

Online Card Sorting Tools

Inge Gsellmann, Martin Heider, Lukas Leitner, and Vrutanjali Patel

706.041 Information Architecture and Web Usability 3VU WS 2023/2024
Graz University of Technology

22 Jan 2024

Abstract

Card sorting is a useful procedure for structuring concepts for end users. However, doing the sorting manually and offline severely limits the number of participants available. To mitigate this there are several online card sorting tools available on the market.

Choosing an online card sorting tool can be overwhelming with many different pricing options and feature sets, some of which will not be named the same in every tool, further complicating comparisons.

This survey compares eight different online card sorting tools in detail. It looks at how they support the owner of a study to set everything up, how they support the study participant, and what analysis tools are provided to analyse the results. To structure the comparison, a total of 22 individual criteria were defined in three groups, against which all the tools were comprehensively compared.

© Copyright 2024 by the author(s), except as otherwise noted.

This work is placed under a Creative Commons Attribution 4.0 International (CC BY 4.0) licence.

Contents

Contents	ii
List of Figures	iii
List of Tables	v
1 Introduction	1
2 Card Sorting	3
3 Analysis of Card Sorting Results	5
4 Criteria for Tool Comparison	7
4.1 Study Setup Criteria [Study Owner]	7
4.1.1 Licensing	7
4.1.2 Trial Version Limitations	7
4.1.3 100 Cards & 100 Participants	7
4.1.4 Type	7
4.1.5 Pool of Participants	8
4.1.6 Import Cards	8
4.1.7 Export Results	8
4.1.8 Shuffle Cards	8
4.1.9 Card Images	8
4.1.10 Recording	8
4.1.11 Save / Load Studies	9
4.2 Sort UI Criteria [Study Participant]	9
4.2.1 Keyboard Accessibility	9
4.2.2 Study Pausing	9
4.2.3 Group Positioning	9
4.2.4 Card Scaling	9
4.3 Analysis Tooling Criteria [Study Owner]	9
4.3.1 Mindset Management	9
4.3.2 Category Standardisation	9
4.3.3 Standardised Matrix	10
4.3.4 Similarity Matrix	10
4.3.5 Dendrogram	10
4.3.6 Similarity Map	12
4.3.7 Label Suggestions	12

4.4	Sample Card Deck	12
5	Tools	13
5.1	Proven By Users	13
5.2	UserBit	13
5.3	PlaybookUX	15
5.4	Userlytics	16
5.5	Card Sorter.	16
5.6	Useberry	17
5.7	OptimalSort	18
5.8	UXArmy	18
6	Concluding Remarks	21
A	Evaluation Spreadsheet	22
	Bibliography	25

List of Figures

2.1	Open Card Sorting	4
4.1	UXArmy: Category Standardisation	10
4.2	UXArmy: Similarity Matrix	11
4.3	Proven By Users: Dendrogram	11
5.1	Proven By Users: Participant Perspective	14
5.2	UserBit: Study Overview	15
5.3	PlaybookUX: Study Details	16
5.4	Userlytics: Category Standardisation	16
5.5	Card Sorter: Analysis Section.	17
5.6	Useberry: Study Overview	17
5.7	OptimalSort: Participant Perspective	18
5.8	UXArmy: Study Results Overview	19

List of Tables

4.1	Card Deck Used for Testing	12
5.1	Online Card Sorting Tools	14

Chapter 1

Introduction

Card sorting is a useful procedure to categorise concepts into groups, which are understandable and useful to the users of a web site or application [Spencer 2009]. Instead of the developer codifying their own perspective (mindset) into a web site's information hierarchy or application's menu structure, card sorting studies gather the perspectives of end users.

Even if the information to be sorted has an official categorisation, this might not be the most useful one for users. For example, even though a tomato is biologically a fruit, no one would search for it in the fruits section of an online supermarket.

There are many different tools available online, with no clear differences when looking at them at first glance. This paper surveys 14 multiple different online card sorting tools and compares their features. Eight systems were examined more closely, with particular focus on any integrated analysis tools. The goal is to discover the best tool to do card sorting tests online, while considering whether the tool is free or has any restrictions or limitations.

This survey first outlines the basics of card sorting in Chapter 2, before briefly discussing the analysis of card sorting data in Chapter 3. Chapter 4 then defines the criteria used for evaluation of the tools in this survey. Chapter 5.1 discusses the eight chosen tools and their features. Finally, Chapter 6 concludes the survey with recommendations for both free and commercial use cases. The entire evaluation spreadsheet is included in Appendix A.

Chapter 2

Card Sorting

Card sorting is a user experience (UX) research technique used to understand how people categorise and organise information [Spencer 2009; Hudson 2014]. It is particularly helpful in designing or refining the structure of websites, apps, information hierarchies, and other systems where organising content is essential. In a card sort session, representative users each look through a set of concept cards and group them as they see fit.

In advance, the study owner has to prepare the deck of concept cards. The cards might contain labels in two different languages or names, as well as unique numbers or IDs to ease the analysis for the study owner. At the beginning of the sorting process, the user should know what all of the words mean. In a supervised card sort, if anything is unclear the user can ask the facilitator.

The user then sorts the cards into groups and gives names (labels) to each of the groups, as shown in Figure 2.1. This step might differ in different kinds of card sorting. To gain insights into the user's thought process, it can be helpful to record (video) the sorting process as well as to encourage the user to think out loud. Once the user is finished, the study owner records the created groups and their assigned cards.

A typical card sort might involve 50 to 100 cards and 50 to 100 participants. Participants often fall into multiple mindsets, in terms of the strategy they use to group the cards. It makes sense to only analyse one mindset at a time, rather than jumbling up all of the sorts from users using different strategies. For meaningful statistical analysis, there should be at least 30 to 50 sorts in the mindset being analysed.

The kind of card sorting described above, where users create and label their own groups is known as *open* card sorting. In *closed* card sorting, participants are asked to place the cards into predefined labelled groups. In *hybrid* card sorting, a number of groups are given, but these can be renamed or deleted, or new groups created. This survey focuses on open card sorting, which gives insight into how user's would group concepts if left to their own devices. Testing how well an existing information hierarchy performs is better served by other methods such as tree testing.

