytics or data preparation.

Additionally it also offers to export experiment data in the required format of two other card sorting analytics tools, namely Casolysis and SynCaps. These two tools are both free of charge and provide good analytics for card sorting experiments. Further information about them can be found in the respective Chapters 7 and 8 within this survey.

6.4 Summary & Ratings

All in all kardSort provides a very good card sorting experience. Everything it does it does well. Apart from a card limit and some formatting with the categories there were no issues when reviewing the tool.

Of course it lacks greatly in comparison to other tools, since it does not provide any own analytics. Although it does provide you with the option to do the analytics elsewhere. So this could be a possible compromise for some users, making this nonetheless a viable option when in search for a card sorting tool.

For a quick overview and to make it easier to compare to other tools in this paper, four ratings were agreed upon to represent the tool. The ratings can be found in Table 6.2 and range from 0 to 5.

Chapter 7

SynCaps

SynCaps is an older card sorting tool that is not available online. It is only usable as an offline Windows program that needs to be installed locally. Since 2018 the full package is offered free of charge and can be downloaded. It is not trivial to use and requires some time spent with the provided documentation videos. Its workflow is dated and requires some getting used to [Syntagm 2018].

As the tool does not offer any card sorting capabilities, this needs to be taken care of in some other way. Originally SynCaps was intended to be used in cooperation with paper card sorting. After the experiment was done one can import the data into SynCaps and analyze it. Nowadays it is also very easy to use other card sorting tools and then import the data into SynCaps for analytics. Figure 7.1 gives an overview of what the basic view in the tool looks like.

7.1 Business Model

As mentioned earlier SynCaps is totally free of charge. There are no additional features to be unlocked by a paywall. Previously other restrictions applied, but since 2018 the tool is not only free of charge, but also licensing free.

Being an offline program, there is also no need for an account. Any data is saved locally and needs to be manually moved to be accessed in other environments.

7.2 Card Sorting

SynCaps does not provide any card sorting capabilities. It is intended to be used with paper card sorting or other tools. For paper card sorting, it provides an option to assign barcodes to cards, for easier importing of the results after the experiment.

7.3 Analytics

This is were this tool shines. When analyzing results from card sorting experiments, the options are quite numerous, not so say overwhelming. Before any analytics, there is the possibility for data preparation. Users can be singled out, cards as well as categories can be merged and lots more.

Once the data has been prepared the results can be analyzed within 5 different charts that can be further customized. These charts are made up of clusterings and dendrograms with different inputs. These charts are somewhat interactive, as a click on a datapoint will reveal more information about it, but that is also where the interactivity ends.

