Exploring the Mental Model of Reputation of Reddit Users: A replication

with extension

Ryan Lang Friedrichsmeier

University of Twente

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First Supervisor: Jule Landwehr

Second Supervisor: Dr. Simone Borsci

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Abstract

This paper investigates the mental model of Reddit users concerning the construct of reputation. Reputation is vital in social online communities, especially in times of misinformation and fake news. We are not aware of any available digital system on the market that enables users to judge other users' reputations. To develop such a reputation system, the first step is to identify the users' mental model of reputation. This paper conceptually replicates Landwehr (2020), to broaden scientific knowledge by applying her methodology to a more specific scope. More specifically, this paper will investigate a specific social online community, namely Reddit. The methodology of Landwehr (2020) consists of first conducting a word association study to find words connected to the construct of reputation, and then using a card sorting study to create the mental model. This paper furthermore compares the found mental model to the one found by Landwehr (2020) to see how the mental model of a specific community differs from a mental model derived from multiple social online communities. We identified a Reddit users' mental model of reputation, and we compared it with the one previously identified by Landwehr. The comparison of the two suggests that different social online communities have similar concepts in their mental model, but how these concepts are connected is still unclear. One interpretation of the results is that the reputation constructs of different social online communities have a common core of concepts but are detailed in different manners in line with community-specific elements. Another possible interpretation is that the reputation constructs of different social online communities draw upon a common set of concepts, but each community connects these concepts in a unique framework. More research into the validity of these interpretation and reputation in specific social online communities, in general, is needed. The study functions as a steppingstone for future research in the field. It provides a mental model of reputation of Reddit users, as well as a basic structure for future research into mental models of social online community users to build upon.

Introduction

Online communities play a significant role in the lives of most people. 76% of global internet users have engaged in online communities (Beer, 2021). These communities can be e-commerce sites like eBay or Amazon, or social networks like Facebook, Reddit, or LinkedIn (Schrammel et al., 2009; Zhou et al., 2021). Online communities offer several benefits to both users, and companies. They offer users a way to have discussions, gain information (Zacharia & Maes, 2000), satisfy the human need for sociability (Ganley & Lampe, 2009), and can be a source of social support, especially for members of minorities (Baams et al., 2011). Further, other businesses can use this publicly shared data about the community members and interests (Ganley & Lampe, 2009), for example, in advertisements.

Next to this plethora of benefits, online communities also face several issues. Most online community users are anonymous (Omernick & Sood, 2013). While this benefits some users in some circumstances, it can also lead to so-called deindividuation amongst users. Deindividuation takes effect if an individual does not feel identifiable, and leads to lower self-regulation and concern for the reaction of others (Omernick & Sood, 2013), which can result in undesirable behaviours. These maladaptive behaviours from users include acts such as cyberbullying, trolling, or spreading fake news (Omernick & Sood, 2013; Guo, 2020; Saurabh et al., 2022). This is not to say that anonymity itself is inherently bad, but rather that it also has negative consequences and leads to issues within online communities.

It is essential to know whom to trust and who not to (Ming Fan et al., 2005), but the anonymity of social online communities can make this difficult. Putting trust in the wrong people online is not just a threat for the actor, in the sense of putting themselves in danger of cyberbullying or fraud, but potentially for society at large, especially when the truthfulness of information and facts are on the line. One of the major impacts of fake news, for example, is ideological polarisation, which leads to its consumers being more radical in their opinions, ultimately damaging democracy and social stability (Au et al., 2021). Another example would be the COVID-19 pandemic, where misinformation led to lower adherence to public health guidelines, potentially amplifying public health risks (Endo et al., 2022). The anonymity of social online communities makes it hard to judge who is trustworthy and reliable, and the deindividuation resulting from that anonymity makes it easier for users to be tempted to act maliciously online. A system rating the reliability of users could allow users to make an informed decision on whom to trust, as well as alleviate some effects of the phenomenon of deindividuation.

Some efforts and research have been put into solving the issues of deindividuation and reputability in e-commerce (Liang et al., 2009; Zhou et al., 2021). One solution is implementing a reputation system, which is now a widespread way in the e-commerce space to reflect the trustworthiness of sellers (Xie & Lui, 2015). Reputation can be defined as "an opinion resulting from collective opinions of community members (Alboaie & Vaida, 2011), or as "public opinions and thoughts about a certain thing or object" (Jeragh et al., 2012). Sites like eBay use a system where

buyers can leave feedback ratings for sellers based on their satisfaction with the process and result. These feedback ratings form the basis of the reputation score of the seller. This reputation score is the cumulative sum of all ratings the seller has received. (Xie & Lui, 2015). They enable the buyer to make an informed decision about the seller. Therefore, reputation scores are an important tool for the buyer to have trust in the seller and a satisfying experience on the site (Zhou et al., 2021; Jeragh et al., 2012). It is worth investigating if a similar system could be introduced to social online communities to alleviate the issue of trustworthiness and reputability caused by anonymity and deindividuation.

Research shows that, at least in some instances, reputation is already a factor users consider before engaging in social online communities. Altay et al. (2020) investigated the relationship between fake news and reputation in social online communities but without a dedicated reputation system. They found that only a very small percentage of users are responsible for most fake news in social online communities. Furthermore, they found that the main reason why people do not engage in sharing fake news is that they feel that their reputation is at stake. This shows that, at least when it comes to spreading fake news, reputation stops people from engaging in malicious behaviours in social online communities. A reputation system could enhance this two-fold, firstly, by making the threat of loss of reputation more visible on the website, and secondly, by making the small number of users spreading fake news more easily recognisable for other users.

Several studies have concerned themselves with the question of reputation and reputation systems in social online communities (Alboaie & Vaida, 2011; Landwehr, 2020; Saurabh et al., 2022). Landwehr (2020) set out to find whether there is an underlying structure for reputation in social online communities. She first investigated the construct of reputation itself and what concepts make up the construct of reputation in social online communities to reveal users' mental models. Her findings suggest that the mental model is comprised of at least two relevant systems, an automated one and a peer-to-peer one. Based on this, she suggests a reputation system that considers these two separate systems as separate components. The automated component uses an algorithm to create scores on constructs important to reputation. Examples are "activeness" or "engagement". These facets are further divided into subconstructs, in the case of activeness for example, into "participation", "socialising", and "productivity". The algorithm continuously collects data on these subconstructs and calculates a score. A second categorical algorithm is used to see whether the data collected is of a positive or negative nature. Based on this, both negative and positive scores are calculated and displayed. Thus, two scores are displayed per subconstruct, one showing their negative score on the subconstruct and one showing their positive score. This allows a user seeing these scores to consider the other user's positive and negative evaluations.

The second component suggested by Landwehr is a peer-to-peer component. This component uses user feedback to evaluate other users on certain constructs. An example of such a construct would be "behaviour", with the subconstructs "beliefs" and "attitude". This peer feedback is weighed according to the reputation of the feedback provider and the history between both users.

Like Landwehr (2020), Saurabh et al. (2022) also utilise an automated and peer-to-peer system, but they take it somewhat further. They propose the SMART tool for trust and reputation management. SMART uses both automated and peer-to-peer systems for computing trust scores. After posting a piece of content, so-called "trust oracles" compute a trust value for this piece of content. Based on these trust values, SMART computes a normalised trust rating for this specific piece of content. For now, two trust oracles are implemented, one community-based, utilising a percentage of upvotes a post gathered in a specific community, and one machine learning-based, classifying posts as trustworthy or fake. Furthermore, based on these trust scores, SMART computes reputation scores for users. Two different reputation scores are created, one specific to a user's reputation in a given community, and one global score reflecting a user's reputation across all communities present on the site. The SMART tool offers community members a great deal of customising opportunities. For example, they can choose which trust oracles are used to compute the initial trust scores, and how these trust scores are weighted in the reputation score computation. The researchers plan to add more trust oracles, such as a fact checker, in the future. It has not yet been integrated or tested in an active community.

While this system seems promising, it still has a few downsides and unanswered questions. Especially the customizability options raise questions. Is every community on a social media site potentially going to have its own computational basis for trust and reputation ratings? If the answer is yes, or at least potentially yes, these different computational bases per community need to be communicated to the users so they can judge the scores appropriately. Furthermore, it is unclear whether the needs and wants of the users were considered while creating this tool, as the paper does not explain how it arrived at its assumptions. Therefore, it can be questioned if users would use this tool if it were to be offered.