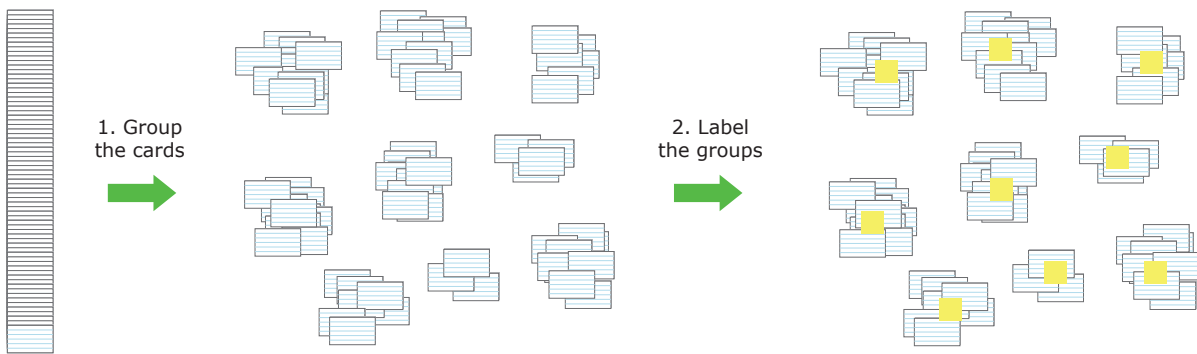


Figure 2.1: The user sorts given cards into their own groups and then labels each group. [Used with kind permission of Keith Andrews.]

Chapter 3

Analysis of Card Sorting Results

After the study is finished, the study owner has to make sense of the resulting data. There are two groups of analysis methods: manual and statistical [Fincher and Tenenberg 2005].

Most analysis starts with grouping the sorts by mindset (grouping strategy) and choosing one mindset to analyse. Next, the category labels have to be standardised, since different users choose slightly different terms of phrases to label the groups. Some groups may have to be merged or split. Manual methods are always necessary, as the process of thinking like the participants to empathise with their mindset cannot be automated.

Statistical methods are usually applied to help make sense of the standardised sort data and come up with a final grouping. Tools such as co-occurrence matrices, dendrograms, and similarity maps allow the study owner to more easily work with large amounts of data and to visualise groups of similar cards.

Chapter 4

Criteria for Tool Comparison

To structure the comparison, a total of 22 individual criteria were defined in three groups: Study Setup, Sort UI, and Analysis Tooling. The online card sorting tools were comprehensively compared using these criteria. The 22 criteria are represented by columns in the comparison spreadsheet included in Appendix A, which presents the results of this survey in a concise format.

4.1 Study Setup Criteria [Study Owner]

Study Setup Criteria are relevant to the study owner when setting up the study in the first place. They deal with different options in the tools, which are usually chosen once, before the study starts.

4.1.1 Licensing

The software license is important for any researcher, as it determines the price which has to be anticipated for a project. Students or independent researchers for smaller companies might not have the budget for a sophisticated commercial tool. The allowable values for this criterion are: “Free”, “Open-Source”, and “Commercial”.

4.1.2 Trial Version Limitations

Many of the commercially available tools offer a trial version of some sort, although the details vary. This criterion describes the limitations one has to expect when using the trial version. This could influence the decision-making process, especially if the project in question requires only one small card sorting study, rather than ongoing or repeated studies. A smaller one-time study might be realisable even within the limitation of a trial version.

4.1.3 100 Cards & 100 Participants

This criterion considers whether it is possible to perform a free study with this tool with 100 cards and 100 participants, even if only for a limited time. Some tools have trial limitations which restrict the number of cards or the number of participants, making it impossible to perform a proper study with it for free, while other tools have trial versions which are simply limited in time or features. This criterion is especially relevant for students who want to perform a proper card sorting project, but who lack the necessary funds to purchase a software license.

4.1.4 Type

As described in Chapter 2, there are three types of card sorting: open, closed, and hybrid. This criterion checks the possibility to perform each of them in a given tool.

4.1.5 Pool of Participants

Some tools offer a pool of participants, meaning that the study owner does not have to find participants themselves, but can utilise users of the online platform. Usually, the participants get paid a small amount for every study they complete. This means that the study owner generally needs to pay for this feature.

There are potential issues with participant pools, no matter what use case is pursued. Since users are paid a small amount, they have an incentive to complete studies as quickly as possible so they can finish more of them. This sometimes leads to them just checking answers randomly or in the case of card sorting, sorting cards into random groups without even reading them. Some platforms take active measures against such practices. In any case, the study owner needs to look through the results manually to check for any obvious signs of bogus groups, then discard that user's sort.

4.1.6 Import Cards

If the number of cards is large, it is impractical to enter all of them by hand, especially if descriptions are also required. To solve this problem, some tools provide the possibility to import cards from a local file, which can be prepared in advance. This saves much time and also provides the opportunity to run the cards through a spellchecker before the study. The allowable values for this criterion are: "Manual" (no import of cards from a file), "Paste" (cards can be pasted from the clipboard, or an import file format such as "CSV" or "XLSX").

4.1.7 Export Results

After a study is finished, the study owner might want to export the results. This is especially important if the tool in question does not provide sufficient analysis tools. It is also useful for archiving purposes. The allowable values for this criterion are "None" or an export file format such as "CSV" or "XLSX".

4.1.8 Shuffle Cards

If the cards are presented to all users in the same order, this could introduce a bias in the groups. To prevent this, it is a good idea to shuffle the cards for each user, i.e. randomise the presentation order, so that the first few cards do not prime the user for a specific mindset.

4.1.9 Card Images

Sometimes it is useful to have images added to the concept cards, even replacing the words on them. In the case of homonyms, an image immediately explains the meaning and it makes the cards easier to differentiate at a glance. Images also provide support for dyslexic participants who might otherwise misread a concept.

4.1.10 Recording

As with other usability tests, it is often useful to add a thinking aloud aspect to a card sorting study, so as to gain insight into why users act in certain ways or make certain choices. In order to do this, the chosen tool has to support session recording in some form. The allowable values for this criterion include: "None" if no recording capability is provided, "Audio" if the tool can record the participant's microphone input during the study, "Video" if the webcam can be recorded, "Screen" screen or window content can be recorded, and "Clickstream" if interactions like clicks or scrolling can be logged and potentially later replayed.

4.1.11 Save / Load Studies

For various reasons, a researcher might want to save the whole study (not just the results) in order to be able to load it again at a later time or possibly move it to a different server. Whether the data is zipped or put into a dedicated file format, this criterion determines whether it is possible at all.

4.2 Sort UI Criteria [Study Participant]

Sort UI Criteria are used to evaluate a tool as it might be relevant for the study participant. It focuses on the part of the tool where sorting is performed.

4.2.1 Keyboard Accessibility

This criterion is concerned with how accessible a tool is to keyboard controls, which is a prerequisite for usage of the tool with screen readers. The possibility to navigate through cards by pressing a button or assigning them to groups without mouse interaction are all part of this criterion. The allowable values for this criterion are: “None”, “Bad”, “Okay” and “Good”.

4.2.2 Study Pausing

This criterion shows whether a tool offers participants the option of pausing the sorting process midway and then returning to it later on. This might be beneficial for large card decks, but might not be desired by the study owner, since it disrupts the participant’s thought process which in turn might lead to a mindset switch during the pause.