The features are summarized in Table 7.1. Furthermore two analytical visualizations, a clustering and a dendrogram, can be seen in Figures 7.2 and 7.3 respectively.
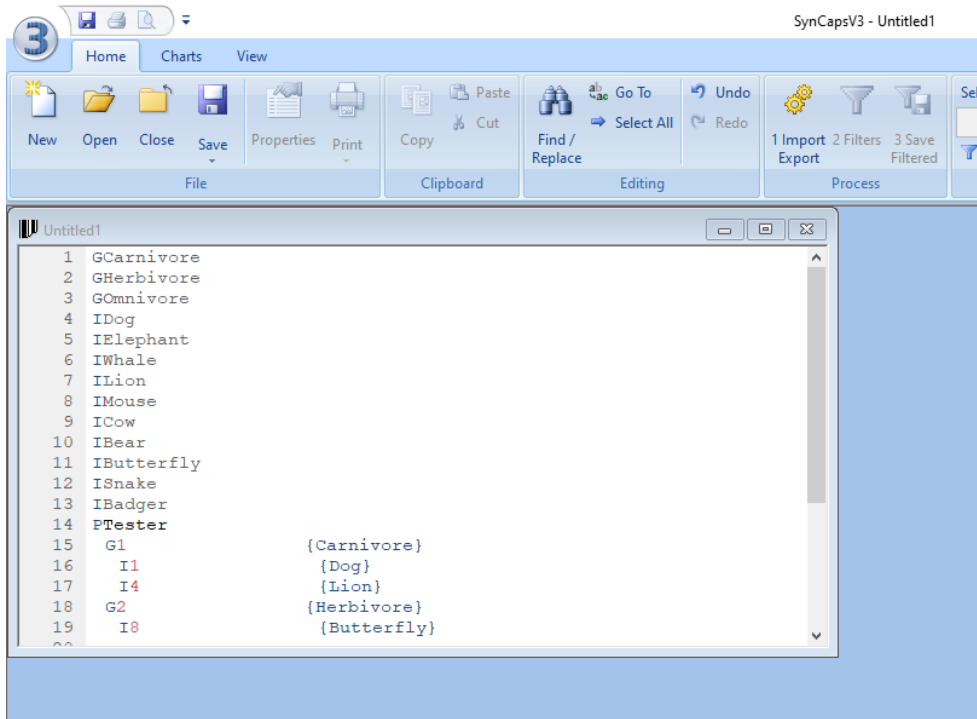
Figure 7.1: The base view within SynCaps. All input data is handled within a .txt file. [Screenshot captured by Christopher Oser using SynCaps [Syntagm 2018].]
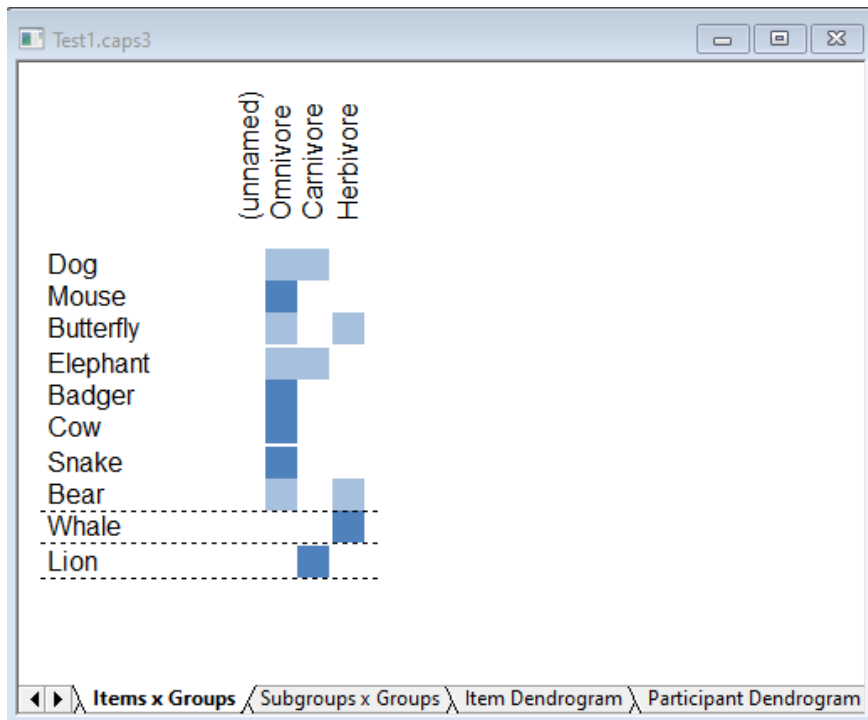