Between the two, Landwehr's approach seems the more promising one as her methodology is more thorough and provides a basis for future studies and systems to build upon. For this reason, it was decided to replicate her study conceptually by applying her methodology to a new context to gain new insights.

Both Landwehr and Saurabh investigated mixed social online communities in their work. This means they did not look at a specific community but rather at social online communities as a whole. This was reasonable for them as they both did more fundamental research. Nevertheless, the question arises whether the idea of what reputation means is the same in different online communities. Simply because all online communities have different systems and are used by different people, users might have different mental models of reputation. It makes sense to investigate if and how much the mental models of users of reputation differ per online community.

Thus, the main rationale behind the present work is to replicate and extend the results of Landwehr by investigating a specific community. The chosen community is the social media site

Reddit. The specific purpose is to gain insights into the construct of reputation of Reddit users as well as into the question how social online communities differ from one another regarding their reputation construct.

Reddit is a social media website where users can post various content about different topics. Its focus lies more on the content shared than on the person sharing it, like on comparable websites, such as Instagram. Reddit was chosen because it is more structured around specific communities than similar websites. Its structure is based on so-called "subreddits", which are groups or community boards centred around a topic or field of interest. Examples include TV shows, bands, cities, or hobbies. Furthermore, Landwehr investigated users of all age groups. However, depending on age, people might have different ideas of reputation in online communities. Thus, this study will examine users between the ages of 18 and 35. This age range was chosen because it covers generations that spent formative years in social online communities.

Aims of the present study

This paper aims to add to scientific knowledge by conceptually replicating Landwehr's study. Her methodology will be used to investigate whether the mental model of reputation of one specific community differs from a mental model found by using mixed social online communities (i.e., the one found by Landwehr). The community that will be investigated is the social media site Reddit.

In line with the work of Landwehr we will attempt to develop a mental model of reputation for the specific community of Reddit by following two phases: first we perform a word association study with the aim of findings words connected to the construct of reputation to use in a card sorting study; then, we will perform a card sorting study with the goal of eliciting and creating a mental model of reputation for Reddit users. Both the result from the word association study and the found mental model will be compared to their respective counterparts from Landwehr's study. No concrete expectations about the results of these comparisons can be formulated. Therefore, the comparisons will be used to *explore the relationship between the set of concepts and cluster representing the mental model of reputation for Reddit users and the mental model found by Landwehr.*

Phase 1 Word Association

Method

Participants

158 Reddit users, aged 18-35 (mean age 23.89 years), participated in the word association study, recruited via a voluntary response sampling. They were of various genders and nationalities (see Appendix A). Participants had to be aged between 18 and 35 and be users of Reddit to be included. 44% indicated that they use Reddit multiple times a day, 26% daily, 6% 4-6 times a week, 7% 2-3 times a week, 9% once a week, and 8% once a month. The study was approved by the University of Twente Faculty of Behavioural Management and Social Sciences Ethics Committee. All participants accepted the informed consent before participating. Forty participants who did not complete the survey were excluded. 118 participants remained.

Material

An online questionnaire was designed to measure what words are associated with the reputation of members of Reddit. The questionnaire consisted of seven items. The first six are demographic questions regarding data like age or gender. Additionally, participants were asked to indicate the amount of Reddit use. The last question asked the participants to write down the first three words that come to their mind if they imagine themselves using Reddit and think of the other user's reputation on the platform. The questionnaire was in English. For a detailed overview of all questions, including the word association question, see Appendix B. It was posted on multiple subreddits on Reddit and was also available on the SONA system of the University of Twente. Participants needed an internet connection and a computer or similar device to access the study.

Procedure

In the online questionnaire, first, the participant was asked to read and accept the informed consent (see appendix C) and fill in some demographical data. After that, the participant was asked to write down the first three words associated with reputation when they imagined themselves using Reddit. In the end, the participant was thanked for filling in the questionnaire.

Data analysis

The words were scored based on the number of participants who named the same or similar words. Specifically, a score of "one" means one participant named the word, a score of "two" means the word was named by two participants, and so on. Based on these scores, a table was created with a score for every word. This table was compared to the words obtained by Landwehr to see whether matches could be found. It was also compared to Landwehr's list of words mentioned more than once.

        Based on this comparison, the final list of words to be used in the further research process was created. It was decided to add all words mentioned more than once in this word association study and all matches between this and Landwehr's word association study. The matches represent an agreement between the two studies' participants and hint at them being part of the mental model, thus warranting further research. So even though some of the words were only found once in either study, the fact that both found them is evidence enough to include them.

Results

The Word association task aimed to collect words to use in the card sorting study. A total of 216 different words were mentioned at least once by the participants. Among these 50 words were mentioned at least twice, and nine at least five times. Comparing the list of words found by the present study with the one found by Landwehr (2020), a total of 26 words were the same or similar (see Table 1). Six of the words found in this word association task were found multiple times by Landwehr. These words were *social*, *annoying*, *followers*, *public*, *blog* and *sharing*. The 25 most mentioned words from this study were mentioned 5.52 times on average; Landwehr's 25 most mentioned words were mentioned an average of 3.26 times in her research. While Landwehr found 25 words mentioned more than once, this study found 50. Table 1 shows the scores of the most mentioned words of the present study as well as matches with Landwehr's word association study. This means, words that were only found once in this study, but were also found by Landwehr are included in the table as well. These matches are indicated by a score in the "Score Landwehr" column. Words that did not match with words found in Landwehr's study have no score in the "Score Landwehr" column. See Appendix D for a dedicated overview of all matches between Landwehr and this study.

Table 1

List of words mentioned more than once and matches with Landwehr

Words	Score	Score Landwehr
Nerd/Nerdy	24	1
Karma	19	
Funny	10	
Upvotes	8	1
Argumentative	7	

Incel	7	
Interesting	5	
Male	5	
Annoying	5	2
Toxic	4	
Neckbeard	4	
Weird	4	
Lonely	4	1
Helpful	4	
Opinionated	4	1
Online	3	
Young	3	
Meme	5	
Questions	3	
Judgmental	3	
Crazy	2	1
Negative	2	
Forum	2	
Troll	2	1
Obnoxious	2	
Rude	2	
Precise	2	
Polite	2	
Community	2	
Antisocial	2	

History	2	1
Repost	2	
Comments	2	
Diverse	2	5
Social	2	1
points	2	
Posts	2	
Loser	2	
Controversial	2	
Informative	2	
Internet	2	
Downvote	2	
Men	2	
Curious	2	
Trustworthy	2	3
Introverted	2	
Liberal	2	
Hivemind	2	
Informed	2	
Outspoken	2	
Age	1	1
Followers	1	4
Mod/Moderator	1	1
Badges	1	1
Public	1	2

Sources	1	1
Gamers	1	1
Distant	1	1
Blog	1	2
Drama	1	1
Wrong	1	1
Reliable	1	1
Sharing	1	1
Eccentric	1	1

Note. Words with a score of one obtained during this study's word association task are included in the table if they were also found in the word association task by Landwehr. The words that were also found by Landwehr's study have their corresponding score displayed in the "score Landwehr" column.

Discussion

The goal of the word association study was to find words associated with the construct of reputation in the context of Reddit, as well as to see how they compare to the words associated with reputation in the context of mixed online social communities, as found by Landwehr. 216 words were found, 50 of which were mentioned more than once. 26 words were found that were also found by Landwehr, six of which were found multiple times by Landwehr.

Three of the five most mentioned words in this study are character descriptions of a, perhaps stereotypical, Reddit user (*Nerd/Nerdy, Funny, argumentative*). The other two words (*Karma* and *upvotes*) describe Reddit's current system to gauge the reputation and performance of posts and users. References to this system ending up high on the list makes sense. In general, many words are descriptors of a supposed user, and most of them are negative (see the aforementioned *Nerd/nerdy* and *argumentative,* but also *toxic, annoying,* or *incel*). This suggests that users of Reddit generally have a more negative picture of other people on the site. A reputation system could be helpful in this context to show users if the other person is indeed as negative as their stereotype would imply.

