User Sentiments and Dynamics in the Decentralized Web: Reddit Migration's Impact on Lemmy

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Abstract

Decentralized alternatives like Mastodon and Lemmy are gaining popularity in response to growing complaints about centralized social media platforms such as Twitter and Reddit, which frequently prioritize business interests over user experience. This study employs a mixed-methods approach to scrutinize the impact of Reddit users' migration on Lemmy. It elucidates user growth patterns, revealing significant registration spikes and centralization trends within decentralized structures. A sentiment analysis with VADER, incorporating a dataset of 48,272 comments from before and after the migration, depicts a predominantly positive sentiment towards Lemmy and criticisms of Reddit. A comprehensive survey with 354 responses from major Lemmy communities validates and supplements the findings, shedding light on users' motivations, adaptation experiences, and long-term intentions. Furthermore, qualitative interviews with 16 purposively sampled users offer in-depth insights into individual experiences, community dynamics, and perspectives on decentralization and engagement. This study reveals a promising future for Lemmy, highlighting its adaptability and users' commitment, and contributes valuable insights to the discourse on the sustainability and growth of decentralized platforms in a dynamic digital landscape.

Key Words: Decentralized Platforms, Lemmy, Sentiment Analysis, Quantitative Data, Qualitative Data.

I. INTRODUCTION

In recent years, the use of social media platforms, such as Facebook, YouTube, and TikTok, has increased exponentially, with a notable surge occurring during the COVID-19 pandemic. However, these platforms are profit-focused and are predominantly controlled by corporate entities [1]. Such social media setups are commonly referred to as centralized; they are characterized by a single organization's control over the entire platform's structure. These platforms adopt a "company-centric" approach over a "user-centric" approach, prioritizing monetary gains through strategies, such as personalized content delivery for user retention and advertising. Consequently, they grapple with issues ranging from the propagation of echo chambers to security and privacy concerns regarding user data [2].

Due to the challenges surrounding centralized social media, there has been growing interest in embracing the "Decentralized Web" as an alternative solution. Decentralized platforms aim to address the shortcomings and concerns associated with centralized platforms by focusing on establishing an open-source, transparent, and democratic environment [1,3].

Several decentralized platforms have garnered significant user bases. Among these, notable platforms include Mastodon (resembling Twitter's microblogging), Lemmy (resembling Reddit's forum), Diaspora (offering a macroblogging social network), and Misskey (also similar to Twitter's microblogging). Each of these software contains independent servers called instances that are capable of interacting with one another. These software and instances collectively form the Federated Universe, or "Fediverse", a collective of web-based platforms that are federated, which means they allow users to connect and communicate with others across platforms [4].

A recent example that highlights users' incentives to shift from centralized social media to platforms within the Fediverse is related to Elon Musk's takeover of Twitter. Subsequent changes, including the rebranding to "X", left a growing cohort of users dissatisfied. Many of these users migrated to Mastodon [5-6]. From October to November 2022, Mastodon experienced exponential growth, with active monthly users skyrocketing from 300,000 to 2.5 million. However, this peak was followed by a subsequent decline to approximately 1.7 million users after a few months [7-8]. In July 2023, Twitter was renamed to "X", and Elon Musk introduced changes like mandatory login to view

tweets and read limits of posts per user. These shifts triggered another exodus from Twitter, leading to yet another surge in Mastodon's user base [9-10].

Given this context, the focal point of this paper centers on Lemmy, a platform that has experienced a similar phenomenon. In June 2023, the community aggregator Reddit began to charge access to its data through its API, thereby causing third-party applications such as Apollo, Sync, and BaconReader to become unsustainable and shut down [11]. As a response, many "subreddits" (communities within Reddit) gathered in protest by organizing a temporary blackout. Lemmy then appeared as an alternative, causing it to grow suddenly in popularity like Mastodon. However, like Mastodon, after sometime the Lemmy userbase stabilized [12].

Mastodon, the largest decentralized software [13], has garnered noticeable attention in academic research [14], but Lemmy still remains relatively uncharted territory within academic discourse. This research paper contributes to this gap by delving through a case study into the dynamics of Lemmy's community during the Reddit user migration period.

To comprehensively understand the impact of the migration on Lemmy, this research adopts a mixed-methods approach, encompassing both quantitative and qualitative research techniques. The study initiated with the collection and analysis of user growth data. Results highlight spikes in registrations correlated with Reddit-related events and policy changes. It reveals patterns of centralization within the decentralized platform, with a concentration of users in specific instances. Secondly, a user sentiment analysis was conducted using data from both before and after the Reddit migration. For the pre-migration phase, data was specifically sourced from three communities: Reddit, AskLemmy and Fediverse on Lemmy.ml, spanning from May 12, 2020, to May 13, 2023. In contrast, the post-migration analysis extended to five prominent Lemmy communities across the major instances of lemmy.world and lemmy.ml, covering the period from June 1 to September 24, 2023. Cumulatively, this quantitative analysis incorporated a dataset of 48.272 comments. This analysis uncovered a predominantly positive outlook towards Lemmy and the migration, but criticisms of Reddit.

A survey about the migration was also conducted in the Reddit and Ask Lemmy communities from lemmy.world, as well as the Reddit community from lemmy.ml. With 354 responses, the survey data confirmed and complemented the findings from the user growth and sentiment analysis, elucidating user motivations for migration, adaptation to Lemmy's features, and long-term platform usage intentions.

Additionally, to gain deeper insights into individual experiences and perceptions, qualitative data were collected through short semi-structured interviews with open-ended questions. A purposive sample of 16 Lemmy users engaged in conversations regarding the Reddit migration was targeted. Thematic analysis of their responses provided nuanced insights and patterns, delving deeper into user motivations, experiences, community dynamics, perspectives on community management, platform decentralization, and user engagement. The findings in this paper offer significant insights into the intricate dynamics of the Lemmy community as a decentralized platform.

II. BACKGROUND

2.1. Literature Review

In the context of online communities, the development of the Decentralized Web signifies a transformative phase, introducing both innovation and challenges. Analysis of these platforms is a rather new academic research area; however, they already provide valuable insights [14].

2.1.1. Evolution, Challenges, and Legal Implications of the Decentralized Web

The ActivityPub protocol enables the Fediverse to maintain connections across many platform types, which presents a learning curve for users more familiar with centralized media. However, there's a noticeable inclination towards centralization even within this decentralized framework. For example, a small percentage of the instances host almost all users in Mastodon, evidencing that there is user, infrastructure and even content pressure for centralization [3]. Research into Pleroma has highlighted difficulties of moderating decentralized platforms due to the large number of individual instances. Tools like WatchGen, which can predict which instances will later have a policy imposed, have been proposed to help administrate instances [15].

The Fediverse's emphasis on fostering a completely free community, where users are allowed to choose their own moderation standards and communities, has also attracted the attention of policy and law researchers. Scalability, legal compliance, and filter bubbles are some of the challenges and risks that the Fediverse faces due to being decentralized. [16-18].