Figure 7.2: A Cards x Groups visualization used for analytics in SynCaps [Screenshot captured by Christopher Oser using SynCaps [Syntagm 2018].]
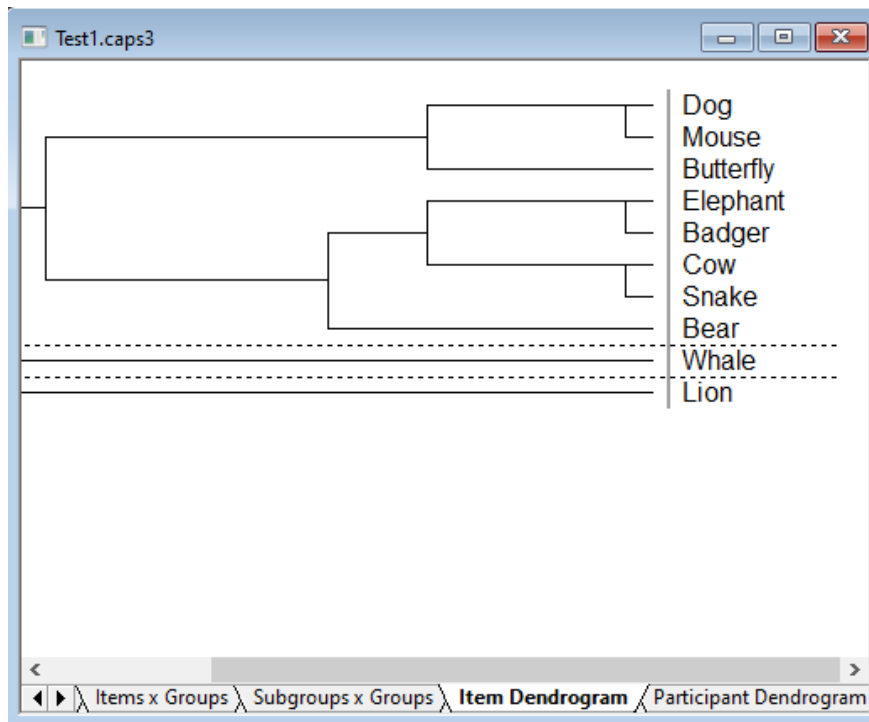
Figure 7.3: A dendrogram used for analytics in SynCaps [Screenshot captured by Christopher Oser using SynCaps [Syntagm 2018].]

Feature/Characteristic	Availability in SynCaps
Card Sorting	None. Paper Cards or other tools needed.
Card Limit	None.
Participant Limit	None.
Analytics	Analytics in 5 semi-interactive charts made up of clusterings and dendrograms
Documentation	Some dated videos.
Business Model	Free.
Import formats	.csv, .txt or paste
Export formats	.csv
Sub-Categories	Yes, sub-categories are supported
Playback of user-sessions	No.
Data preparation	Extensive options from user exclusion to card merging.

Table 7.1: The features and characteristics of SynCaps.

Simplicity	Documentation	Features	Business Model	Average
1	2	4	5	3.0

Table 7.2: Ratings for SynCaps including the average rating.

7.4 Summary & Ratings

SynCaps is a solid analytics tool if you can get past its workflow and learning curve. The videos offered as documentation, but are not fun to watch to say the least. It offers many data preparation options and enables efficient evaluation of results with its many semi-interactive visualizations.

It is always necessary to pair SynCaps with either physical paper card sorting or another tool to perform the actual card sorting. If this is an option, then SynCaps can be very handy for analyzing.

For a quick overview and to make it easier to compare to other tools in this paper, four ratings were agreed upon to represent the tool. The ratings can be found in Table 7.2 and range from 0 to 5.

Chapter 8

Casolysis

Casolysis is a free card sorting tool that was developed by multiple students at the University of Paderborn [PU 2020]. It is standalone Windows .exe file that requires no installation. The tool is no longer under development, but can still be downloaded from the university's website.

Similar to Syntagm [2018] offers no actual card sorting tool, but rather takes over the analytical part of the process. Card sorting needs to be done in some other form, be it physical or with a different tool, and then the results can be imported to Casolysis. Figure 8.1 shows the basic view within the tool.

8.1 Business Model

Casolysis is free of charge and can be downloaded an unlimited amount of times. Its development has seized, but the tool can still be used in its current form. Additionally no account is needed to access Casolysis. It does not even require installation, but can be run straight out of the .exe file.

8.2 Card Sorting

Casolysis does not support the actual sorting of cards. It needs to be used in cooperation with another form of card sorting, be it physical paper card sorting or a different card sorting tool. The results can then be imported to Casolysis via a .csv file for analytics.

8.3 Analytics

The core functionality of Casolysis, analyzing card sorting results. Once data is imported it is very simple to produce analytics. Before the analyzing begins, it is possible to adjust the data a bit, adjusting sources, in case the .csv file was not correctly formatted, deciding whether the experiment was done though open or closed card sorting and whether or not sub-categories were in use.

As soon as the data is ready, all analytics Casolysis offers are only one button click away. Although Casolysis does not seem to have any kind of documentation, usage was rather simple and no documentation was required during the review process.