This negative stereotype amongst Reddit users could be due to the asymmetry of reputation. Asymmetry of reputation describes the phenomenon that it takes many instances of reputable behaviour to form a good reputation but only a few instances of unreputable behaviour to destroy a

good reputation (Altay et al., 2020). So, Reddit users might have a negative stereotype of other Reddit users only because of a few bad actors that confirm the stereotype, while most users act reputable and not according to the stereotype. A reputation system can be helpful in this case to break the negative perception of other users by making it more apparent that most users act reputable. This could then make the community a less hostile environment. Furthermore, any eventual reputation system should consider the asymmetry of reputation development in its calculations.

When comparing the findings from this study to Landwehr's findings, it appears that the current findings are more specific. This study mentioned words with a much higher frequency than in Landwehr's study (5.52 times on average compared to 3.26 times). This implies a higher agreement on the words among participants of this study, and, consequently, a more cohesive mental model. As Landwehr investigated mixed online social communities instead of one specific one, it makes sense that she found a broader mental model with less agreement amongst participants. It is plausible that reputation means somewhat has different meanings across different online social communities, with certain aspects being more or less important in certain communities. Thus, investigating mixed social online communities instead of specific ones will produce more broad findings. Consequently, her findings seem to describe the construct of reputation for social online communities in a more general sense compared to the present study.

Nevertheless, there is also considerable overlap between the findings of the two studies (26 matches in total, seven matches mentioned more than once). This suggests that there are some commonalities between the reputation constructs measured in the two studies, meaning that the reputation construct of Reddit users and that of mixed online social community users share certain aspects of their mental model. On the other hand, it also appears that the reputation construct of Reddit users has characteristics unique from the reputation construct of mixed online social community users, as most of the words found in the Reddit word association were not found in the mixed online communities word association. This implies that the construct of reputation has a core that is similar across all online social communities, but community-specific aspects and characteristics enrich this core.

These findings are investigated further in the second part of the study. This second phase consist of a card sorting study and utilizes the words obtained in the word association study to better understand the construct of reputation of Reddit users. This is then used to create the mental model.

Phase 2 Card Sorting

The word association study produced a list of 216 words associated with reputation on Reddit. This list formed the basis for the selection of words used in the Card Sorting. Two conditions were used for selection. Firstly, all words that were mentioned more than once were included. Secondly, all matches with the list obtained by Landwehr were included. This resulted in a list of 64 words. The second condition resulted in words being included that were only mentioned once during the word association because Landwehr also found them.

The card sort aims to get an understanding of the underlying semantic structures and mental model of reputation. The study deviates slightly from Landwehr's methodology in this phase. While Landwehr conducted an online card-sorting study, this study uses two focus groups as a sample. Furthermore, this study only did one card-sorting study instead of two, as Landwehr did. Like Landwehr, the card-sorting study will be used to create a mental model. The resulting mental model was compared to the mental model of Landwehr.

Method

Participants

Eight Reddit users in two focus groups of four people each took part in the card sorting study. 7 were male, 1 was female. 6 were Dutch, 1 German, and 1 Lithuanian. The mean age of participants was 23, with an age range from 19-29. The study was approved by the University of Twente Faculty of Behavioural Management and Social Sciences Ethics Committee. All participants agreed with the informed consent before participation. The participants had to be users of Reddit to participate. They were recruited via convenience sampling.

Material

A focus group session was designed. For this, a detailed script of the session was created, as well as written instructions for the participants (see Appendix E). 68 Cards with the words from the word association were created too. An audio-recording device was used to record the sessions. A smartphone was used to take pictures of the sorted cards. An online survey was used to gather demographic information about the participants (see Appendix F).

Procedure

In the first step, the participants were asked to sign the informed consent form and complete the demographic survey. After consenting and completing the survey, the participants were verbally instructed to familiarise themselves with the cards and sort them into groups that make sense to them.

This was a group task. Lastly, they were asked to name the groups, which was an individual task. After completing the session, a picture of the cards in their sorted form was taken, and the participants were thanked for their participation. For a more detailed description of the session, see the session script and all other material for the focus group session in Appendix 4.

Data analysis

To analyse the data collected during the card sorting, the Jaccard coefficient (Jaccard, 1912) was used. This similarity measure is used to obtain similarity measures between two items that can be represented in a similarity matrix. Two steps are necessary to calculate the Jaccard Coefficient for a pair of words. First, you need to count the number of groups both words belong to, and second, you need to divide it by the number of groups either word belongs to (Schmettow & Sommer, 2016). This score was first calculated in Excel for each focus group separately. After that, the two tables were merged into the final score table. Scores range from 0-2, with 0 meaning the two words were never sorted together, and 2 meaning that both focus groups sorted them together. This created an unorganised heatmap.

This final score table was then analysed in the programme "R". A vector analysis was performed to produce a heatmap and a dendrogram. These were used to answer the first research question. A dendrogram is a tree diagram that presents distances between vectors. This distance between clusters and sub-cluster is displayed on the horizontal axis. The vertical axis shows the sets of words and clusters. A vertical line must be drawn to find meaningful clusters in the dendrogram. If clusters border or are close to each other, they have a higher association than clusters that are far away. Three methods are used to find relevant clusters: (1) the elbow method (Thorndike, 1953), (2) the silhouette method (Rousseeuw, 1987), and (3) the number of clusters observed in the graph. These three methods will be explained shortly.

The elbow method uses a percentage of variance that can be explained by the number of clusters and puts them in a graph. In the beginning, the variance is high, but at some point in the data, the variance plummets and gives the data an angle reminiscent of an elbow. This point is then used to choose the number of clusters. The silhouette method utilises consistency within the clusters. Different values are calculated by measuring how similar a word is to its cluster compared to other clusters. The higher the value, the more similar the words are. One of the highest values is chosen to determine the number of clusters. In the last method, the number of clusters is selected based on the relative distances in the dendrogram. The graph is analysed for jumps in distances that might indicate where to cut the dendrogram. The context of the data is also considered in this method. See Appendix G for the code used to analyse the results.

The overall mental model was created based on the clusters in the heatmap and dendrogram. This mental model was then compared to the one obtained by Landwehr. This comparison looked at two aspects, cluster similarity and internal similarity of the clusters. Cluster similarity means that two clusters in both studies describe the same general idea, while internal similarity means that two

clusters contain the same concepts across both studies. The latter is only possible for words found in both word association studies. Their internal similarity was calculated using the Jaccard coefficient, as it was found to be a suitable similarity measure in card sorting (S. M. Liang & Tzeng, 2012). To calculate this, the first step is to count the number of matching words in the two clusters in question. Afterwards, all non-matching words need to be counted as well. In the last step, the number of matches is divided by the number of non-matches. The resulting score can range from 0 to 1, with 0 meaning no similarity and 1 meaning a complete match. (Schmettow & Sommer, 2016). Afterwards, the overall clusters were compared by looking at overlapping meanings to determine cluster similarity. These scores and judgements were used to answer the research question.