2.1.2. Migration Patterns in the Decentralized Web

Platform policy changes can drive significant user shifts [19]. Such migrations are not just numerical but bring with them shifts in user behavior, sentiment, and platform dynamics [20]. The migration from Twitter to Mastodon showed patterns that resembled an information diffusion model, similar to how epidemics spread. This indicates that individual migrations are significantly influenced by

broader social dynamics and peer influence. These migrations also pose several challenges, such as adapting to a new environment, maintaining user engagement and retention, and ensuring security and reliability.

User dynamics in decentralized communities differ from those in centralized ones. For instance, in Mastodon, a user's choice to stay is primarily influenced by their efforts to engage in social interactions, valuing the community-centered experience, rather than by the number of responses they receive or how frequently they share migration hashtags. Mastodon sets itself apart from established platforms by emphasizing community-centered experiences, in contrast to social media's usual priority for individual self-promotion or the creation of viral content [5, 6, 20]. Users migrated from Twitter to Mastodon not just because of Twitter's issues, but because Mastodon's unique features and community-oriented approach provided what they were seeking at that time. Mastodon, despite its differences from Twitter, effectively met these users' technical and social needs [21].

2.1.3. Advantages and Potential of Sentiment Analysis in Decentralized Platforms

A subfield of natural language processing, sentiment analysis focuses on discerning subjective information from textual data to determine the polarity of sentiments— be they either positive, negative, or neutral. Sentiment analysis has been used in research to gather insights on social media in various studies [22-23]. Due to social media's fast-paced structure, sentiment analysis can offer immediate feedback, access a vast demographic, facilitate understanding of trends, provide cost-effective market analysis, guide business decision-making, assist in crisis management, and even personalize user experiences [24].

Not many sentiment analyses have been conducted in the studies of the Decentralized Web. However, it presents a promising avenue for exploration, especially given the absence of licensing restrictions that are often associated with other platforms. For instance, Mastodon is similar to Twitter in content and usage but comes with permissive licenses that support research: an open-source AGPL license and user-generated content under a Creative Commons license. Mastodon has been used as an alternative for testing a multi-task learning approach for dialog acts and sentiment recognition, generating valuable insight into the correlation between sentiment and dialog acts and/while emphasizing its potential for transfer learning in Natural language processing tasks [25].

2.2. Lemmy

Lemmy is an open-source Decentralized Web platform released in 2019 [26]. Similar to community aggregator

Reddit, Lemmy contains communities users can join and participate, like a forum. They can comment on posts and upvote or downvote both comments and posts. The difference between them is that Lemmy is also separated by instances. Each instance has its own separate rules, admins and communities. Users need to create only one account on an instance of their choice, such as lemmy.world. Once registered, they can seamlessly subscribe to the communities (akin to subreddits on Reddit) of their chosen instance.

The true power of Lemmy becomes evident when users want to join communities in other instances. For example, if a user on lemmy.world finds a community on lemmy.ml appealing, they can simply append the instance name to the community URL: lemmy.world/c/fediverse@lemmy.ml. This way, Lemmy users can access and engage with multiple communities across different instances without the need for multiple accounts. For referencing, usernames on the home server can be simply mentioned as @username. However, for referencing users on a different instance, the format is @username@instance_name [27].

When a user logs in to their local instance, they are presented with filter options. The first filter is between posts and comments. The second one is divided into: 1. "Subscribed", with posts and comments of communities the user is subscribed to; 2. "Local", showcasing posts and comments from communities within the user's local instance; and 3. "All", containing all posts or comments that have been retrieved from both local or other instances' communities. This way, as long as the instances the user wants to see are federated with their local instance, Lemmy users get to explore them comfortably, without the need to create other accounts.

Reddit's API policy changes made users want to move to another platform, but meanwhile they also protested in the form of blackouts inside subreddits, making them private and inaccessible for a period of time. This, however, is not the first time Reddit has had this happen; in July 2015 moderators of 2,278 subreddit communities disabled their subreddits because of a sudden dismissal of a key employee who supported moderators, combined with broader grievances about Reddit's lack of communication with moderators [28]. Like Twitter with Mastodon, Reddit's unpopular decisions influenced Lemmy's fast growth [11-12].

At the time of the writing of this paper, some of the most popular instances with active local communities (100 users a day or more) that possess around 10,000 users or more include: lemmy.world (133,000 users), lemmy.ml (47,300 users), lemmynsfw.com (39,200 users), hexbear.net (24,900 users), sh.itjust.works (23,300 users), lemm.ee (21,900 users), beehaw.org (13,000 users), lemmy.dbzer0.com (11,100 users) feddit.de (10,500 users), lemmygrad.ml (9,800 users).

III. METHODOLOGY

The primary goal of this paper is to better understand how Lemmy, as a decentralized social media platform, was impacted by the migration of users from Reddit. To achieve this objective, this study employed a mixed-methods approach, incorporating both quantitative and qualitative data. The methods employed include analysis of user and server growth, comment activity data, user sentiment analysis with VADER, a multiple-choice survey, and an open-ended questionnaire.

3.1. Examination of Growth Metrics and User Engagement

3.1.1. Lemmy User Growth Data Collection

With the assistance of fediverse.observer, a website dedicated to compiling statistics on Fediverse software, this study gathered data on Lemmy's growth both before and during the Reddit migration period. Observations depicted in Fig. 1 to Fig. 4 show that user activity remained consistent for the majority of the year before undergoing exponential growth across all segments, starting in June 2023 [29]. This surge in growth was particularly notable from the end of June to the beginning of July, aligning with the discontinuation of Reddit's third-party applications on June 30. One significant observation was the expansion in the number of servers, or as termed in the Fediverse, instances, from fewer than 200 to more than 1200. As a result, the platform saw an exponential increase in the number of posts and comments, reflecting a community that was becoming more active and abundant in content. Specifically, posts escalated from approximately 250,000 in May to nearly 500,000 in June 2023, exceeding 1,000,000 in July 2023, and reaching over 2,500,000 in August. Similarly, comments, which had been gradually increasing before May, rose from around 500,000 in May to over 2,000,000 in June, surpassed 6,800,000 in July, and peaked at more than 11,000,000 in August. However, a notable trend depicted in Fig. 1 reveals that the number of monthly active users began to experience a downturn from the end of July, indicating that not all of the newcomers are maintaining their presence on Lemmy.
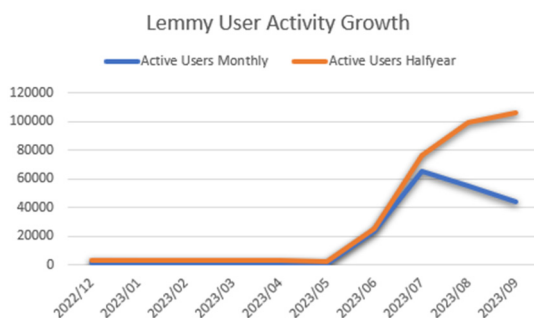

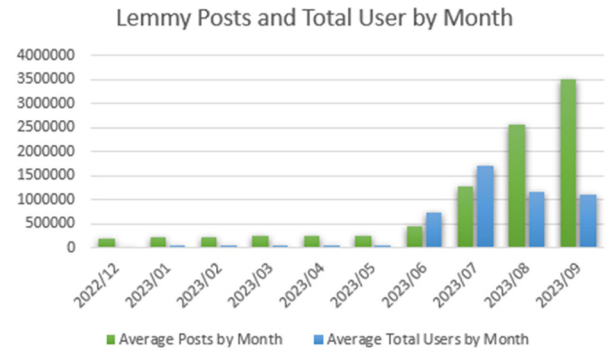Fig. 1. Lemmy active users monthly and half year.