4.2.3 Group Positioning

This criterion assesses whether a tool allows participants to freely position their created groups. For example, the tool could allow reordering of the groups, or a truly free positioning in a 2D canvas.

4.2.4 Card Scaling

With large card decks it is hard to maintain an overview of all cards. Scrolling through cards means that only a small proportion of cards are displayed at once. Another approach is to scale cards (like zooming), so that all of them can be displayed at once. This criterion shows whether a tool offers this feature or not.

4.3 Analysis Tooling Criteria [Study Owner]

Analysis Tooling Criteria are relevant to the study owner, when analysing the results from the study.

4.3.1 Mindset Management

Different users have different mindsets when sorting concepts. This criterion evaluates if the system provides tools to help define and manage mindsets. This could be by allowing users to name a mindset and then assign sorts to it. It makes sense to analyse one mindset at a time.

4.3.2 Category Standardisation

Different users assign different names to very similar groups of cards. Category standardisation is necessary to arrive at a clean dataset for further analysis. A common case is the use of synonyms: categories “Cleaning Products” and “Hygiene” could be standardised as “Hygiene”, especially if they generally contain very similar cards. Another example is the use of plurals: categories “Bird” and “Birds” should be standardised as “Birds”. Spelling mistakes can also be harmonised this way. An example of category standardisation can be seen in Figure 4.1.

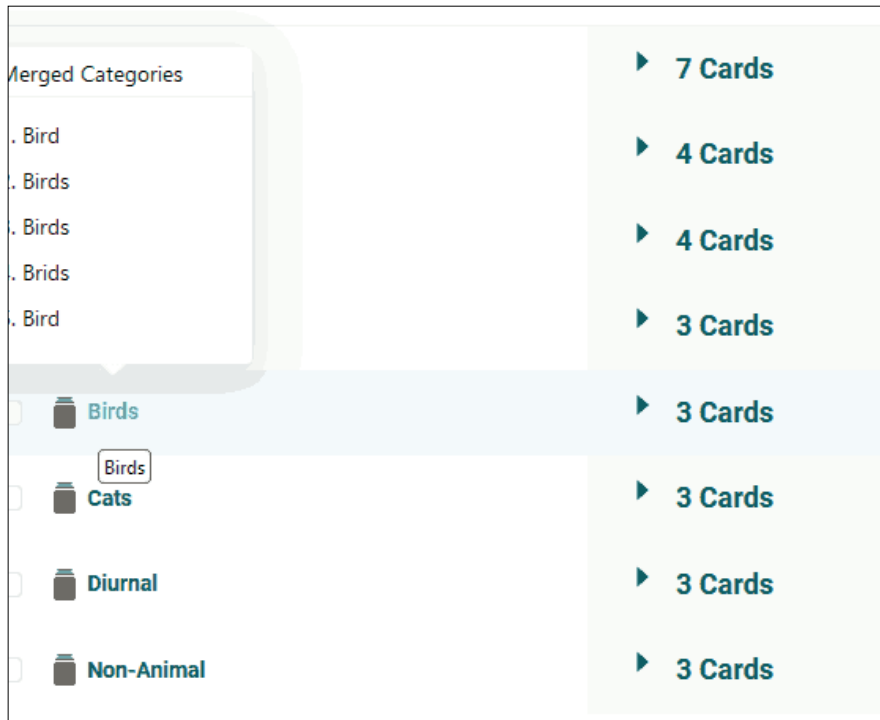


Figure 4.1: UXArmy: An example of categories being standardised. [Screenshot taken by the authors of this paper.]

4.3.3 Standardised Matrix

The standardised matrix (or merged matrix) shows the full sort data using the standardised category labels. Typically, the rows represent cards, and the columns represent sorts (i.e. the result of one participant). Each cell shows the standardised category where that user placed that card.

The matrix offers a good overview of the cards and categories. Usually the y-axis shows the cards while the x-axis shows the categories. Within the table the frequencies, how often each card is sorted in each category, are shown. Some tools also offer to show the absolute count per card as category instead of the frequency.

4.3.4 Similarity Matrix

A similarity matrix (or co-occurrence matrix) shows the correlation between each pair of cards. If two cards are always placed in the same category in every sort, the similarity will be 1 or 100%. If they are never placed together, the similarity will be 0 or 0%. The cards are shown along both the rows and columns. The matrix is symmetric along the diagonal, so sometimes only the top or bottom triangle is shown. Usually the similarity is colour-coded, with darker colours for stronger relationships. A good example of this can be seen in Figure 4.2.

4.3.5 Dendrogram

A dendrogram shows relationships between cards as the result of hierarchical clustering. More similar cards are related lower in the tree. An example can be seen in Figure 4.3. In OptimalSort, the thickness of the lines in the dendrogram indicates the degree of agreement across sorts. This is called the Actual Agreement Method (AAM) by OptimalSort, and works best with more data, the recommended minimum number of participants being 30. An alternative, the Best Match Method (BMM) makes more compromises and is useful for fewer than 30 sorts.

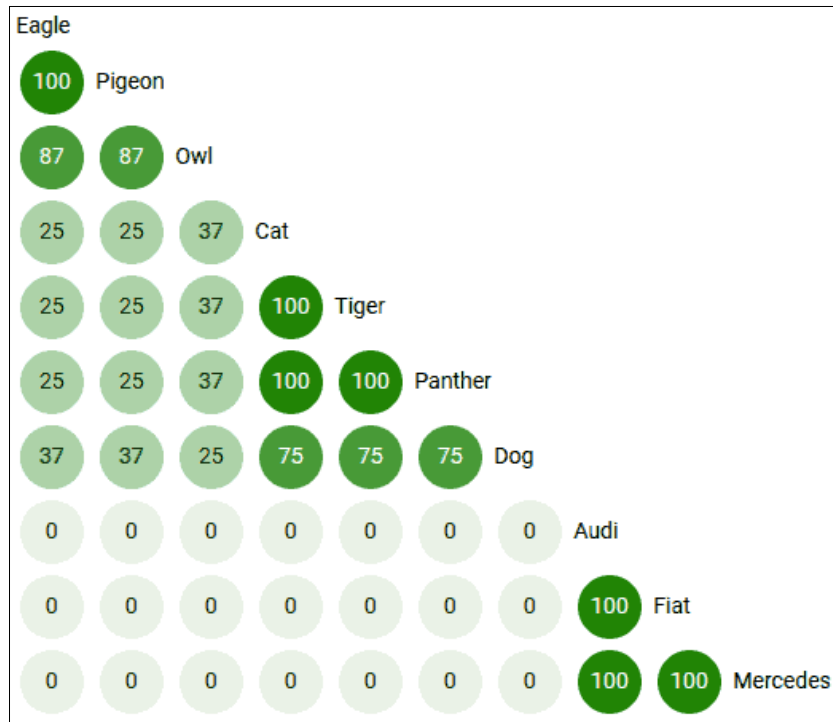


Figure 4.2: UXArmy: An example of a similarity matrix. Cards always placed together in every sort are considered 100% similar. [Screenshot taken by the authors of this paper.]