Results

The results of the card sorting study are presented in a dendrogram (see Figure 1) and a heatmap (see Figure 2). They are used to explore whether a set of concepts describing the mental model of reputation for Reddit users can be found. ***Dendrogram***

Figure 1

Dendrogram with clusters. Colours and dotted lines represent the different clusters
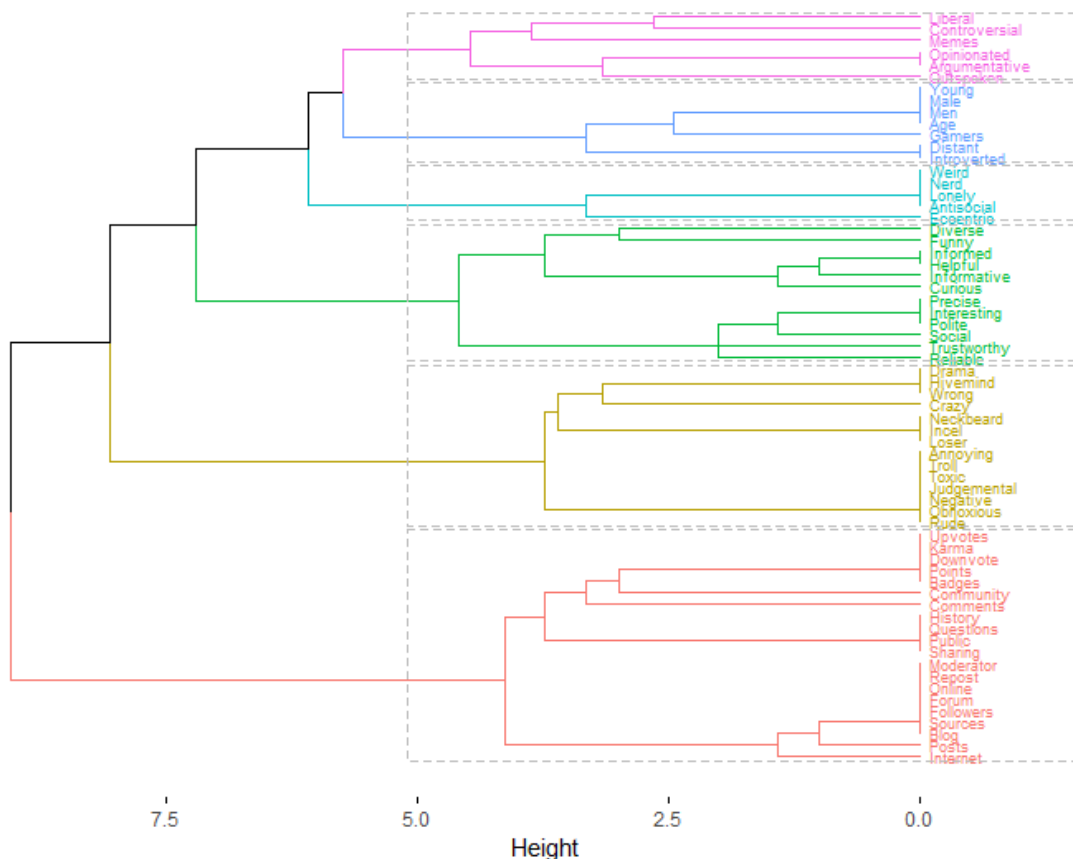
In the first step, the dendrogram was analysed. The elbow method suggests 4 clusters. The silhouette method suggests 9 clusters. Because these methods do not consider the context of the data, they only indicate where the line should be drawn. Thus, all three methods are used to find the cut-off point. Looking at the graph, it appears that the "jumps" in the data seem to get bigger around a height of 5.0. This indicates that after that point, things might have been merged that should not have been merged. Thus, 5.0 was chosen as the cut-off point. This resulted in 6 clusters. The dotted lines and colour-coded rectangles represent these clusters. The first cluster comprises *Liberal*, *controversial*, *Memes*, *opinionated*, *argumentative*, and *outspoken.* The second cluster is made up of *young, male, men, age, gamers, distant* and *introverted*. The third one is made up of *Weird, nerd, lonely, antisocial,* and *eccentric*. Cluster four contains *Diverse, funny, informed, helpful, informative, curious, precise, interesting, polite, social, trustworthy,* and *reliable*. Cluster 5 is made up of *drama, hivemind, wrong, crazy, neckbeard, incel, loser, annoying, troll, toxic, judgemental, negative, obnoxious,* and *rude*. Lastly, cluster 6 is made up of *upvotes*, *karma*, *downvote*, *points*, *badges*, *community*, *comments*, *history*, *questions*, *public*, *sharing*, *moderator*, *repost*, *online*, *forum*, *followers*, *sources*, *blog*, *posts*, and *internet*.

Heatmap

Figure 2
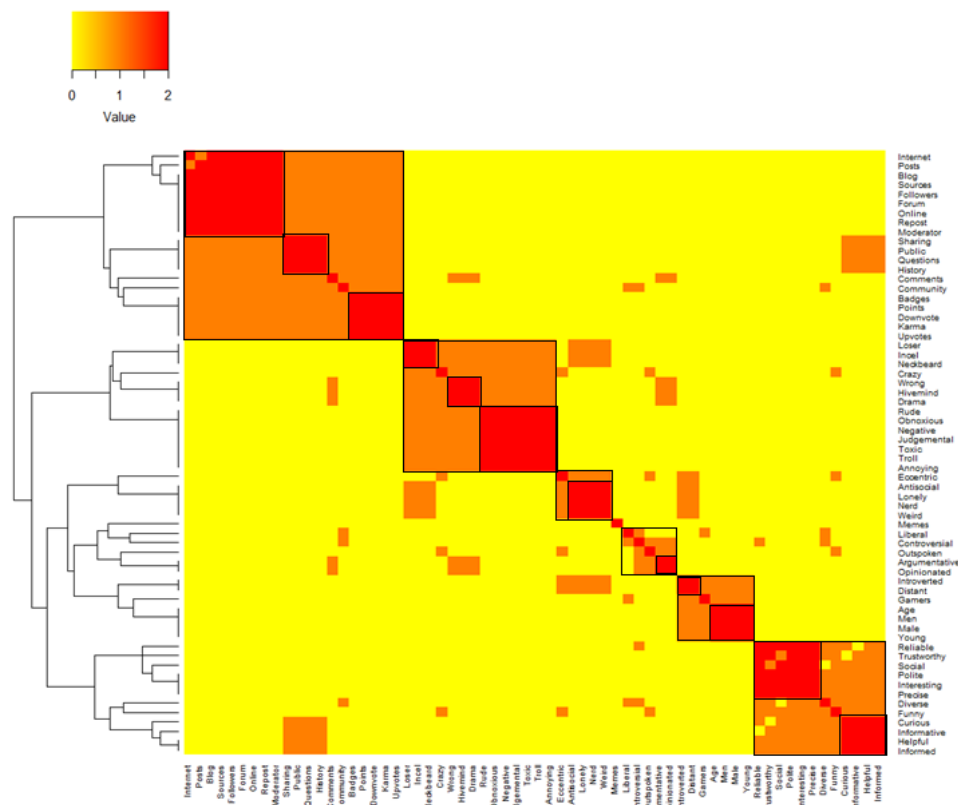
Heatmap with clustered Items

Figure 2 shows the results of the card sorting study in a heatmap. The colour represents the strength of the association between the two words, yellow meaning weak and red meaning strong. The more a word is sorted with another word, the stronger the association. There were two focus groups thus, yellow indicates the words were not sorted together, orange means they were sorted together by one group, and red means both groups sorted them together. The resulting rectangles in the heatmap are related to the clusters found in the dendrogram (see Figure 1). The orange clusters, indicated by the black boxes, are the same six clusters found in the dendrogram. These can be called main clusters. The red squares, indicated by the black boxes, located within the orange clusters are correlations that cannot be seen in the dendrogram. Since they are all located entirely within the orange clusters, they can be considered subclusters. In total, ten subclusters can be identified in the heatmap. The top left corner shows one such subcluster with a 9x9 square in red. These nine words are *internet, posts, blog, sources, followers, forum, online, repost,* and *moderator*. However, *posts* and *internet* were only sorted together by one group. Due to the nature of a heatmap, distances between groups cannot be seen on a heatmap.

Mental model

Based on the heatmap and the dendrogram, a mental model with clusters potentially related to reputation on Reddit was created. The heatmap, dendrogram, and the distances observed in the dendrogram were used to create the tentative cluster structure. Overall, six big clusters with ten sub-clusters were found. All clusters in the heatmap were part of bigger clusters in the dendrogram. Thus the heatmap clusters make up subclusters of the dendrogram. The heatmap overall suggests smaller clusters. The clusters of items associated with the construct of reputation on Reddit are presented in Table 2.