Fig. 2. Lemmy posts and total users' growth by month.
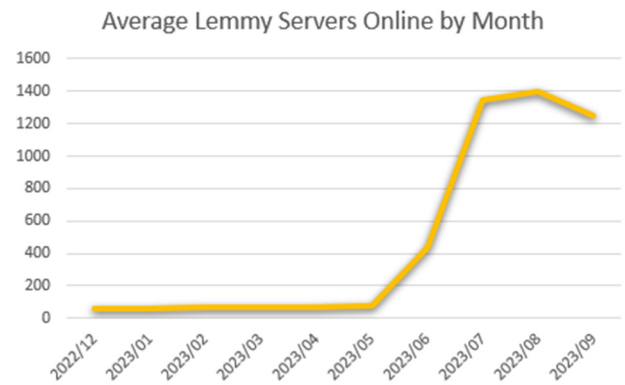

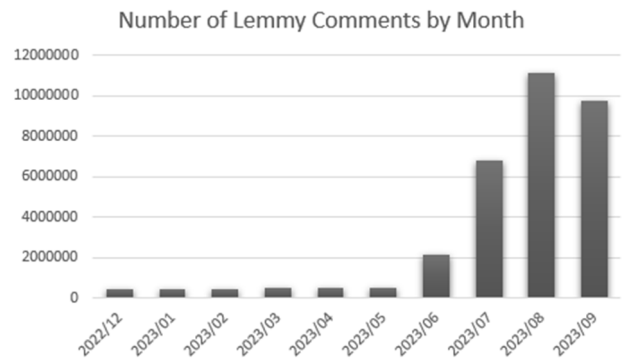Fig. 3. Lemmy server (instance) growth by month.

Fig. 4. Lemmy total comments per month.

An analysis of Reddit's alterations [11] reveals a correlation with the growth in Lemmy's user activity, as illustrated in Fig. 5. The third-party app shutdown led to an even faster rise in user activity on Lemmy.

As illustrated in Fig 6 and 7, Google Trends data indicate a significant surge in the popularity of the terms "lemmy" and "reddit alternative" during the migration period [30] [31]. Furthermore, SimilarWeb data reveals that a substantial 96.66% of social media traffic directed to join-lemmy.org, the front page of Lemmy, originates from Reddit [32]. This influx of users positions Lemmy as a viable alternative for Reddit users, and the presented data rein-
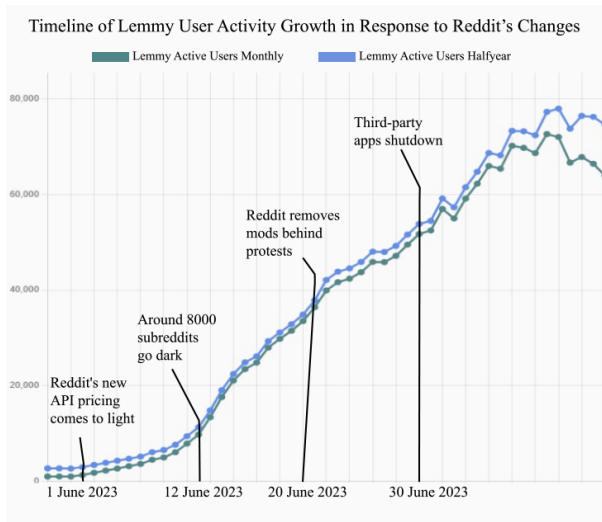
Fig. 5. Lemmy user activity growth alongside annotations of pertinent events occurring on Reddit.

Fig. 6. Google trends data showing a peak in search of the term "lemmy".
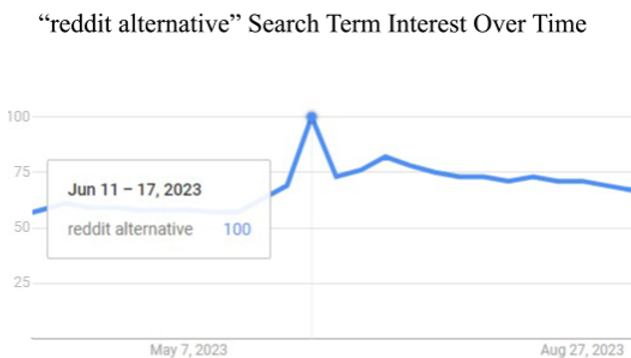

Fig. 7. Google trends data showing a peak in search of the term "reddit alternative".

forces the notion that Lemmy's growth trajectory was markedly influenced by alterations on Reddit.

3.1.2. Lemmy.world and Lemmy.ml User Growth Data Collection

According to fediverse.observer, the software Lemmy currently has 979,605 users. Lemmy.world, the most populated Lemmy instance (133,000 users) and lemmy.ml, the

instance made by Lemmy creators (47,300 users) together possess a total of around 180.300 users, which means they cover approximately 18% total of Lemmy users. For that reason, they were chosen for a more detailed user growth analysis. Lemmy.world is an instance that was started on June 1st, 2023 [33], a little before the peak of user migration that happened from Reddit. However, Lemmy.ml was created together with Lemmy's launch in 2019, and was the most active instance before the appearance of Lemmy. world.

In Fig. 8 and Fig. 9 a pronounced uptrend in the number of users is evident. The trajectory suggests not just an increase in registrations but potentially an influx of active participants migrating to Lemmy, and Fig. 10 offers a complementary perspective, highlighting an accelerated growth in the number of comments. The steep rise in commenting activity signifies not only an increased user base but also heightened interaction and engagement levels. It indicates that users aren't merely joining Lemmy but are actively participating, contributing, and integrating themselves into its community.

3.1.3. Platform Outages in Relation to User Growth on Lemmy.world

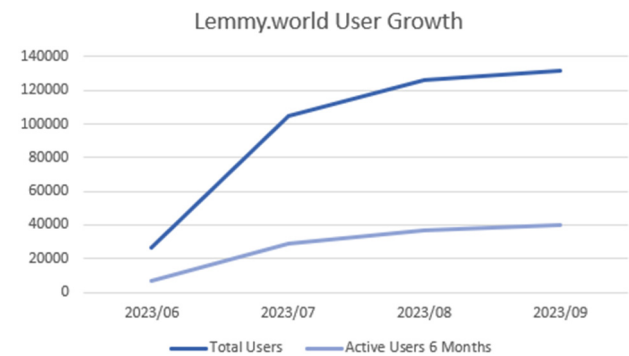Data retrieved from lemmy-world.statuspage.io shown