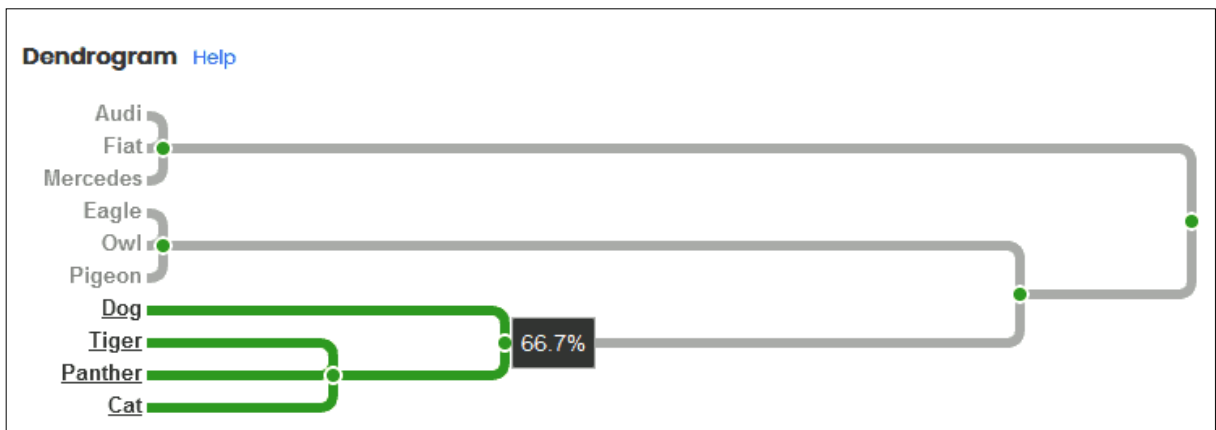


Figure 4.3: Proven By Users: An example of a dendrogram showing which cards are more closely related. [Screenshot taken by the authors of this paper.]

Number	English	German
1	Eagle	Adler
2	Tiger	Tiger
3	Panther	Panther
4	Owl	Eule
5	Audi	Audi
6	Pigeon	Taube
7	Cat	Katze
8	Fiat	Fiat
9	Mercedes	Mercedes
10	Dog	Hund

Table 4.1: The card deck used for testing the card sorting tools.

4.3.6 Similarity Map

A similarity map is a generic term for a visualisation where more similar items are closer in proximity. Often, techniques like force-directed placement (FDP), t-SNE, or UMAP are used to create the similarity map. Ideally, similar cards will form visual clusters.

4.3.7 Label Suggestions

It would be desirable for a tool to suggest labels for the resulting groups, based on the frequency of labels used in the sort data. These suggestions might appear in the dendrogram or simply as a list of groups with corresponding name suggestions.

4.4 Sample Card Deck

In order to test the tools with the same deck of cards, a sample set of ten cards was defined. This is fewer cards than would be present in an actual card sorting use case, but is sufficient to test out the user interface for a participant and gain an overview of the analysis tools from the study owner's perspective, while keeping the testing process quick. The deck of cards chosen for this study can be seen in Table 4.1. No descriptions or images were added to the cards for this survey, since not all tools offered that functionality.

Chapter 5

Tools

In an initial discovery phase, a list of 14 card sorting tools was compiled, from open-source software to commercial products. An overview of their capabilities and availability can be found in the spreadsheet in Appendix A. Of these, eight were chosen for more detailed exploration (chosen group). Mock studies were performed with a sample card deck and showcase videos were produced to illustrate each tool. The experiences with those studies, both as study owner and participant, are described in this chapter. Table 5.1 provides a quick overview of all 14 tools, whether they are in the chosen group, and whether they support a free study with 100 cards and 100 participants (for more details on this criterion see Section 4.1.3).

5.1 Proven By Users

Proven By Users is a commercial tool which supports multiple different types of user study [PBU 2023]:

- *First Click Testing*: to learn where a users first click will be.
- *Preference Testing*: to find out which design, copy or UX users like more.
- *Five Second Testing*: to discover the initial impression of users.
- *Card Sorting*: to determine the best information architecture.
- *Tree Testing*: to validate an application's information architecture.
- *Surveys*: to gather key information from users.

On the web site they also provide much useful information on where to use card sorting, how many users to test, and an in-depth explanation of all their options [PBU 2021].

The free plan only allows for a maximum of ten participants for a single study, which is a huge drawback, everything else works as a full version would. There are many options for how to set up the study. The participant view simple drag-and-drop mechanics and also works with a keyboard allowing for good accessibility. It can be seen in Figure 5.1. Interpreting the study results also has many different options, with group merging being very reliable as well as being able to undo the merge. If there were no limitations on the free version, this tool would be the best out of the tested ones.

5.2 UserBit

UserBit is a commercial UX research tool [Crayon Bits 2023]. The web site offers a variety of options for companies user experience research such as card sorting, tree testing, or user flow analysis. The first project created is for free. The € 30 monthly subscription comes with three projects. A full version costs around € 200 per month.

Tool	Section	Chosen	100 Cards & Participants
Proven By Users	5.1	Yes	No
UserBit	5.2	Yes	No
PlaybookUX	5.3	Yes	No
userlytics	5.4	Yes	No
Card Sorter	5.5	Yes	Yes
Useberry	5.6	Yes	No
OptimalSort	5.7	Yes	Yes
UXArmy	5.8	Yes	No
UXtweak		No	No
UXMetrics		No	No
Maze		No	No
Lyssna		No	No
kardSort		No	No
Diamond ISDS		No	Yes

Table 5.1: Online card sorting tools in this survey.