Table 2

Clusters and subclusters of items found by the dendrogram and heatmap associated with the construct of reputation on Reddit

Cluster Name	Dendrogram cluster	Heatmap clusters		
General User Traits	Young	Young		Distant
	Male	Male	Gamers	Introverted
	Men	Men Age		
	Age			
	Gamers			
	Distant			
	Introverted			
Nature of Discussion	Liberal	Argumentative		Liberal

	Memes	Opinionated	Memes	
	Controversial		Controversial	
	Argumentative		Outspoken	
	Opinionated			
	Outspoken			
Subjective Personality Of Reddit Users	Weird	Weird	Eccentric	
	Nerd	Nerd		
	Lonely	Lonely		
	Antisocial	Antisocial		
	Eccentric			
Reddit Ideas	Informed	Informed	Precise	Diverse
	Helpful	Helpful	Interesting	Funny
	Informative	Informative	Polite	
	Curious	Curious	Social	
	Precise		Trustworthy	
	Interesting		Reliable	
	Polite			
	Social			
	Trustworthy			
	Reliable			
	Diverse			
	Funny			
General Attributes Of The Website	Sharing	Sharing	Posts	Badges
	Public	Public	Blog	Points
	Questions	Questions	Sources	Downvote
	History	History	Followers	Karma
	Internet	Internet	Forum	Upvotes
	Posts		Online	
	Blog		Repost	
	Sources		Moderator	
	Followers			
	Forum			
	Online			
	Repost			
	Moderator			
	Badges			
	Points			

	Downvote				
	Karma				
	Upvotes				
Negative user perception	Drama	Drama	Neckbeard	Annoying	Crazy
	Hivemind	Hivemind	Incel	Troll	
	Wrong	Wrong	Loser	Toxic	
	Neckbeard			Judgemental	
	Incel			Negative	
	Loser			Obnoxious	
	Annoying			Rude	
	Troll				
	Toxic				
	Judgemental				
	Negative				
	Obnoxious				
	Rude				
	Crazy				

Note. The separate columns in the heatmap column represent the different clusters found in the heatmap, all of which are subclusters of their respective dendrogram clusters.

The first group seems to describe the general traits of users. It was produced during both focus group sessions. The subcluster describes the words the two focus groups agreed on. Both focus groups gave this cluster names that referred to the general nature of these traits, thus the name *general user traits* seem appropriate.

The second group is harder to summarise in a title. It is made up of two groupings from the first focus group they named "descriptors of argumentativeness" and "miscellaneous". There seems to be no pattern for the second focus group, as the words are spread over multiple clusters in their sorting. A name like *nature of discussions* seems to encompass all words in this group except for "memes".

Group number 3 is, barring one word, comprised of the cluster "subjective neutral descriptors of Reddit" from focus group 1. The subgroup is half of the "negative public perception of Reddit" cluster from focus group 2. The groups seem to disagree on whether words like "Weird" or "Nerd" are inherently negative. Both focus groups had discussions about this during the session itself as well. As all the words describe personality traits in a sense, a name like *subjective personality of Reddit users* seems adequate.

Group 4 is congruent with the "positive descriptors of individuals" cluster from focus group 1.

The first subgroup is a part of "Reddit forum ideals" from focus group 2, while the second subgroup is congruent with "Reddit user ideals" from focus group 2. There seems to be agreement on the positive nature of these words, thus the group will be called *Reddit Ideals*.

Group 5 is, except for two words, congruent with "general attributes of the website" from focus group 1. The subgroups are the second part of "Reddit forum ideals", "Reddit description", and "rating system" from focus group 2. Looking at the words, *general attributes of the website* seems to be a fitting name, with the subgroup names providing additional detail.

Lastly, group 6 is "negative descriptors of individuals" from focus group 1. The subgroups are "perception of interaction", the second part of "negative public perception of Reddit", and "description of negative users" from focus group 2. Compared to group 3, these words are more overtly negative, so a name like *negative user perception* seems adequate.

Comparison to the results of the original model of reputation

To explore the relationship between these findings and the ones of Landwehr, they have to be compared. The comparison of results is based on Landwehr's pilot study results. This was decided because it is more comparable to the card sorting experiment of this study in methodology than her second card sorting study. The first thing that becomes apparent after comparing the two is that Landwehr's findings are more nestled into each other than the results from this study. Furthermore, her results seem to be broader in general. When comparing the different groups directly, Landwehr's Group 1 and Group 5 "General Attributes Of The Website" in this study both seem to describe the same idea of general attributes. Six words can be found in both groups. Most of these matches can be found in the rightmost subgroup of Landwehr's group 1. Landwehr's group 3 describes the negative aspects of users similarly to the group "negative user perception" of this study. Three words match. The most significant difference is the presence of words like "vain" or "self-absorbed" in Landwehr's group, which reflects Reddit's text-based nature in opposition to other, more picture-focused social media. The cluster "Reddit ideals" and Landwehr's group 8 share three words between them, as, for the purpose of this study, the words "trust" and "trustworthy" are considered to be matching. Other than that, there seem to be minimal similarities between the findings of Landwehr's card sorting study and this card sorting study. Table 3 summarises the groups that include matching words and provides the Jaccard similarity index as a measure of similarity.

Table 3

Comparison of Reddit and Landwehr clusters based on the Jaccard similarity index

Reddit Cluster	Landwehr Cluster	Jaccard similarity index
General attributes of the website	Group 1	0.19

Sharing	*Moderator*	
Public	Sponsors	
Questions	*Public*	
History	Stars	
Internet	Trolls	
Posts	Content	
Blog	Memes	
Sources	Rating	
Followers	*Badges*	
Forum	*Points*	
Online	*Follower*	
Repost	Influencer	
Moderator	Profile Level	
Badges	Profile activity	
Points	Profile status	
Downvote	*Blog*	
Karma	Like	
Upvotes	Comments	
	Number of posts	
Negative user perception	*Group 3*	0.11
Drama	Meanigless	
Hivemind	Prejudice	
Wrong	Dangerous	
Neckbeard	*Annoying*	
Incel	Negative	
Loser	*Toxic*	
Annoying	Distant	
Troll	Self-absorbed	
Toxic	Vain	
Judgemental	Illusion	
Negative	*Drama*	
Obnoxious	Fake	
Rude	Manipulation	
Crazy	Disadvantage	
	Non serious	
Reddit Ideals Cluster	*Group 8*	0.15
Informed	*Helpful*	
Helpful	Supportive	
Informative	Positive	
Curious	*Reliable*	

Precise	Value
Interesting	Important
Polite	Honour
Social	Respect
Trustworthy	Credibility
Reliable	Meaningful
Diverse	**_Trust_**
Funny	

Note. Matches between Reddit clusters and clusters found by Landwehr are written in bold and italiscs.

Table 4 compares the overall idea of clusters found in this study to the overall idea expressed in clusters found by Landwehr's study. It provides a feel for how two given clusters relate to each other, as this is a very subjective analysis, especially because Landwehr did not give her clusters names. It presents what the researcher considers "expressing similar ideas" and allows the reader to understand the logic and come to their own conclusion. Only pairings where the words express a similar idea, excluding those already displayed in Table 3, are shown.

Table 4

Comparison of clusters that express a similar idea across both this and Landwehr's study

Current study	Landwehr
General User Trait Cluster	Group 5
Young	Individual
Male	Character trait
Men	Self-worth
Age	
Gamers	
Distant	
Introverted	
Reddit Ideals Cluster	Group 9
Informed	Active
Helpful	Involved
Informative	Spontaneous
Curious	Being alert
Precise	Perfetct
Intersting	
Polite	
Social	
Trustwrothy	

General attributes of the website cluster	Group 6
Reliable	
Diverse	
Funny	

General attributes of the website cluster	Group 6
Sharing	Verified
Public	Achievements
Questions	Rewards
History	
Internet	
Posts	
Blog	
Sources	
Followers	
Forum	
Online	
Repost	
Moderator	
Badges	
Points	
Downvote	
Karma	
Upvote	

The cluster "general user traits" and Landwehr's group 5 both describe individuals, although Landwehr's group is way more general in its terms. "Reddit Ideals" and Group 9 both describe positive user traits and traits a social online community should be promoting. Lastly, the cluster "general attributes of the website" and Landwehr's group 6 both pertain to attributes of the website, or rather mechanisms of social online communities. Especially the last subgroup of "general attributes of the website" describes a similar idea to Landwehr's group 6.

Discussion

The word association study set out to find words connected to the construct of reputation on Reddit. 216 words were mentioned at least once, 50 words were mentioned at least twice, and 9 words were mentioned at least five times. Furthermore, 26 matches between this word association study and the one conducted by Landwehr were found.