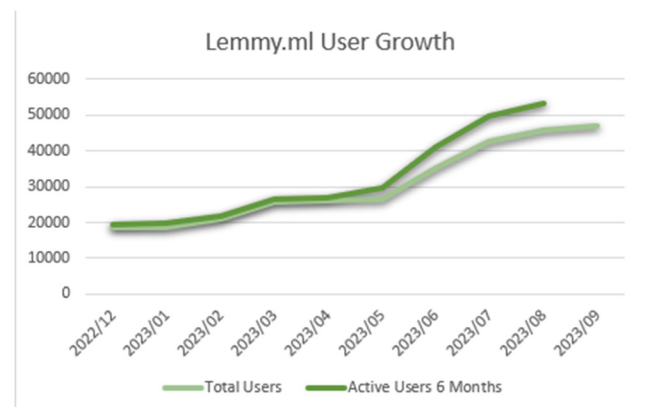

Fig. 8. Lemmy.world user growth.
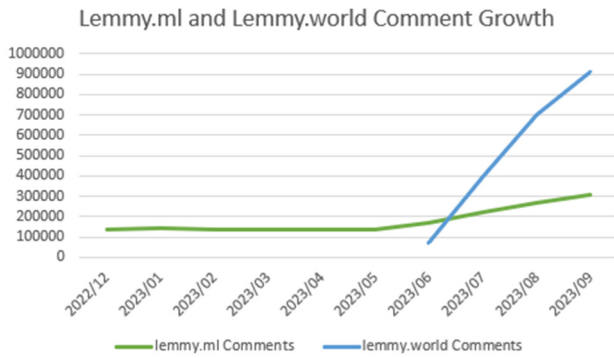

Fig. 9. Lemmy.ml user growth.

Fig. 10. Lemmy.world and lemmy.ml comment growth.

in Fig. 11 [34] and lemmy-status.org shown in Fig. 12 [35] suggests that lemmy.world was having outages shortly after the platform experienced its peak in user growth. The user number increasing isn't the cause for these outages, as is explained by lemmy.world admins [36]. However, being
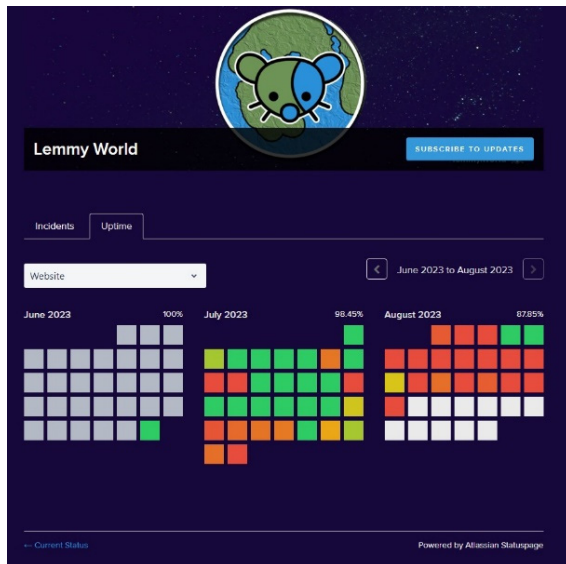

Fig. 11. Lemmy.world status. Green means no issues found, yellow to red represent amount of outages.
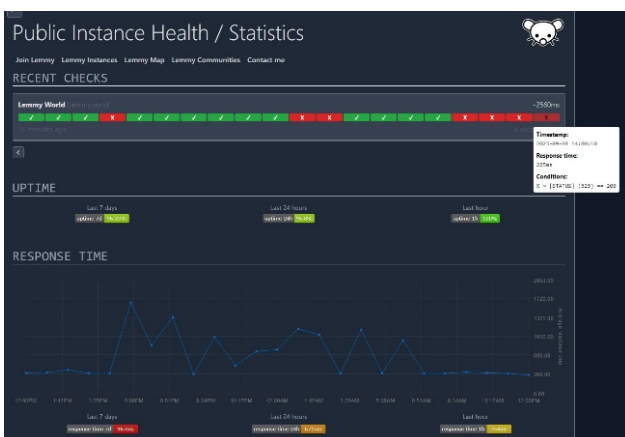

Fig. 12. Example of lemmy.world outage data collected from lemmy-status.org.

aware of the existence of these outages will assist in understanding user sentiment data. The outages on lemmy.world could have had a direct impact on the user experience, particularly for new users who had recently migrated to the platform. Interruptions in service can be frustrating and may shape the initial impressions of users about the stability and reliability of the platform.

3.2 User Sentiment Analysis

To assess the sentiments of users regarding the migration from Reddit, a sentiment analysis was conducted focused on the two most active instances on Lemmy: lemmy.world and lemmy.ml. These instances were chosen based on their large user base (18% of Lemmy users) and the active discussions related to Reddit migration occurring within their communities. The specific communities selected for data scraping within lemmy.world included Reddit, Fediverse, Lemmy.world Announcements, and Ask Lemmy, while those in lemmy.ml were Reddit, Fediverse, and AskLemmy. These communities not only contain a large number of users within their instances, but were also identified as the most engaged in discussions about Reddit migration throughout its duration.

The sentiment analysis was conducted using VADER (Valence Aware Dictionary and sEntiment Reasoner), a sentiment lexicon specifically attuned to social media sentiments. Its correlation coefficient indicates that VADER (r = 0.881) demonstrates a performance comparable to individual human raters (r = 0.888) in aligning with ground truth [37]. In testing, VADER was even able to surpass individual human rating on Twitter sentiment. In VADER, each word is assigned a polarity score, which indicates the degree of positive or negative sentiment associated with the word. It also includes scores for acronyms, slang and emojis. The input text is tokenized into individual words, and the text is broken into smaller parts, and each part is analyzed. Then each word is scored and if the word is not in the lexicon, it is not scored.

VADER's lexicon is especially adept at handling nuances found in social media text, recognizing the sentiment impact of intensifiers, diminishers, and negation words. Intensifiers, such as "very" and "extremely," amplify the sentiment value of the subsequent word, while diminishers, like "kind of" and "slightly," reduce it. The presence of negation words, for instance, "not" or "isn't," inversely affects the polarity of the sentiment score assigned to the following word. Additionally, VADER considers the influence of capitalization and punctuation on sentiment; words in all uppercase letters may convey stronger sentiment, and the usage of exclamation marks can intensify the sentiment expressed. After assigning sentiment scores to individual tokens, VADER computes a compound score for the entire text, representing the overall sentiment. This compound

score is normalized between −1 (most negative) and +1 (most positive). Finally, using predefined thresholds, typically considering texts with a compound score greater than 0.05 as positive, less than -0.05 as negative, and those in between as neutral, VADER classifies the overall sentiment of the text. This nuanced approach to sentiment analysis makes VADER particularly effective for evaluating sentiments in short, informal, and contextually rich text.

VADER was chosen to evaluate Lemmy comments for its high accuracy in capturing sentiments in social media, grasping meaning in a large dataset of comments in a condensed and organized manner. For readability, the polarity in the graphs in this paper have been divided between "Negative", "Neutral" and "Positive".

3.2.1. User Sentiment Data Collection

Data was collected from the communities using Lemmy's API [38] and the python library Lemmy.py [39]. The API was utilized to fetch posts and comments from the communities with search terms such as "reddit" and "reddit migration". To facilitate a comparative analysis, the collected data was categorized into "pre-migration" and "post-migration". For recent data, posts were sorted under "Top All Time", while "Old" was used for pre-migration data. Specifically, comment data was amassed from lemmy.ml spanning May 12, 2020, to September 24, 2023, and from lemmy.world from June 1 to August 29, considering that this instance became active online from June 1.