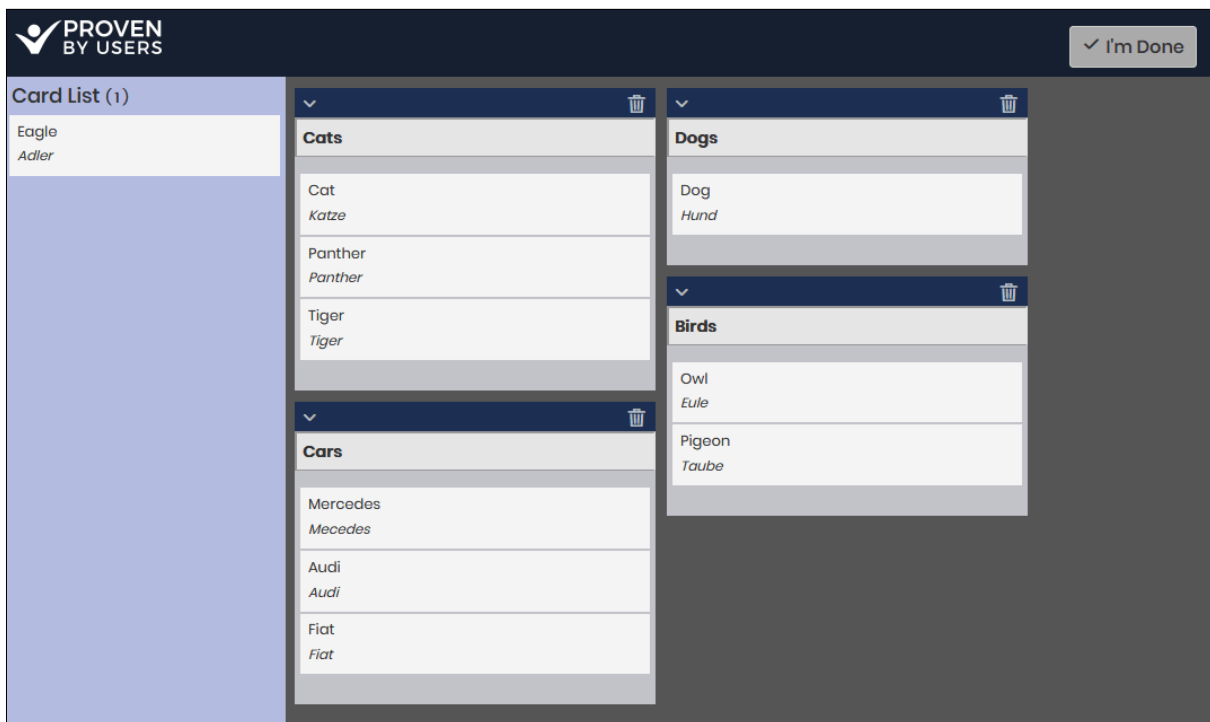


Figure 5.1: Proven By Users: Participant perspective. [Screenshot taken by the authors of this paper.]

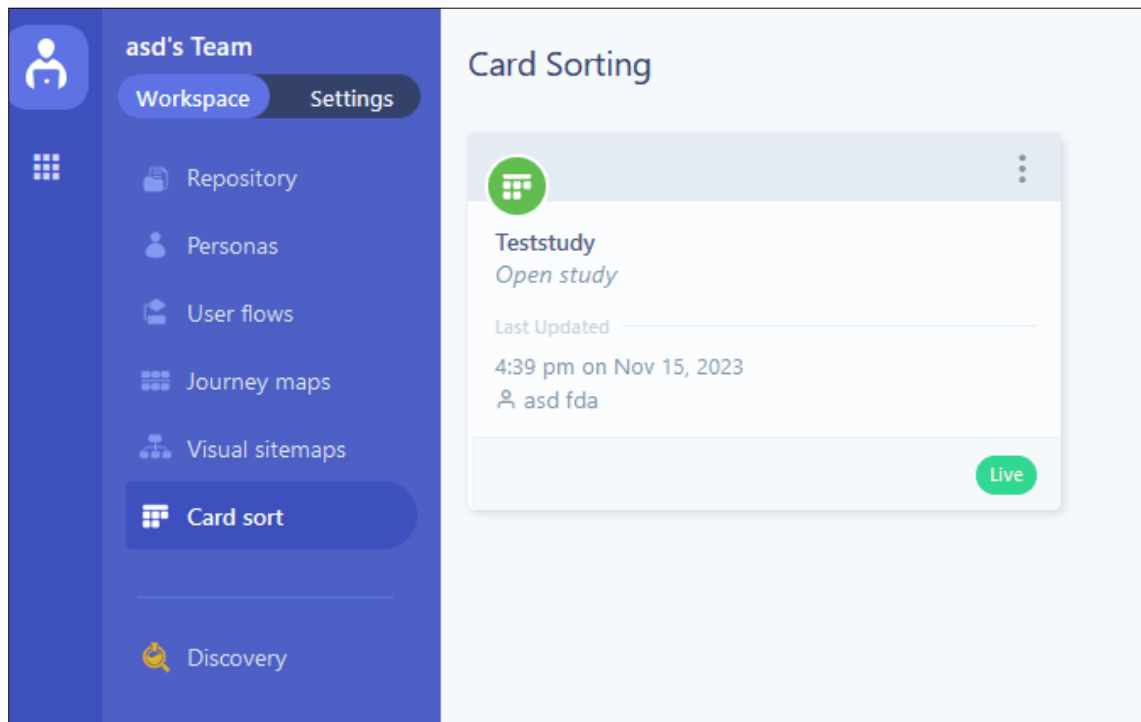


Figure 5.2: UserBit: Study overview. [Screenshot taken by the authors of this paper.]

In the study setup, a study owner can choose between open, closed, and hybrid card sorting. The tool offers the possibility to import csv files for the cards, as well as adding pictures to the cards. During setup, the study owner can decide if the cards should appear to the user in the uploaded order or shuffled. There is no possibility to record the participants or their screen during the card sort. Once the study is published, it can be paused or duplicated. An overview of the studies can be seen in Figure 5.2. Users are able to pause the card sorting process and return at a later time. Unfortunately, the tool does not scale well when adding many cards to a single group. Keyboard accessibility is also quite bad. Study owners have no option of exporting the study results. However, the tool offers a few analysis tools of its own, including the possibility to standardise categories, a similarity matrix, and categorisation confidence.

In conclusion, Userbit is a good tool for small card sorting studies. However, for a large study with many cards there are better tools available. Another drawback is the missing option to export results, which limits the study owner to the built-in analysis tools.

5.3 PlaybookUX

PlaybookUX is a commercial tool, which supports a variety of user feedback methods [PlaybookUX 2023], including card sorting and tree testing.

PlaybookUX supports open, closed, and hybrid card sorts. It provides free trial for 7 days with unlimited responses, the paid version which can cost up to \$ 290 per month. The study owner can add cards manually, upload images, and randomise cards, as can be seen in Figure 5.3. On the participant side, the study can be started by clicking on the link. Created groups can be moved easily according to personal preference. PlaybookUX does not allow a participant to pause a sort and continue at a later time. A number of tools are provided for the analysis of results, including category standardisation, similarity matrix, and dendrogram.

Overall, PlaybookUX has a limited trial period of 7 days, but the paid version is recommended for larger card sorting studies.