The analytical visualizations are made up of a heatmap, distance matrix , dendrograms for hierarchical clustering and 3 other miscellaneous algorithms. The distance map and a dendrogram can be seen in Figures 8.2 and 8.3 respectively.With all these possibilities, lots of knowledge can be extracted from experiment results.

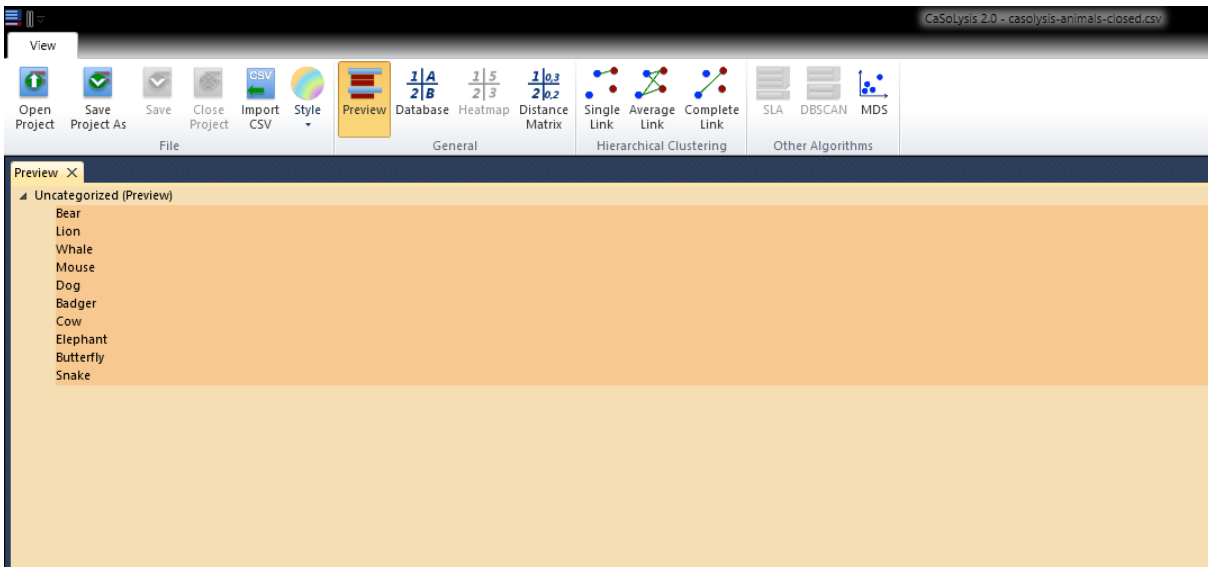The features are summarized in Table 8.1.

Figure 8.1: The base view within Casolysis once data is imported from a .csv file. [Screenshot captured by Christopher Oser using Casolysis [PU 2020].]
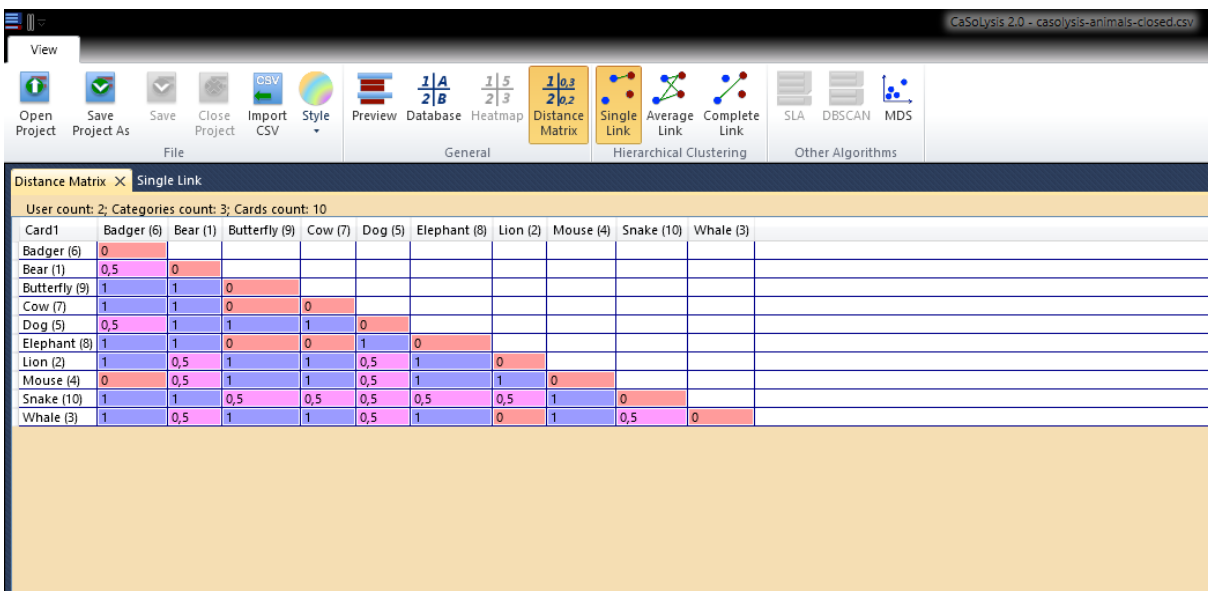