The card sorting study set out to first find a set of constructs that describes the construct of reputation for Reddit users and, secondly, to find out whether this set of constructs is similar to the one found by Landwehr (2020). A set of constructs representing the mental model of reputation for Reddit

users aged 18-35 was found. The similarity to Landwehr's results is not as clear-cut. It was possible to find six clusters describing the same idea between this study's results and those of Landwehr. On the other hand, only three clusters were found where the same words were sorted together, and within these clusters, the internal similarity was relatively low, with a Jaccard score ranging from 0.11 to 0.19.

A closer look at the results of this study's card sorting experiment shows that the mental model of reputation for Reddit users is somewhat consistent. Barring one exception, the focus groups always agreed on a name for their groupings, and there was considerable agreement between the two focus groups on how to sort the words. One group was more detailed, sorting the words into smaller groups, but they described the same general idea. This hints strongly at them describing the same mental model.

The results of this replication study imply that there indeed is a specific mental model regarding reputation for users of Reddit, and this mental model is somewhat connected to the one found by Landwehr (2020). More concretely, the results imply a structure that can be translated into a reputation system to be used on Reddit. The clusters *Negative User Perception, Reddit Ideals,* and *Nature of Discussions* all contain constructs that can be used to measure and rate individuals' behaviour to inform users better with whom they are dealing. The *nature of discussions* clusters could be used to rate specific posts, while the other two can be used to rate the user themself. Furthermore, the clusters *negative user perception*, and *subjective personality of Reddit users* together describe a stereotypical user of Reddit. This can be utilised by showing the user whether or not the individual they are interacting with fits this stereotype.

If we take a step back and look at the results from this study's card sorting experiment and Landwehr's experiment, her results again seem to describe a broader mental model than the results from this study. Not only does she have more clusters in total, but her clusters also have more nestled sub- and sub-sub-clusters. This more nestled and interwoven result hints at a less distinct and clear cut mental model. Looking at the context of her research, that makes sense as she investigated a mix of different social online communities, while this study examined only one. This is evidence of the expectation that online social communities have a common core in their reputation construct but also have more site-specific elements to them. More research into the reputation construct on different social online communities is needed to uncover those site-specific elements and what components might make up that common core.

The fact that matching words were only minimally sorted together, and the low internal similarity goes against the expectation of a common core. Finding pairs of clusters that describe the same concept across the two studies does hint at a common core. But the fact that matches from the word association studies were not sorted together goes against that interpretation. Instead, it seems to hint at the reputation construct being made up of similar building blocks connected differently without being the same structure. This could be due to the reputation construct of different social online

communities being more distant than initially imagined. Another reason for these findings could be the choice of social online community itself. Reddit is conceptually quite different from other social online communities due to how the user is visible on the site and its text-based nature. So, it is conceivable that Reddit's reputation construct is drastically different from other platforms, but the other platforms have a more similar reputation construct among themselves, akin to the common core hypothesis. Future research should clarify this by investigating the mental model of more specific social online communities.

The building-block hypothesis also seems more compatible with the findings from Vaid and Harari (2021). They found that the users of different social online communities systematically differ, based on personality traits. If social online community users are systematically different, and no social online community can be seen as prototypical, it suggests they also do not have a common reputation construct. A building-block approach to a community-wide reputation construct aligns more with this idea of independent user bases for social online communities. One thing to be kept in mind, however, is that Vaid and Harari (2021) investigated users' personality types, not thoughts on reputation, mental model of reputation or even user interaction in their study. Further research on these questions is needed to answer whether these speculations about a common-core or building-block model of reputation are valid. Generally, more research into more different social online communities is needed to determine if the common-core or building-block hypotheses are more appropriate.

Whether the common-core or building-block hypotheses turn out to be a better approximation of reality, a system using the trust oracle idea from the SMART tool could be a promising approach for a reputation system. For a system using the building-block hypotheses, the trust oracles for different aspects of reputation could be created that handle different computations. However, details like what variables are used for calculation, how they are weighed, and how the various aspects interconnect with each other are set by community managers. A system using the common-core hypothesis could offer similar customising features but with the addition of a set of variables as a common core.

Some limitations must be mentioned. Firstly, the sample size in the card sorting study. Having only two focus groups comprising only university students recruited via convenience sampling introduces much potential for bias. Future studies need to have a sample more representative of the user base of Reddit, as well as more data points. Specifically, the heatmap would benefit from more than two data points, as it would yield more nuanced results. Furthermore, it is unknown how volatile reputation construct of social online communities are. Landwehr's study was conducted three years ago, so it is unclear whether this could have affected the comparison of the two studies. How a social online community's reputation construct develops over time is unknown. The COVID-19 pandemic has to be especially considered in this. Landwehr collected her data before the outbreak of the pandemic. It is conceivable that this period of misinformation (Endo et al., 2022) had a considerable effect on the reputation construct of social online communities. Apart from the COVID-19 pandemic,

and its possible consequences, future research should investigate how reputation constructs in social online communities develop. Knowing how, in what aspects, and over which period reputation constructs develop gives important insights into how an eventual reputation system could be kept up to date.

Conclusion

This research set out to contribute to the creation of a reputation system for social online communities by investigating the mental model of reputation of users of Reddit, as well as comparing the mental model that emerged from surveying the Reddit users to the one identified by Landwehr (2020). The word association study found 216 unique words, and 26 matches with Landwehr's word association study. A specific mental model of reputation for users of Reddit was found. The comparison to Landwehr (2020) found that the two mental models overlap to some extent, but it cannot be concluded that they are the same. The two-step approach of collecting words associated with reputation on the given social online community followed by a card-sorting study to create the mental model still seems appropriate. However, a sample more statistically robust than two focus groups needs to be used in the future. No direct expectations about the comparison to the mental model found by Landwehr could be formulated. Comparing the results of the two word association studies hinted at a common-core within the reputation construct of different social online communities. Comparing the results of the present study and Landwehr hinted at another possible interpretations of the relationship between the reputation constructs of different social online communities, the building-blocks hypothesis.

This study showed that more research into the mental model of reputation and reputation in the context of different specific social online communities is necessary. This is important to find out what the relationship between the different communities' reputation constructs is, if the common-core or the building-block hypothesis holds up, or if there is an entirely different relationship. This relationship is essential for developing a reputation system, as it lies at the core of the question of how tailor-made to a specific social online community that system must be. Furthermore, more research into how reputation constructs in social online communities develop over time is needed to keep any eventual reputation system up to date.

Overall, this research functions as a steppingstone for future research into the development of a reputation system for social online communities. It showed that different social online communities have differences in their reputation construct and need to be investigated separately. For this, the study brought forward a mental model of reputation for Reddit users to be used as a reference point by future research. Furthermore, it provides a structure for future research into the reputation construct of

different social online communities to follow, by substantiating the methodology brought forward by Landwehr (2020). Both the common-core and building-blocks hypotheses are promising explanations for the relationship between reputation constructs of different communities. Additionally, further strong impulses for future research are provided. All of these are important contributions to the development of a reputation system for social online communities.