The data was collected using a python script with the following libraries: pandas [40-41] for data structuring, vaderSentiment for the sentiment analysis, and Lemmy.py to interact with the Lemmy API.

First an instance of the Lemmy class is created to interact with the desired instance, in the case of this study, lemmy.world and lemmy.ml. Then the Communities are targeted and specified by name and unique ID. All fetched posts are accumulated in the all_community_posts list.

The data collected from these communities was divided into:
1. Post Title: This denotes the title of the Lemmy post, serving as an initial insight into the post's theme or main topic.
2. Type: This field distinguishes the nature of the content by indicating whether it is a comment or a response to a comment, aiding in contextualizing the conversation structure.
3. Content: Representing the actual textual content of a comment or reply, this field provides the primary data for analysis.
4. Sentiment: Assigned based on VADER sentiment analysis, this field categorizes the content's sentiment as Negative, Neutral, or Positive, reflecting the emo

tional tone conveyed in the text.
5. ID: This contains a unique identifier for each comment or reply, ensuring individual entries can be distinctly identified and referenced for analysis.
6. Timestamp: Logs the date and time at which the comment or reply was made.

The accumulated data is structured into a Pandas DataFrame, and cleaned of duplicate entries by using each comment's unique IDs. The collected data was transformed into an Excel file for further manual evaluation. During this evaluation, additional duplicate comments were manually removed, and graphs were created using the data to represent user sentiment. A total of 48.272 comments were analyzed. The "pre-migration" comments were collected from three communities in lemmy.ml: Reddit, Fediverse and AskLemmy. The search terms "reddit" and "reddit migration" were employed with the intention of discerning the prevailing user sentiment on this subject during that period. As shown before in Fig. 1 to Fig. 4, Lemmy wasn't very active as a platform before June, therefore, the data that could be collected about a specific subject was limited. As depicted in Fig. 13 through Fig. 16, VADER sentiment analysis was executed on comments from these communities,
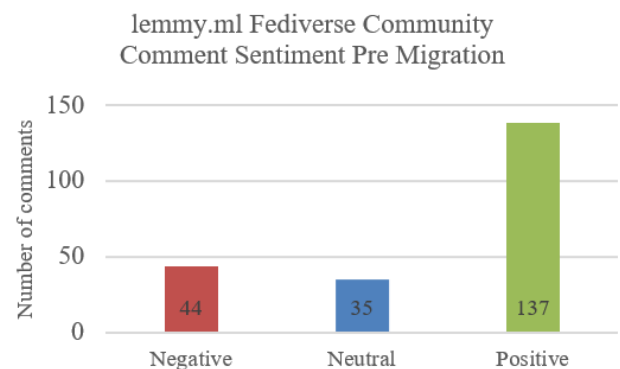

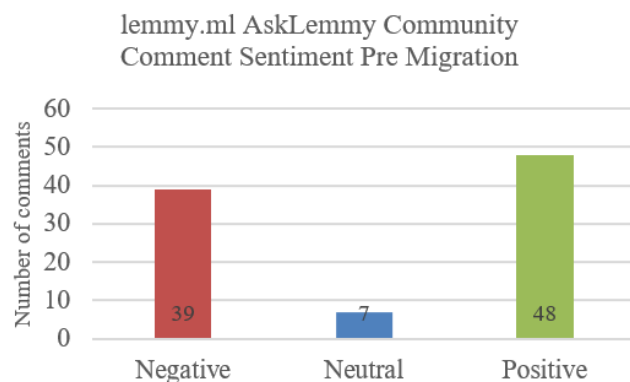Fig. 13. Lemmy.ml Fediverse community sentiment analysis pre Reddit migration.

Fig. 14. Lemmy.ml AskLemmy community sentiment analysis pre Reddit migration.
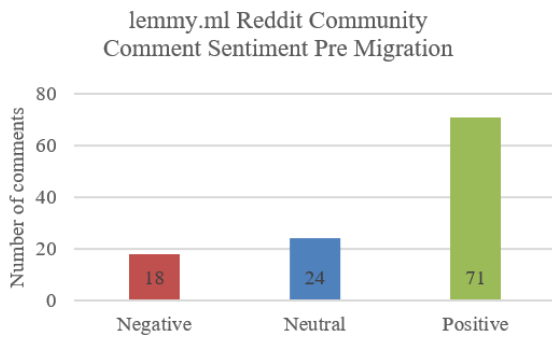
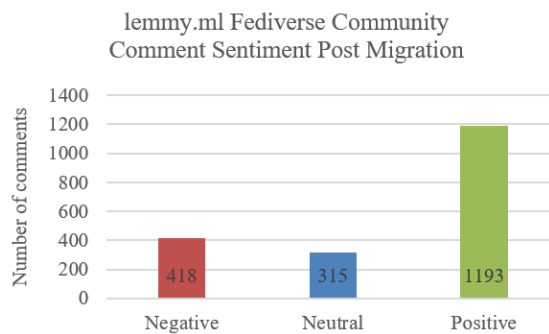Fig. 15. Lemmy.ml Reddit community sentiment analysis pre Reddit migration.

Fig. 16. Lemmy.ml Fediverse comment sentiment graph.

centering on discussions related to Reddit, and, on the lack of them, the migration to other platforms within the Decentralized Web (e.g., Mastodon). The overarching sentiment revealed was positive. Delving deeper through a rigorous manual content analysis, it was discerned that only a small number of users were contemplating the transition from Reddit to Lemmy before the June/July 2023 migration. This is particularly striking when contrasted with the volume of discussions observed in the data collected post-Reddit migration (see Fig. 16 to Fig. 21).