Figure 8.2: A distance matrix over all cards used for analytics. [Screenshot captured by Christopher Oser using Casolysis [PU 2020].]
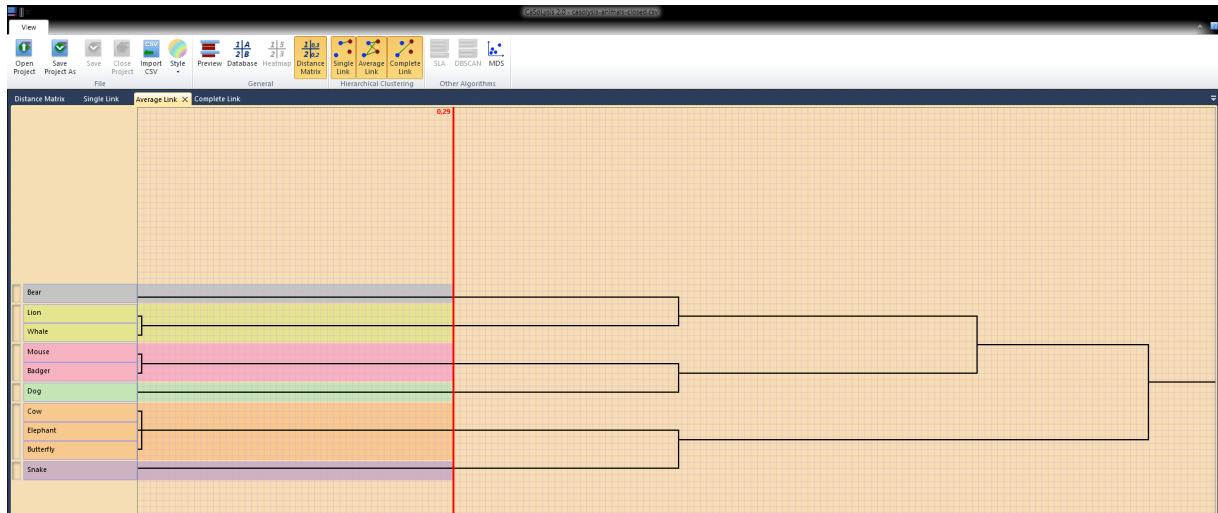
Figure 8.3: A dendrogram for the average link of cards used for analytics.   [Screenshot captured by Christopher Oser using Casolysis [PU 2020].]

Feature/Characteristic	Availability in Casolysis
Card Sorting	None. Paper Cards or other tools needed.
Card Limit	None.
Participant Limit	None.
Analytics	Analytics with 5 different types of visualizations with different versions for some of them.
Documentation	None.
Business Model	Free. No longer under development
Import formats	.csv
Export formats	None. Screenshots of visualizations possibly.
Sub-Categories	Yes, sub-categories are supported
Playback of user-sessions	No.
Data preparation	Very little - open/closed and sub-categories. Everything else must be done manually.

Table 8.1: The features and characteristics of Casolysis.