References

Alboaie, L., & Vaida, M. F. (2011). Trust and Reputation Model for Various Online Communities. *Studies in Informatics and Control*. https://doi.org/10.24846/v20i2y201107

Altay, S., Hacquin, A., & Mercier, H. (2020). Why do so few people share fake news? It hurts their reputation. *New Media & Society*, *24*(6), 1303–1324. https://doi.org/10.1177/1461444820969893

Au, C. H., Chiu, D. K., & Chiu, D. K. (2021). The Role of Online Misinformation and Fake News in Ideological Polarization: Barriers, Catalysts, and Implications. *Information Systems Frontiers*, *24*(4), 1331–1354. https://doi.org/10.1007/s10796-021-10133-9

Baams, L., Jonas, K., Utz, S., Bos, H., & Van Der Vuurst, L. (2011). Internet use and online social support among same sex attracted individuals of different ages. *Computers in Human Behavior*, *27*(5), 1820–1827. https://doi.org/10.1016/j.chb.2011.04.002

Beer, C. (2021, March 9). *The Rise of Online Communities - GWI*. GWI. https://blog.gwi.com/chart-of-the-week/online-communities/

Endo, P. T., Santos, G. L., De Lima Xavier, M. I. L., Campos, G. R. N., De Lima, L. D., Silva, I., Egli, A., & Lynn, T. (2022). Illusion of Truth: Analysing and Classifying COVID-19 Fake News in Brazilian Portuguese Language. *Big Data and Cognitive Computing*, *6*(2), 36. https://doi.org/10.3390/bdcc6020036

Ganley, D., & Lampe, C. (2009). The ties that bind: Social network principles in online communities. *Decision Support Systems*, *47*(3), 266–274. https://doi.org/10.1016/j.dss.2009.02.013

Guo, C. (2020). Identity and User Behavior in Online Communities. *Companion of the 2020 ACM International Conference on Supporting Group Work*. https://doi.org/10.1145/3323994.3371018

Jaccard, P. (1912). THE DISTRIBUTION OF THE FLORA IN THE ALPINE ZONE.1. *New Phytologist*, *11*(2), 37–50. https://doi.org/10.1111/j.1469-8137.1912.tb05611.x

Jeragh, M., AlQuraishi, E., & AlDwaisan, E. (2012). A Twitter-Based Weighted Reputation system. *Procedia Computer Science*, *10*, 902–908. https://doi.org/10.1016/j.procs.2012.06.119

Liang, S. M., & Tzeng, L. (2012). *Assessing suitability of similarity coefficients in measuring human mental models*. https://doi.org/10.1109/seanes.2012.6299563

Liang, W., Yajun, G., & Mei, Q. (2009). A Reputation-Based Trust Evaluation Model for P2P E-Commerce. *International Journal of Distributed Sensor Networks*, *5*(1), 39. https://doi.org/10.1080/15501320802533467

Ming Fan, Yong Tan, & Whinston, A. (2005). Evaluation and design of online cooperative feedback mechanisms for reputation management. *IEEE Transactions on Knowledge and Data Engineering*, *17*(2), 244–254. https://doi.org/10.1109/tkde.2005.26

Omernick, E., & Sood, S. O. (2013). The Impact of Anonymity in Online Communities. *2013 International Conference on Social Computing*. https://doi.org/10.1109/socialcom.2013.80

Rousseeuw, P. J. (1987). Silhouettes: A graphical aid to the interpretation and validation of cluster analysis. *Journal of Computational and Applied Mathematics*, *20*, 53–65. https://doi.org/10.1016/0377-0427(87)90125-7

Saurabh, N., Herold, M., Fard, H. M., & Prodan, R. (2022). SMART: A Tool for Trust and Reputation Management in Social Media. *Euro-Par 2021: Parallel Processing Workshops*, 417–427. https://doi.org/10.1007/978-3-031-06156-1_33

Schmettow, M., & Sommer, J. H. (2016). Linking card sorting to browsing performance – are congruent municipal websites more efficient to use? *Behaviour & Information Technology*, *35*(6), 452–470. https://doi.org/10.1080/0144929x.2016.1157207

Schrammel, J., Köffel, C., & Tscheligi, M. (2009). Personality Traits, Usage Patterns and Information Disclosure in Online Communities. *BCS Learning & Development*. https://doi.org/10.14236/ewic/hci2009.19

Thorndike, R. L. (1953). Who belongs in the family? *Psychometrika*, *18*(4), 267–276. https://doi.org/10.1007/bf02289263

Vaid, S. S., & Harari, G. M. (2021). Who uses what and how often?: Personality predictors of multiplatform social media use among young adults. *Journal of Research in Personality*, *91*, 104005. https://doi.org/10.1016/j.jrp.2020.104005

Xie, H., & Lui, J. C. (2015). Modeling eBay-like reputation systems: Analysis, characterization and insurance mechanism design. *Performance Evaluation*, *91*, 132–149. https://doi.org/10.1016/j.peva.2015.06.009

Zacharia, G., & Maes, P. (2000). Trust management through reputation mechanisms. *Applied Artificial Intelligence*, *14*(9), 881–907. https://doi.org/10.1080/08839510050144868

Zhou, Z., Wang, M., Yang, C. N., Fu, Z., Sun, X., & Wu, Q. J. (2021). Blockchain-based decentralized reputation system in E-commerce environment. *Future Generation Computer Systems*, *124*, 155–167. https://doi.org/10.1016/j.future.2021.05.035

Appendix A

Gender and nationality of the participants of the word associations study

Table A1

Gender of participants

Gender	Count
Female	61
Male	59
Transgender Male	8
Transgender Female	2
Genderqueer	10
Agender	2
Genderfluid	2
Declined to answer	1

Table A2

Nationality of participants

Nationality	Count
American	40
German	32
Dutch	9
Irish	3
British	7
Portuguese	3
Canadian	4
Polish	2
Hong Kong	1
Swedish	2
Australian	3
English	2
Italian	2
Turkish	1
Swiss	2
Austrian	1
French	2

Slovak	1
Mexican	1
Serbian	1
Gabonese	1
Czech	1
Filipino	1
Latvian	1
Greek	2
Finish	1
Spanish	1

Appendix B

Questionnaire word association study

First we will start with some demographic questions.

What is your current gender identity? (check all that apply)

☐ Man

☐ Woman

☐ Female-to-Male(FTM)/Transgender Male/Trans Man

☐ Male-to-Female(MTF)/Transgender Female/Trans Woman

☐ Genderqueer, neither exclusively male or female

☐ Additional Gender Category, please specify

☐ Decline to Answer

How old are you in years?

What is your nationality?

○ Dutch

○ German

○ Other (please specify)

Do you use Reddit?

○ Yes

○ No

How often do you use Reddit?

○ Once a month

○ Once a week

○ 2-3 times a week

○ 4-6 times a week

○ Daily

○ Multiple times a day

What do you use Reddit for?

○ Entertainment

○ Discussions

○ Keeping up to date

○ Other

Now we will beginn with the word associaton task.

Imagine yourself using reddit. Please write down the first three words that immediately come to your mind when you think about reputation of users. After writing down the words, click on 'Next' to submit the questionnaire.

First word

Second word

Third word

Appendix C

Informed Consent word association study

You are being invited to participate in a research study titled *Word association study towards a reputation system in online communities for Reddit users*. Participation in this study is voluntary and takes approximately 5 minutes. The data collected will be used for my Bachelor's thesis.

The purpose of this study is to find out what concepts users of Reddit associate with the concept of reputation with the end goal of creating a reputation system for the site.

There are no known risks associated with this study. It being an online study makes the risk of a breach possible though. Your data is being treated confidentially. All data obtained by the study does not contain personal information. It might be shared in its original form to inform future research or validate research results, but not to serve any other goal than that of the research. The results will be reported in my Bachelor's thesis.

Study contact details for further information: Ryan Lang Friedrichsmeier, r.n.langfriedrichsmeier@student.utwente.nl

I have read and understood the study information dated [15/03/2023], or it has been read to me.

○ Yes

○ No

First, your informed consent is collected. If you indicate "no" on one of the question, you will be send to the end of the study and your data will not be used.

I consent voluntarily to be a participant in this study and understand that I can refuse to answer questions and I can withdraw from the study at any time, without having to give a reason.

○ Yes

○ No

I understand that taking part in the study involves recording my written responses.

○ Yes

○ No

I understand that information I provide will be used for a bachelor's thesis.

○ Yes

○ No

I agree that my information may be shared with other researchers for future research studies that may be similar to this study. The information shared with other researchers will not include any information that can directly identify me. Researchers will not contact me for additional permission to use this information.

○ Yes

○ No

Appendix D

Matches between Landwehr and this word association study

Table D1

Words found in both this and Landwehr's card sorting

Matches
Upvotes
Annoying
Nerd/Nerdy
Lonely
Opinionated
Crazy
Troll
History
Diverse
Social
Meme
Trustworthy
Age
Followers
Mod/Moderator
Badges
Public
Sources

Gamers

Distant

Blog

Drama

Wrong

Sharing

Eccentric

Appendix E

Materials Card sorting study

Task description

Imagine yourself using Reddit. You're browsing through different subreddits and see a number of things. First you see a post about your favourite movie star and one of the comments tells a story of an amazing feat from before they got famous. Another person responds to this comment by claiming that the movie star has always been a terrible person and should not be liked. You have never heard of that before. You are confused and don't know who to believe. Afterwards, you see a post about a current hot-button political issue with a very controversial opinion backed by a statistic. You decide to go to the comments and see someone talking about a statistic with the polar opposite implication. No one cites their sources. You close the website. You are unsure. Who are you supposed to trust? How can you know how reputable different users are?