As for the post-migration analysis, as observed in Fig. 16 through Fig. 20, the sentiment was predominantly positive.
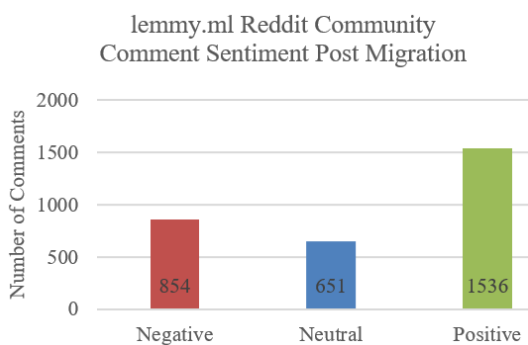
Fig. 17. Lemmy.ml Reddit comment sentiment graph.
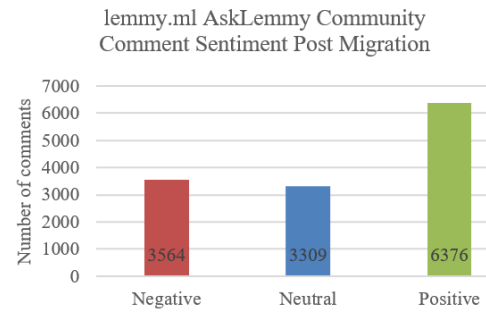
Fig. 18. Lemmy.ml AskLemmy comment sentiment graph.
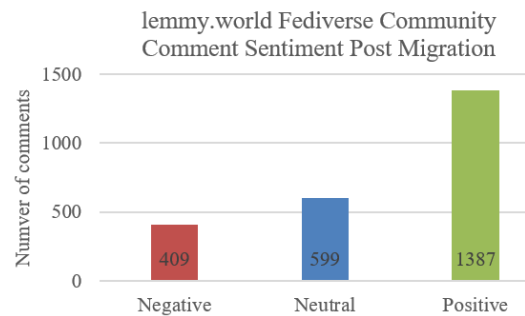
Fig. 19. Lemmy.world Fediverse comment sentiment graph.
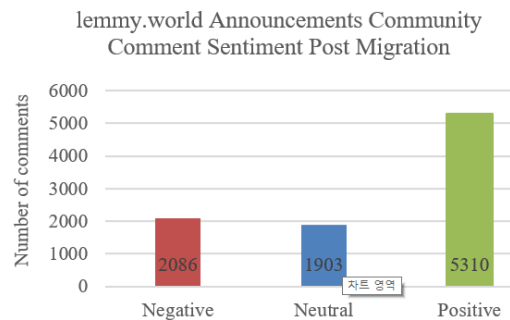
Fig. 20. Lemmy.world Announcements comment sentiment graph.
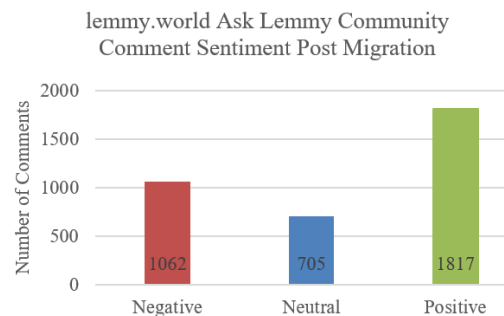
Fig. 21. Lemmy.world Ask Lemmy comment sentiment graph.

A manual content analysis was conducted on a representative sample of these comments to make the analysis more manageable and focused. Efforts were made to include both positive and negative comments to ensure a balanced perspective on user experiences, the sample can be observed in Table 1. The information observed through the comments

Table 1. Example of a typical dialogue from the lemmy.world Fediverse corpus.

Sentiment	Textual content of segment
Positive	Welcome newcomers to the fediverse!
Positive	The 40k community is pretty solid here and growing
Positive	Hello to the Fediverse! Hopefully you can also enjoy the rest of the sites ...
Negative	I'm finding that quite a lot of communities exist, they just take more work at the moment.
Negative	I think you might've run into another teething problem.
Negative	Yeah, it was REALLY weird bug!

Fig. 22. Lemmy.world Reddit comment sentiment graph.

was that Positive comments predominantly included welcoming messages, whereas Negative comments typically related to the challenges of engaging with less populated Lemmy communities compared to Reddit or conveyed dissatisfaction due to technical issues.
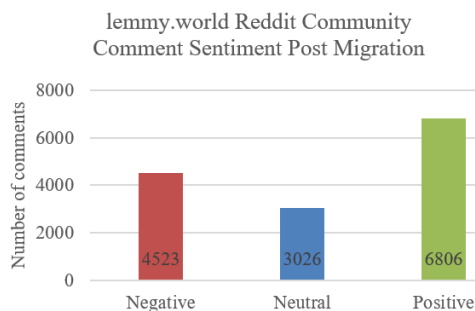
In Fig. 21 and Fig. 22, which display the lemmy.world Reddit and Ask Lemmy communities, a notable predominance of negative comments is observed. An analysis, supported by manual content analysis conducted on a sample is represented in Table 2. It indicates that the bulk of this negativity is primarily attributed to criticisms directed at Reddit as a platform, rather than the process of user migration. Additionally, a series of negative comments highlighting issues with Lemmy, such as glitches and bugs, are also present.

3.3. Lemmy User Sentiment Survey

3.3.1. Survey Design and Administration

To gather more nuanced and direct data from Lemmy users regarding their experiences and sentiments about the migration an online survey through Google Forms was conducted on three key communities that had a considerable amount of discussion regarding the subject: Reddit at lemmy.ml and Reddit and Ask Lemmy at lemmy.world. Together these communities have a total population of around 47,700, and the sample size of respondents was 354 people,

Table 2. Example of a typical dialogue from the lemmy.world Reddit/Ask Lemmy corpus.

Sentiment	Textual content of segment
Negative	Just deleted my original 10+ year old account on Reddit.
Negative	Also new users please be aware that there's this bug that causes commenting to sometimes fail completely and get stuck on loading.
Negative	Probably the only smart thing Reddit has done all year…
Positive	I'm loving it too- I miss a lot of subreddits and the sheer volume of content from the other site, but it feels quite special here at the moment. […]
Positive	Most mods that left Reddit are just chilling here as regular community members …
Positive	I'm actually quite pleased at the new influx of users! […]

fitting in a confidence level of 95% with a 5.08% margin of error. The survey was online for 5 days from September 22 to September 26, 2023. By the second day, the survey had collected 90% of its total answers. The structure of the survey was informed by the findings detailed in Sections 3.1 and 3.2 of this study, and valuable insights were gleaned from the respondents' answers. The survey was organized into three main sections: first, informed consent; second, questions pertaining to the migration from Reddit to Lemmy; and finally, a confirmation to ensure the participant's willingness to submit their responses. Once informed consent was secured, participation in the subsequent sections of the survey was entirely optional.

This survey was designed with adherence to ethical guidelines to ensure the privacy and anonymity of the participants. All responses were collected anonymously, and the questions posed were exclusively related to the subject matter of this study. Additionally, participants were informed of the purpose of the survey and the voluntary nature of their participation. Participants were also assured that they could withdraw from the survey at any point without consequence.

3.3.2. User Perceptions and Migration Motivations

First, the survey questions if the user is originally a Lemmy user or if they recently migrated from Reddit. A big majority of respondents (95.5%) were recently migrated from Reddit (joined Lemmy June 2023 or after), while 4% were original Lemmy users.

When asked about their motivations for migrating to Lemmy, with more than one choice available, a big part of respondents chose the option "Dissatisfaction with Reddit's Policies/API changes" (96.6%) and also added "Seeking alternatives to mainstream platforms", while a smaller per-

centage also chose "Prefer Lemmy's features/community". Through a thematic analysis it was also possible to discover that while many users who chose the option "Other" in this question had varying opinions, a reoccurring answer was that the user's motivation for migration was due to the inability to use third-party apps anymore, a situation caused by the API changes. As a user stated: *"The app I used to surf Reddit was no longer able to actually be used for reddit (using sync)."* Lemmy currently supports various apps [11] which seems to be attractive to users. Some users also reported using Kbin instead of Lemmy, another Decentralized software that federates with Lemmy.

As can be seen in Fig. 23, Participants were also queried about their perceptions of Reddit post-migration, with the majority expressing negative (62.1%) or slightly negative (21.5%) views, aligning with the sentiments identified through VADER analysis.