8.4 Summary & Ratings

All in all Casolysis seems to be a more modern Syntagm [2018], minus the extensive data preparation options. Nevertheless it offers more analytics and does so in a much simpler way. The visualizations are easy to understand and frankly, quite pleasing to the eye.

Since its development has ended, there will be no added features in the future and any bugs that might occur will not be fixed. So this should be taken into account when considering Casolysis.

If the features are sufficient and you do not require card sorting capabilities the tool seems to be a great fit. The only final drawback being, that it is offline and needs Windows to be run.

For a quick overview and to make it easier to compare to other tools in this paper, four ratings were agreed upon to represent the tool. The ratings can be found in Table 8.2 and range from 0 to 5.

Simplicity	Documentation	Features	Business Model	Average
4	0	4	5	3.25

Table 8.2: Ratings for Casolysis including the average rating.

Chapter 9

CSA

Card Sorting Analysis (CSA) was developed at Graz University of Technology as part of the course Information Architecture and Web Usability. It allows users to analyze the results of card sorting studies, but does not offer the capabilities to create an online card sorting study within the program. It is also worth mentioning, that CSA can only be launched after install R via console or after installing R and RStudio via the RStudio GUI. A screenshot of the base view of CSA can be seen in figure 9.1.

9.1 Business Model

CSA is not publicly available. The only way to gain access is by contacting Prof. Keith Andrews.

9.2 Card Sorting

Just like the other analysis tools before, CSA does not support online card sorting and has to be used in conjunction with another form of card sorting, either physical or online. The results can then be imported to CS via a .csv file.

9.3 Analytics

Before starting CSA, it is necessary to install R, and RStudio if one does not like using command line arguments. Even for tech-savvy people, it will take a while to install all necessary R packages and set up a working directory. It stands to reason, that the installation process will be extremely difficult for users who have no experience programming, or working with programs without a professionally designed user face.

After importing data as a .csv file, CSA offers a variety of visualizations. These visualizations can be accessed via a Menu bar at the top and can be exported as .csv, .svg or .png, depending on the type of visualization. The visualizations offered by CSA are: similarity matrix, distance matrix, distance histogram, co-occurrence matrix, similarity map, dendrogram and a results table. A screenshot of the similarity map can be seen in Figure 9.2 and a screenshot of the dendrogram can be seen in Figure 9.3. A detailed summary of features can be viewed in Table 9.1.

9.4 Summary & Ratings

While the analytics capabilities of CSA are quite extensive, there are some major problems when it comes to using it. First, it will be extremely hard for new users to install it if they do not have a background in computer science or are highly tech-savvy. This is not necessarily the applications fault, but rather comes with the fact that it is an R application and can only be launched via R or RStudio. Additionally, this is