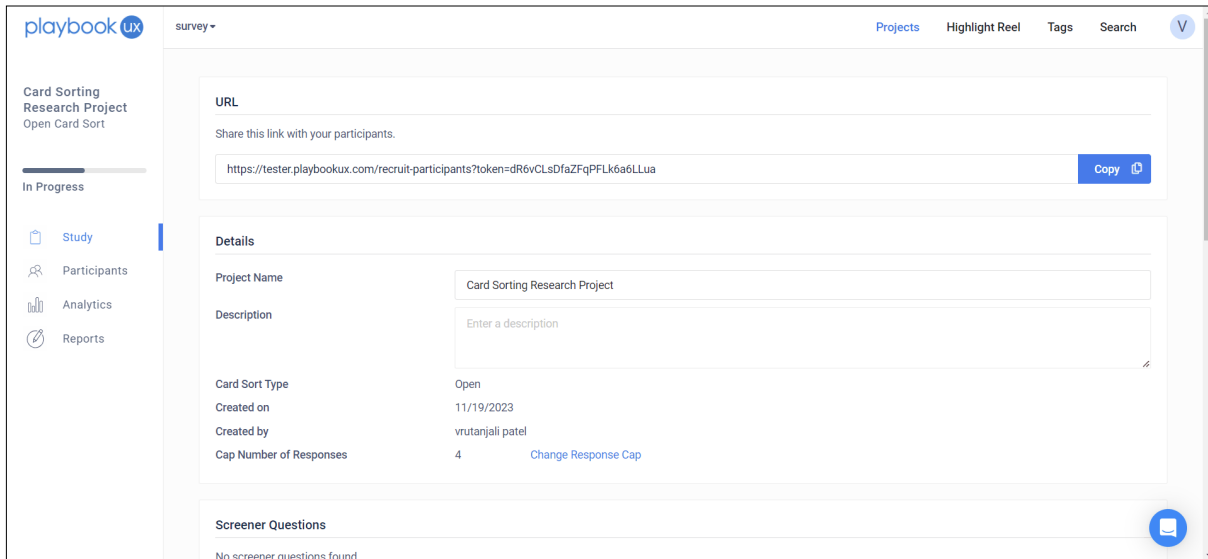


Figure 5.3: PlaybookUX: Study details. [Screenshot taken by the authors of this paper.]

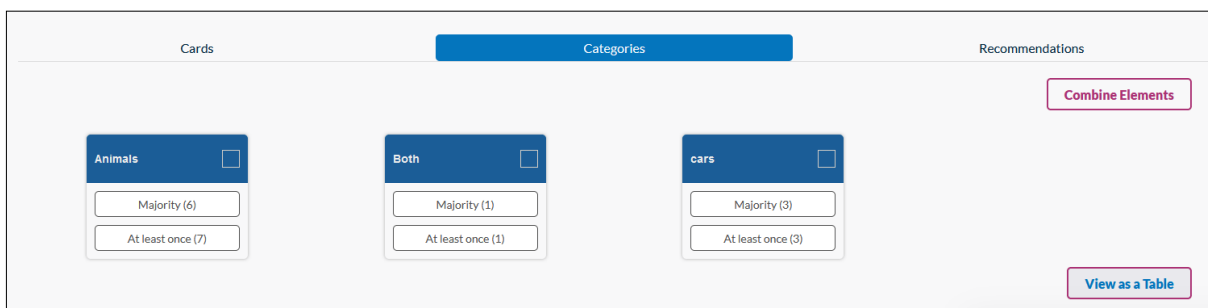


Figure 5.4: Userlytics: Category standardisation. [Screenshot taken by the authors of this paper.]

5.4 Userlytics

Userlytics provides a suite of online tools for user studies, of which card sorting is one [Userlytics 2023]. Userlytics requires every participant to record their screen and audio. A facilitator can also require the users to record themselves via video (webcam) during the test. Participants therefore have a high barrier to entry to overcome. Userlytics can provide a pool of users themselves, which would make it easier to recruit participants. There is no free option for this tool and payment is required per user who is tested, even if users are recruited outside of Userlytics. The interface during sorting is very clean, however it does not allow users to navigate via their keyboard. When analysing the results, there are many options for annotating the user video and taking notes, however there are almost no tools to get a statistical overview on the final group names. Category standardisation in Userlytics can be seen in Figure 5.4.

5.5 Card Sorter

Card Sorter is a small, open-source card sorting tool by George Melissourgos [Melissourgos 2021]. It supports only open card sorting and all card data has to be entered manually. The tool provides a similarity matrix and a dendrogram, but other than that has no analysis tools. An overview of these can be seen in Figure 5.5. From the perspective of participants it is easy and straightforward to use, cards being simply dragged into groups and naming new groups as needed. The user can submit partial sortings as well. Overall it is a solid tool, even if functionality is currently limited, an eye should be kept on it for future developments.

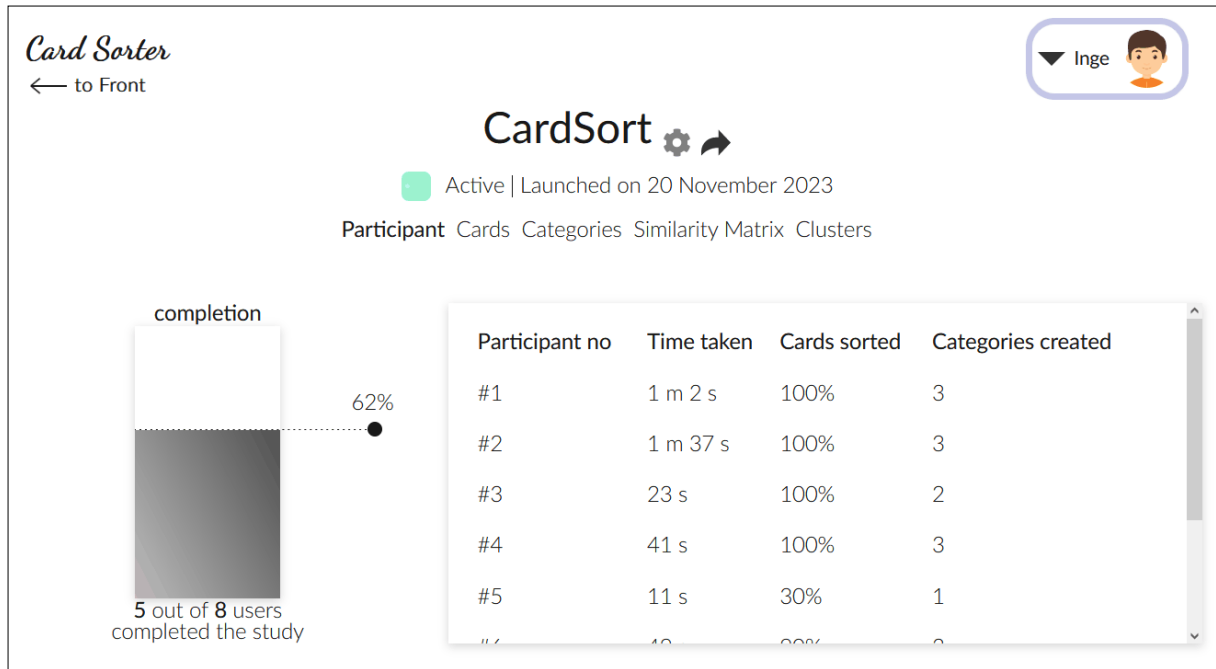


Figure 5.5: Card Sorter: Analysis section. [Screenshot taken by the authors of this paper.]