Users were then asked if the meaning of instances and federation, core parts of the Decentralized Web were difficult to understand. Answers were divided, 36.9% stated they understood right away but 39.8% responded that it took some time for them to understand it. Some (16.2%) already knew the Fediverse but for 7.1% these are still concepts they don't completely understand. In contrast, most users registered it was either easy or very easy to adapt to Lemmy's community dynamics.

When asked about their experience in Lemmy in comparison to Reddit, users were again divided. 37.6% thought it was similar, 30.5% that it was better, 12.5% Much better and 18.5% defined it as worse. However, when asked about their perception over the Reddit migration to Lemmy 52.7% were very positive, 31.4% was slightly positive and the rest were very or slightly resistant. As can be seen in Fig. 24, they also felt that the response from the Lemmy community towards the migration was mostly welcoming, with 58.3% of users reacting in a very welcoming manner and 28.7% in a slightly welcoming manner. The rest were recorded to be mostly slightly resistant or indifferent to the migration.

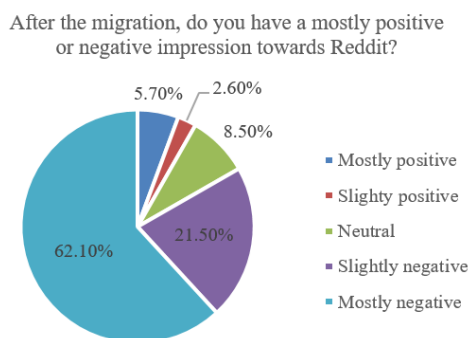92.6% of users responded they use Lemmy daily, and

Fig. 23. Graph of Lemmy's users impression towards Reddit after migrating to Lemmy.
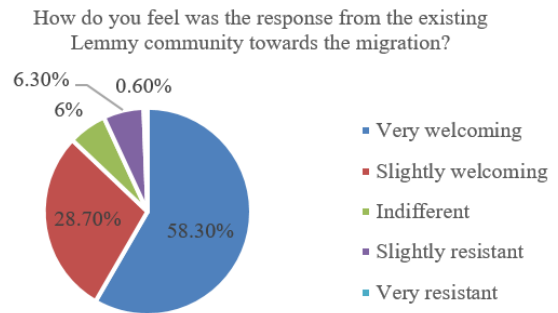
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Fig. 24. Graph depicting Lemmy's response to the Reddit migration.

48.3% said that they did notice an increase in Lemmy usage since the Reddit migration, but a big number answered that they were not sure (38.7%). Since most respondents originally came from Reddit, it indicates that they weren't on the platform before, and therefore cannot perceive the change in user activity. 41.1% of users replied that the communities they participate in are active, but another half doesn't feel strongly about it or see them as inactive. That may be due to the next finding where 40.1% of users rarely comment or post (lurkers).

After all these details, Lemmy users are still satisfied with their experience on Lemmy, and as preferences of Lemmy over Reddit they stated the Decentralization/Federation, Open Source nature and the absence of ads while some also prefer Lemmy's community dynamics. Many others stated that they like to have third-party app support which Lemmy provides. In contrast, users miss the large user base present in Reddit, the diverse content, the active niche communities while some miss the moderation tool available to it as well.

When asked if they had any technical issues with Lemmy, 42.2% of users responded they encountered minor technical issues, but weren't strongly impacted by them, 25.8% encountered bigger issues that were solvable, 18.4% haven't seen any technical issues, 6.2% encountered bigger issues and 7.4% had the platform be unusable for some time.

Lastly, they were asked if they saw themselves continuing to use Lemmy in the long term. 90.7% answered Yes and 8.8% were Unsure, while 0.6% answered No.

3.4. Qualitative Analysis Open-ended Questionnaire

In order to offer an in-depth understanding of user motivations, preferences, and community dynamics surrounding the migration from Reddit to Lemmy, a qualitative analysis was conducted through a questionnaire. The questionnaire, sent privately to selected users, contained six questions focused on gathering direct feedback regarding their feelings and experiences related to the Reddit migration to Lemmy. This short interview was conducted with a total of

16 users, comprising two distinct user groups: five participants who were original Lemmy users before the migration, and ten participants who joined Lemmy as new users coming from Reddit during the migration. This diverse sample allowed for a comprehensive exploration of varying perspectives and experiences, providing a richer context to the quantitative data.

3.4.1. Questionnaire Data Collection

Interviewees were identified through their participation in discussions and threads about the Reddit migration to Lemmy. Those who had commented or posted on such threads were targeted to extract diverse insights on how they view the changes. Each message sent to potential interviewees contained an informed consent section as its introduction. This section abided by all common ethical rules, including disclosure of the researcher's identity, the topic of research, the estimated time needed to complete the questionnaire, and an assurance that participation was entirely voluntary. Additionally, interviewees were informed that all data gathered would remain strictly confidential and be used solely for academic purposes. The questionnaire was structured around six key questions, aimed at delving into the participants' thoughts, feelings, and experiences surrounding the migration from Reddit to Lemmy:

1. In your opinion, what were the primary reasons users migrated from Reddit to Lemmy?
2. Were you initially a Lemmy user, or did you migrate from Reddit? Can you describe your feelings before, during and after the migration?
3. How easy or difficult was it for you to adapt to Lemmy's platform and community dynamics?
4. How do you feel the existing Lemmy community responded to the influx of new users from Reddit? Were they welcoming, indifferent, or resistant?
5. What are some features or aspects of Lemmy that you prefer over Reddit? Conversely, are there any features or aspects of Reddit that you miss on Lemmy?
6. Do you see yourself continuing to use Lemmy in the long term? Why or why not?

The participants were categorized as follows:

Reddit Migrants (10 users): User 2, User 4, User 6, User 7, User 8, User 10, User 11, User 12, User 13, and User 15.
Original Lemmy Users (6 users): User 1, User 3, User 5, User 9, User 14 and User 16.

3.4.2. Questionnaire Data Analysis

A thematic analysis [43] was conducted to systematically identify, organize, and interpret the patterns of meaning (themes) across the responses. Each response was meticulously analyzed to derive themes representing the users' varied experiences and opinions.

The analysis revealed several recurring themes and patterns, offering insights into discontent with Reddit, the appeal of alternatives, adaptation experiences, community responses, feature preferences, and long-term considerations. The emergence of these themes provided a comprehensive understanding of the migration dynamics.

Data saturation was noted around the reply of User 10, additional interviews did not introduce new themes or insights, signifying that the gathered data was representative of the diverse experiences and opinions of the user base.

Question 1:
In your opinion, what were the primary reasons users migrated from Reddit to Lemmy?

Themes Identified:
The main reasons seem to surround Reddit's recent policies. Users expressed dissatisfaction with Reddit's API changes and were critical of Reddit's leadership, CEO, and administration, citing unfair treatment of users and moderators. They stated that the platform's non-flexibility and poor communication led to a loss of trust in Reddit as a company. Some users even referred to Reddit's actions as a "betrayal", highlighting the depth of their dissatisfaction. As quoted by User 15: *"My primary reason for migration was the disappearance of third-party apps. Because the official Reddit app is basically unusable for anything slightly less basic than scrolling through memes, [...]".*

Users preferred to use Lemmy and refuse to use the official Reddit App. The migration was also seen as an opportunity, with users considering platforms like Squabbles, Discuit, Tildes, Kbin, and Lemmy. The latter's open-source nature and federated structure were attractive despite challenges. The migration was not only due to specific changes but also as a form of protest against Reddit. The idea of moving platforms became more mainstream, fueling the migration.