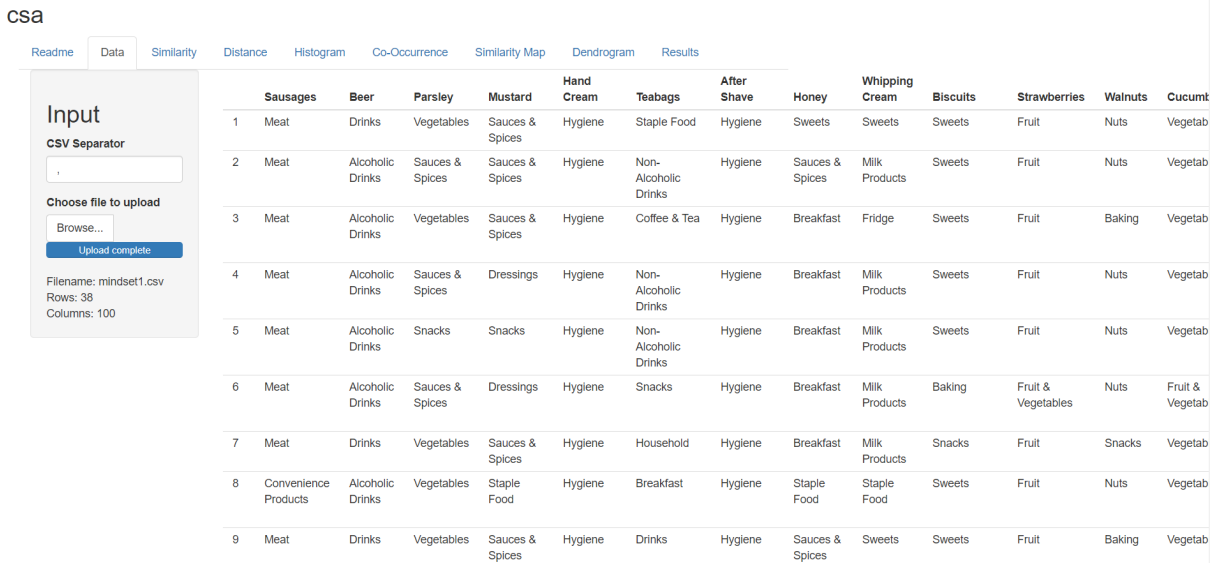**Figure 9.1:** The base view within CSA once data is imported from a .csv file. [Screenshot captured by Markus Ruplitsch using CSA.]
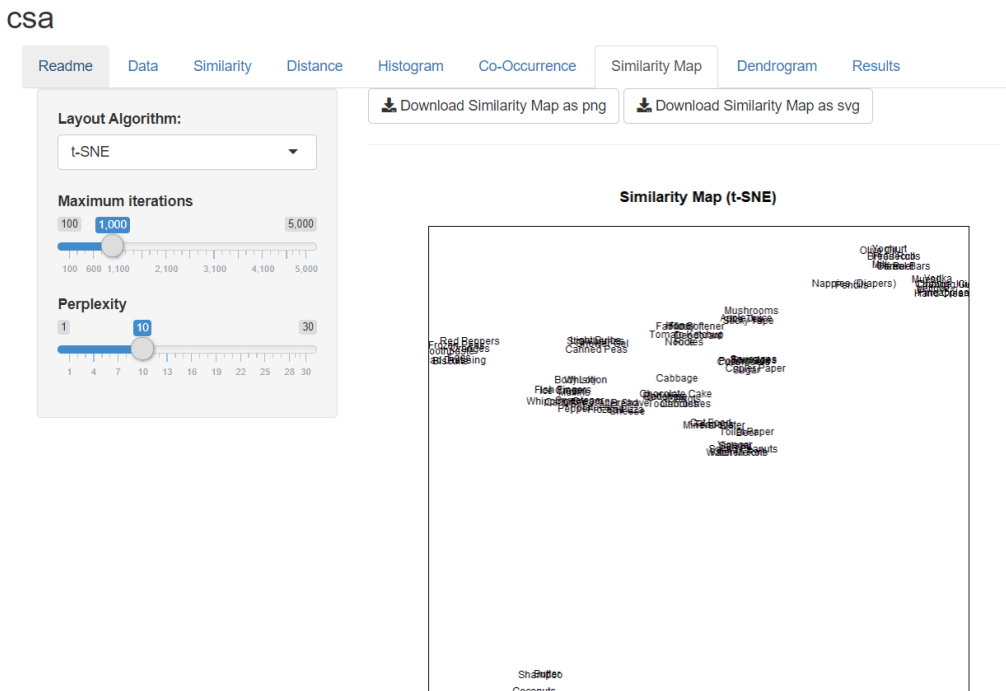