Step 1: Familiarise yourself with the cards.

Step 2: Sort the cards into groups that make sense to you. There is no right or wrong. Just do what comes naturally. You have to agree as a group.

Step 3: Assign fitting and descriptive names to the categories. You can either as a group decide on names or assign names individually.

If any questions arise, please feel free to ask.

Script

[Participants enter the room]

Hello! Thank you for being here. Please have a seat. I will explain to you how this focus group session will go.

[Participants take a seat]

First of all, have a look at the information sheet. While you do that, I will tell you a bit about the study. I want to learn something about how reputation works on Reddit. We started with a word association study to gather words associated with reputation by users of Reddit. And now we want to make sense of these words. That's what you are here for. The final final goal of this work is to create a reputation system for social online communities.

Now please take a look at the informed consent form. If you agree to it, please sign the form.

[Participants sign the informed consent]

Also, please scan this code/enter this link and fill out the short questionnaire.

[Participants fill out the survey]

Now to the focus group. You are going to do something called card sorting. The goal is to elicit the underlying mental model of reputation of Reddit users. On the table you can find the cards you need to sort. In a first step, please familiarise yourself with the cards. In a second step, you have to sort them into groups that make sense to you. In this step you have to agree as a group on the way you sort the cards. There is no right or wrong. You can create as many groups as you deem necessary.
Let me give you an example of this.

[I demonstrate a card sort using the sample cards]

Also, please feel free to make use of the drinks and snacks provided. Please also have a look at the written instructions on the table. If you have any questions, please don't hesitate to ask.

[Participants do the card sorting task]

Ok great. In a last step, please give the different groups you created a descriptive name. Here you don't have to agree on one name and can assign names individually.

[I take a picture of the card sort]

{if the vibe allows it

      Do you maybe have subgroups you want to create within certain groups?

      }

Thank you for participating in this card sorting study! Your help is greatly appreciated. If you have any other questions still, please let me know. Feel free to grab another cookie.

[participants leave the room]

Appendix F

Informed consent card sorting study

Informed consent form template for research with human participants

Authors: BMS Ethics Committee with input from Human Research Ethics TU Delft

Last edited: 20-01-2022

Thank you for agreeing to participate in this focus group session. You can end this session at any time without any repercussions. Due to the nature of focus groups, anonymity cannot be assured. Everything discussed in the session, however, is confidential. So please, treat everything said during the focus group with confidentiality. Your data is being treated confidentially. All data obtained by the study does not contain personal information. It might be shared in its original form to inform future research or validate research results, but not to serve any other goal than that of the research. Data will be collected via audio recording. This audio recording will only be used for analysis in my Bachelor thesis and will be deleted immediately afterwards. The purpose of this study is to elicit the underlying mental model of reputation in the context of Reddit.

There are no known risks associated with this study.

Study contact details for further information: Ryan Lang Friedrichsmeier, r.n.langfriedrichsmeier@student.utwente.nl

Consent Form for [*Focus group*]
YOU WILL BE GIVEN A COPY OF THIS INFORMED CONSENT FORM

Please tick the appropriate boxes	Yes	No
Taking part in the study		
I have read and understood the study information dated [DD/MM/YYYY], or it has been read to me. I have been able to ask questions about the study and my questions have been answered to my satisfaction.	☐	☐
I consent voluntarily to be a participant in this study and understand that I can refuse to answer questions and I can withdraw from the study at any time, without having to give a reason.	☐	☐
I understand that taking part in the study involves taking part in a focus group discussion. Information will be recorded via written notes	☐	☐
Use of the information in the study		
I understand that information I provide will be used for my Bachelor thesis	☐	☐
Consent to be Audio Recorded		
I agree to be audio recorded.	☐	☐

Signatures

_____   _____   _____

Name of participant   Signature   Date

I have accurately read out the information sheet to the potential participant and, to the best of my ability, ensured that the participant understands to what they are freely consenting.

_____   _____   _____

Researcher name   Signature   Date

Study contact details for further information: Ryan Lang Friedrichsmeier, r.n.langfriedrichsmeier@student.utwente.nl

Contact Information for Questions about Your Rights as a Research Participant

If you have questions about your rights as a research participant, or wish to obtain information, ask questions, or discuss any concerns about this study with someone other than the researcher(s), please contact the Secretary of the Ethics Committee/domain Humanities & Social Sciences of the Faculty of Behavioural, Management and Social Sciences at the University of Twente by ethicscommittee-hss@utwente.nl

Appendix G

R code for card sorting data analysis

```r
library(gplots)
library(RColorBrewer)
library(tidyverse)  # data manipulation
library(cluster)    # clustering algorithms
library(factoextra) # clustering visualization
library(dendextend) # for comparing two dendrograms
library(pheatmap)
library(knitr)
#install.packages("Rtools")
#install.packages("knitr")
#install.packages("gplots")
#install.packages("RColorBrewer")
#install.packages("cluster")
#install.packages("factoextra")
#install.packages("dendextend")
#install.packages("pheatmap")
```


Read the data file & transform data in numerical format and give names


```{r}
my_data <- read.csv("results_complete.csv", comment.char="#")
rnames_my <- my_data[,1]
```


```{r}
my_data <- data.matrix(my_data[,2:ncol(my_data)])
rownames(my_data) <- rnames_my
```

```
```

```{r}
old_data <- read.csv("old_data.csv", comment.char="#")
rnames_old <- old_data[,1]
```

```{r}
old_data <- data.matrix(old_data[,2:ncol(old_data)])
rownames(old_data) <- rnames_old
```

Define colors of heatmap: red for high numbers

```{r}
my_palette <- colorRampPalette(c("yellow","red"))(n = 299)
```

#Heatmap

```{r}
heatmap_my <- heatmap.2(dendrogram = "row", my_data, key = TRUE
    , keysize = 0.9, key.title = NA, col = my_palette, density.info="none", trace="none",
    revC = TRUE, cexCol = 0.6, cexRow = 0.6, margins = c(5, 5), offsetRow = 0.2,
    offsetCol = 0.1)
```

```{r}
heatmap_old <- heatmap.2(dendrogram = "none", old_data, key = TRUE
    , keysize = 1.5, key.title = NA, col = my_palette, density.info="none", trace="none",
    revC = TRUE, cexCol = 0.9, cexRow = 0.8, margins = c(8, 8), offsetRow = 0.2,
    offsetCol = 0.1)
```

#Dendrogram

Elbow method

```{r}
fviz_nbclust(my_data, kmeans, method = "wss")+

  labs(title = NULL) +

  geom_vline(xintercept = 4, linetype = 2) # you need to put the line based on where the ellbow is so it can also be 1 or 10 instead of 6
```

```{r}
fviz_nbclust(old_data, kmeans, method = "wss")+

  labs(title = NULL) +

  geom_vline(xintercept = 3, linetype = 2) # you need to put the line based on where the ellbow is so it can also be 1 or 10 instead of 6
```

Silhouette method

```{r}
fviz_nbclust(my_data, kmeans, method = "silhouette") +

  labs(title = NULL)
```

```{r}
fviz_nbclust(old_data, kmeans, method = "silhouette") +

  labs(title = NULL)
```

Compute hierarchical clustering and cut into .. number of clusters

```{r}
hc1 <- hclust(dist(my_data))
```

```{r}
hc2 <- hclust(dist(old_data))
```

Visualise

You need to play around with the cex command. If you make it bigger your words get bigger but if they are too big you can not see every word.

```{r}
fviz_dend(hc1, cex = 0.5, k = 6, color_labels_by_k = TRUE, horiz = TRUE, rect=TRUE)
```

```{r}
fviz_dend(hc2, cex = 0.35, k = 3, color_labels_by_k = TRUE, horiz = TRUE, rect=TRUE,
labels_track_height=22)
```