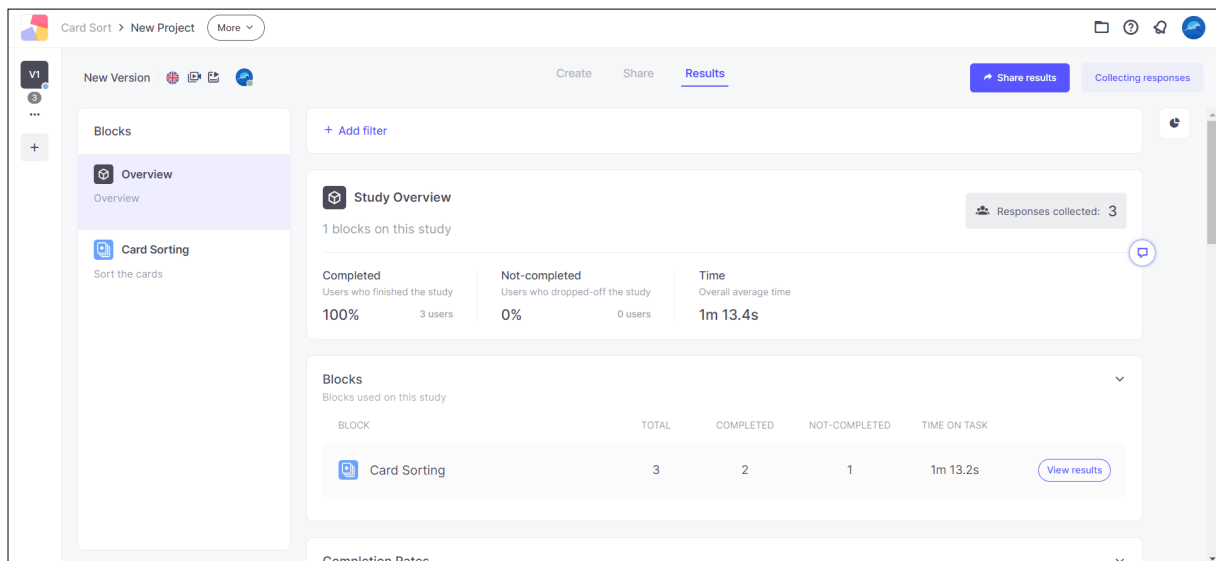


Figure 5.6: Useberry: Study overview. [Screenshot taken by the authors of this paper.]

5.6 Useberry

Useberry is a commercial tool, which supports a variety of user research methods [useberry 2023], including card sorting and tree testing. The free version of Useberry it is limited to 10 responses per month, the paid version allows 300 responses per month. Useberry supports open and closed card sorting. A study owner can add cards manually or in bulk using copy and paste. Pictures and descriptions can be added to cards, and the ordering can be randomised. It is possible to record session screen and audio. The study owner can start and end studies at any time. An overview of the studies can be seen in Figure 5.6.

Once a study is finished, the results can be shared online and are shown with analysis tools like standardisation grid and similarity matrix. Exporting the results is not available in the free version.

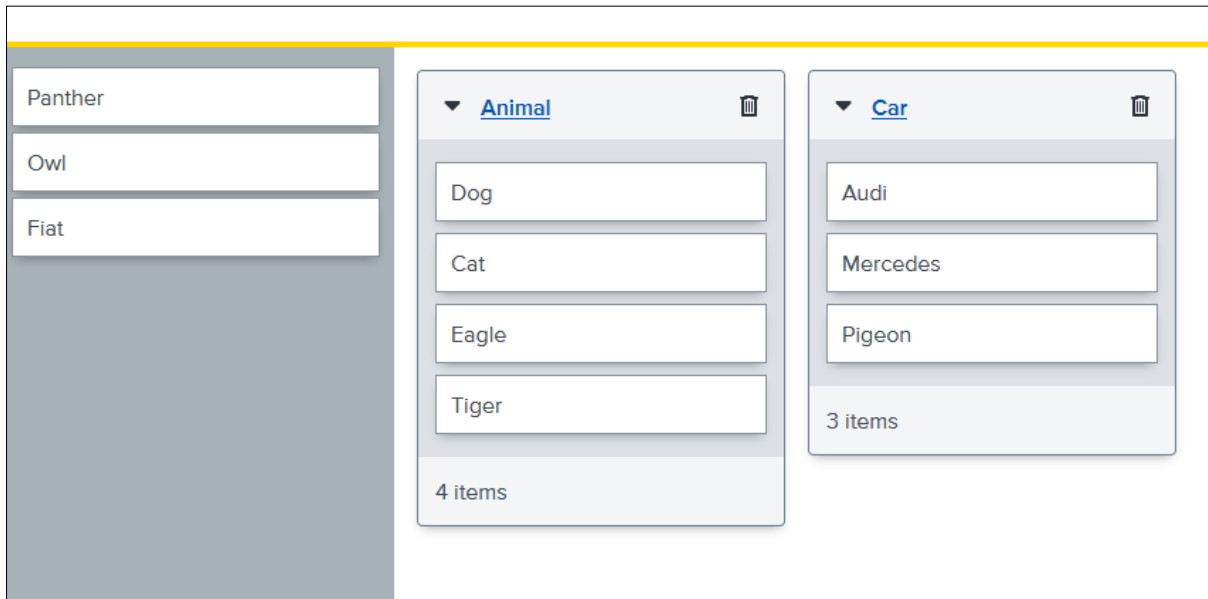


Figure 5.7: OptimalSort: Participant perspective. [Screenshot taken by the authors of this paper.]

Session recordings can provide different moments on the screen like clicks, moves, scrolls and touches, and participants can be asked to think out loud. Overall, the free version of the Useberry tool can be recommended for conducting a small study. With the paid version, a study owner can conduct a large study and can export the results at the end.