Figure 9.2: A similarity map over all cards used for analytics. [Screenshot captured by Markus Ruplitsch using CSA.]
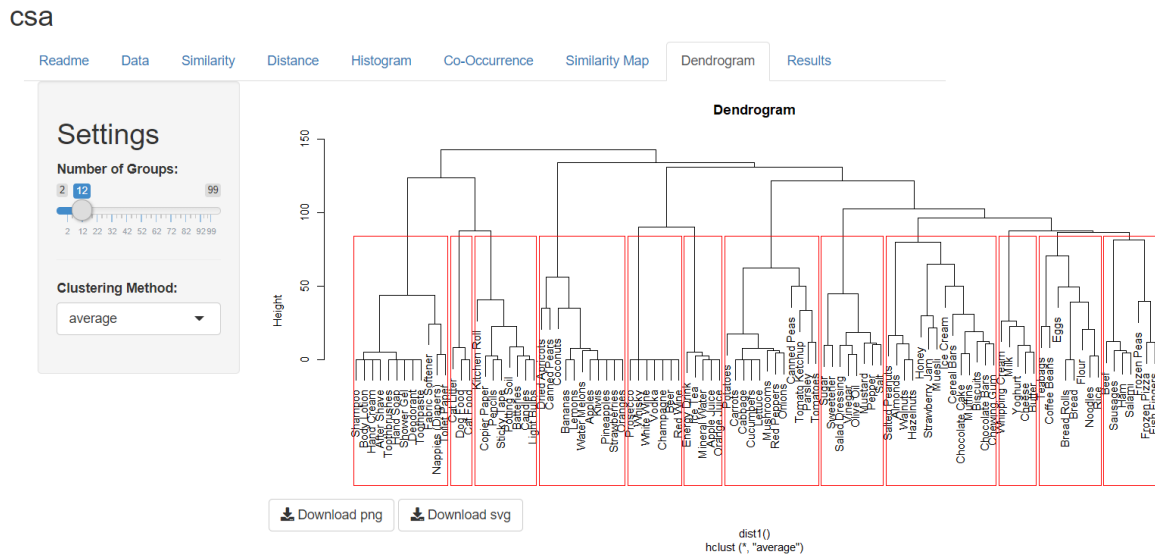
Figure 9.3: A dendrogram for the average link of cards used for analytics. [Screenshot captured by Markus Ruplitsch using CSA.]

Feature/Characteristic	Availability in Casolysis
Card Sorting	None. Paper Cards or other tools needed.
Card Limit	None.
Participant Limit	None.
Analytics	Analytics with 7 different types of visualizations.
Documentation	None.
Business Model	Not publicly available
Import formats	.csv
Export formats	.csv, .png, .svg
Sub-Categories	Not really supported, but can be used
Playback of user-sessions	No.
Data preparation	No. Has to be done before inporting the .csv file

Table 9.1: The features and characteristics of CSA.

not made easier by the complete lack of documentation, aside from a small README file in the main directory. Because of this, CSA gets 0 for both simplicity and documentation.

Secondly, most people will never use CSA because it is not publicly available. While it would have been possible to give CSA a 5 for its business model, since it is free, the decision was made to take into account the fact that the majority of people will never hear of CSA, or be able access to it. These flaws lead to CSA having the lowest average score of only 1.0. The ratings can be found in Table 9.2 and range from 0 to 5.

Simplicity	Documentation	Features	Business Model	Average
0	0	4	0	1.0

Table 9.2: Ratings for CSA including the average rating.

Chapter 10

Concluding Remarks

The tested tools are designed for different tasks and also differ in their features. Table 10.1 shows an overview of the results and ratings of all the reviewed tools.

10.1 Recommendations

With reference to the overview of all the reviewed tools which can be seen in Table 10.1, it is recommended to make three categories of recommendations: One for the best allrounder, another one for the best bang of your buck and a third one for the offline card sorting.

OptimalSort has emerged as the best allrounder, even if you only find a limited number of participants and cards to use in the free version. But the pretty good usability and all the analysis tools speak for themselves.

As the best bang for your buck the fully free card sorting tool kardSort in combination with a free analysis tool, e.g., Casolysis or SynCaps, would be the best choice. Carrying out the study with kardSort is very intuitive and easy to handle. Furthermore, all the sorting data can be easily exported to SynCaps, where you can analyze it afterwards.

For offline card sorting the good old paper cards are definitely the easiest and best way to use. In combination with an analysis in SynCaps this method can keep up with many online tools.

Name	Simplicity	Documentation	Features	Business Model	Average
OptimalSort	4	5	5	3	4.25
UXtweak	5	4	4	3	4.00
ProvenByUsers	4	4	4	1	3.50
Casolysis	4	0	4	5	3.25
kardSort	5	1	1	5	3.00
SynCaps v3	1	2	4	5	3.00
xSort	2	2	3	4	2.75
CSA	0	0	4	0	1.00

Table 10.1: A comparision of tools based on ratings from the reviewers, sorted in descending order of average rating.

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