5.7 OptimalSort

OptimalSort is a commercial online tool, which supports a number of user research tools, including card sorting and tree testing [OW 2023]. The pro version of the tool costs around € 200 per month. However, the company offers a limited free version too. OptimalSort supports open, closed, and hybrid card sorting. Setting up studies on the web site is fairly easy. Already prepared card decks can be included using copy and paste. The study owner can add pictures to the cards as well as randomise the order in which participants will see the cards. After publishing a study, it can be paused and relaunched as well as duplicated.

On the participant side, OptimalSort offers good keyboard accessibility. Created groups can be placed freely in the whole area. Participants can pause the study by saving the link and return later by opening the link in another window. The participant perspective can be seen in Figure 5.7. OptimalSort can provide a pool of participants, who the study owner can pay to participate. Once a study is finished, the results are immediately available in the analysis tool of the web site. There is no option to record sessions, but OptimalSort still provides insight on the participants such as the country and time taken to complete the card sort. The analysis tools include category standardisation, similarity matrix, dendrogram, and a similarity map. The results can be exported in a variety of formats such as CSV or XLSX. Overall, OptimalSort is a solid tool to use. However, the pro version is recommended to use all of the available features.

5.8 UXArmy

UXArmy is a commercial tool offering many possibilities for user testing, including card sorting and tree testing [UXArmy 2023]. Card sorting costs around € 80 per month. However, there is a free 7-day trial. Setting up studies is fairly easy. A study owner can upload cards and create open, closed, and hybrid

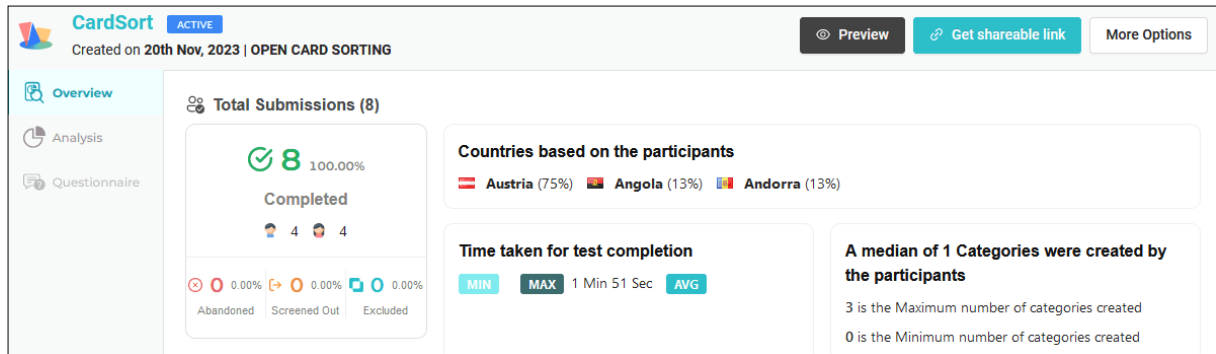


Figure 5.8: UXArmy: Study results overview. [Screenshot taken by the authors of this paper.]

card sorts. Adding pictures to cards is possible, as well as shuffling cards. UXArmy provides a pool of participants, who can be paid to participate in the study. The tool does not offer screen or video recording of the user during the study. Launched studies can be paused and duplicated. Once a participant has started the card sort, they have to either finish it or start all over again, as there is no possibility to pause and continue later. Accessing the cards or groups with the keyboard is not possible. However, created groups can be placed freely in the designated area.

UXArmy provides four analysis tools: category standardisation, standardised matrix, similarity matrix, and categorisation confidence. Figure 5.8 shows the results overview. It also offers the possibility to download the study results as a XLSX file. Overall, the tool can be recommended to use for card sorting studies. Although the tool is not cheap, it offers many options for the study owner in the setup process as well as different analysis tools. However, each research tool is charged for separately.

Chapter 6

Concluding Remarks

The tools explored in this survey are very homogeneous in their features. Although some tools provide vastly more features than others, there are few tools with truly unique features, like for instance clickstream recording, and those features are probably not the deciding factor in the choice of tool. Since the foremost deciding factor in choosing a tool will likely be the study owner's budget, two distinct recommendations are made: one for free tools and one for commercial tools.

From the commercial tools, this survey recommends Proven By Users (see Section 5.1), since it offers stable performance and many features for both the participants and study owners. It has useful analysis tools and some features to simply make the work easier. Additionally, it also offers other types of user studies in addition to card sorting.

As for the free tools, the options are sadly rather limited with only three tools to choose from. Amongst these Card Sorter (see Section 5.5) is this survey's preferred tool, since it offers a few analysis tools and is very easy to use. However, as development of these tools continues, it is well worth going back to each of them to see the changes.

For a short-term solution not requiring a budget, a free trial might suffice. In this case, it is recommended to peruse the tools fulfilling the criterion of enabling a study with 100 cards and 100 participants for free, as explained in Section 4.1.3.

Appendix A

Evaluation Spreadsheet

Bibliography

- Crayon Bits [2023]. *UserBit*. 2023. <https://userbit.com/> (cited on page 13).
- Fincher, Sally and Josh Tenenberg [2005]. *Making Sense of Card Sorting Data*. *Expert Systems* 22.3 (23 Jun 2005), pages 89–93. doi:10.1111/j.1468-0394.2005.00299.x. <https://faculty.washington.edu/jtenenbg/publications/fincherMakingSenseOfCardSorting-expSys2005.pdf> (cited on page 5).
- Hudson, William [2014]. *The Encyclopedia of Human-Computer Interaction, 2nd Ed*. 2014. <https://interaction-design.org/literature/book/the-encyclopedia-of-human-computer-interaction-2nd-ed/card-sorting> (cited on page 3).
- Melissourgios, George [2021]. *Card Sorter*. 2021. <https://usability.csd.auth.gr/card-sorter/> (cited on page 16).
- OW [2023]. *OptimalSort*. Optimal Workshop, 2023. <https://optimalworkshop.com/optimalsort/> (cited on page 18).
- PBU [2021]. *Card Sorting Intro*. Proven By Users, 2021. https://provenbyusers.com/help/Card_Sorting-Introduction.html (cited on page 13).
- PBU [2023]. *Proven by Users*. Proven By Users, 2023. <https://provenbyusers.com/> (cited on page 13).
- PlaybookUX [2023]. *PlaybookUX*. 2023. <https://playbookux.com/> (cited on page 15).
- Spencer, Donna [2009]. *Card Sorting: Designing Usable Categories*. Rosenfeld Media, Apr 2009. ISBN 1933820020. <https://rosenfeldmedia.com/books/card-sorting/> (cited on pages 1, 3).
- useberry [2023]. *Useberry*. 2023. <https://useberry.com/> (cited on page 17).
- Userlytics [2023]. *Userlytics*. 2023. <https://userlytics.com/> (cited on page 16).
- UXArmy [2023]. *UXArmy*. 2023. <https://uxarmy.com/use-cases/card-sorting> (cited on page 18).