Question 2:
Were you initially a Lemmy user, or did you migrate from Reddit? Can you describe your feelings before, during and after the migration?

Themes Identified:
Existing Lemmy users described the platform as slower and smaller, where responses from the community could take days or weeks. User 5 explains this well: *"I'm on lemmy since 2020, but it was a small community. I was ex-*

cited for the change, hoping many more people would stay and turn their backs on reddit. Before the migration it wasnt just getting enough momentum, it felt a bit like a sleepy village." Lemmy users were overall excited about the potential increase in activity. The migration led to increased activity and diluted the political focus of Lemmy, making it more diverse. However, certain communities like beehaw.org felt overwhelmed and took measures like disabling sign-ups and defederating from multiple instances.

Long-time Reddit users were upset with Reddit's decisions and had mixed expectations about Lemmy. A user shared*, "Before migrating, I had low expectations, because I knew such platforms depend on a very large user base… I expected a desolate desert."* The influx of users led to a surprising increase in content and activity on Lemmy. Both initial Lemmy users and Reddit migrants noted the diversity brought about by the migration. It gave hope that the growth of Lemmy would continue.

Question 3:
How easy or difficult was it for you to adapt to Lemmy's platform and community dynamics?

Themes Identified:
Original Lemmy users generally found it easy to adapt to the platform, largely due to their previous use. They felt the platform was easy to get used to, with one user expressing a positive feeling towards the lemmy.world instance, noting its similarity to Reddit. While the adaptation to the platform was generally smooth, some Lemmy users were more concerned with adapting to the political discussions on the platform. They noted that some communities have stricter moderation than others, which could influence the user experience depending on where one joins.

Despite the initial lack of culture, most Reddit users found Lemmy similar to forums and appreciated the decentralization. User 13 noted that *"On one hand, I like that I can join many different instances and they all have different rules. I like that if the instance I sign to defederates from an instance I like, I can bypass that separation and visit it anyway. There's not just one person at the top telling me what I can and can't access."* Understanding the concept of federation and instances posed a learning curve for some users, but once grasped, it was generally favored.

Question 4:
How do you feel the existing Lemmy community responded to the influx of new users from Reddit? Were they welcoming, indifferent, or resistant?

Themes Identified:
Original Lemmy users generally expressed a welcoming attitude but also voiced concerns. They were enthusiastic about the potential growth and activity brought by Reddit users but were cautious about the capacity and adaptability of the platform. User 14 highlighted, *"Many users of Lemmy were afraid about server capacity. Many were worried about moderator tools. Some were worried about spam… A lot of these worries were accurate things to worry about."* The response varied across different instances of Lemmy. For instance, lemmy.ml, the biggest instance at the time, was seen as a welcoming hub. In contrast, beehaw.org adopted a more selective approach, disabling new sign-ups and defederating from certain instances, citing concerns about preserving their community culture.

Other communities like hexbear.net, lemmygrad.ml, and exploding-heads.com exhibited varied reactions. Hexbear, for instance, maintained strict entry requirements and never federated with other instances before the migration, but started to federate after the influx of users started.

Reddit users migrating to Lemmy generally felt welcomed. The majority found the Lemmy community to be accepting and saw potential in the platform. User 9 stated, *"I think the vast majority were quite welcoming."* However, some Reddit users observed conflicts within the existing Lemmy community regarding the influx. They noted a mix of enthusiasm and resistance, with some members fearing centralization and others hoping for Lemmy's growth. As User 7 observed, *"I saw some respond happily… But I saw others lament it, treating it like some Eternal September like phenomenon."*

Some Reddit users also took practical considerations into account when joining Lemmy, choosing instances that were not overcrowded to avoid potential issues with crashing. User 13 remarked, *"I did a bit of research and joined an instance that wasn't too full, so I didn't have to worry about it crashing when the influx happened."*

Question 5:
What are some features or aspects of Lemmy that you prefer over Reddit? Conversely, are there any features or aspects of Reddit that you miss on Lemmy?

Themes Identified:
Original Lemmy users appreciated Lemmy for its overall transparency, exemplified by its open-source code and public modlogs. The decentralization of Lemmy and the absence of advertisements were also highlighted as positive features. The ability to use third-party apps on Lemmy was seen as a significant advantage, offering users more flexibility and options. On the advantages of using Lemmy User 16 stated that *"[…] Free and open-source. No tracking, invading my privacy and selling my data as part of a business model"* were some of the motives for preferring Lemmy.

Some users expressed a preference for Kbin, another platform that went live shortly before Reddit's migration.

Despite lacking some features and a robust API, Kbin is federated with Lemmy, allowing access for Lemmy users.

Users miss the diverse and extensive community base of Reddit, where there's a community for virtually everything. The set of moderator tools available on Reddit was cited as being superior to those on Lemmy.

Reddit migrants viewed the absence of a Karma system in Lemmy as an improvement, fostering a different user interaction dynamic. User 7 stated that *"Lemmy does NOT have a Karma system, which I think is an improvement."*

Despite some current limitations, Reddit migrants are hopeful that Lemmy will continue to develop and introduce features that are currently lacking. The decentralized nature of Lemmy, with no central controlling entity, was seen as a positive aspect by several users. The diversity of content and the depth of conversations on Reddit due to its larger user base are missed by some Lemmy users. Reddit's crowd of users contributes to more vibrant discussions.

The underdevelopment of moderator tools on Lemmy, including the absence of Auto Mod, was noted as a disadvantage compared to Reddit. Some users expressed missing the unified communities for specific topics found on Reddit and cited challenges with federation on Lemmy.

Question 6:

What are some features or aspects of Lemmy that you prefer over Reddit? Conversely, are there any features or aspects of Reddit that you miss on Lemmy?

Themes Identified:

Original Lemmy users expressed a unanimous intention to continue using Lemmy. They remain optimistic about the platform's future and hope that the communities within Lemmy will thrive. These users have invested effort in using Lemmy and see potential in the platform improving and growing over time.

Many Reddit migrants expressed a strong commitment to continuing to use Lemmy. For some, this commitment was marked by a significant step of deleting years of history on Reddit. User 9 stated *"Absolutely. I deleted 8 years of history when I left Reddit and it was the hardest of my big tech social media to give up on."*

While there is a general inclination to continue using Lemmy, some users expressed uncertainty due to the platform's current lack of content diversity and the predominance of political posts. The activity level of niche communities is also a factor influencing their decision.

User 4 shared *"I will continue to scroll on Lemmy when I have nothing to do, but because of its lack of diversity, when it comes to content (too many political posts, niche communities are often not very active), I may or may not stop using it in the near future."*

The level of activity and user engagement on Lemmy is a significant factor for Reddit migrants in deciding whether to continue using the platform in the long term.

IV. RESULTS AND DISCUSSION

Through a mixed-methods approach, this study gathered data from diverse sources to understand the impact that the Reddit migration had on Lemmy as a decentralized platform.

4.1. Findings

4.1.1. Lemmy User Growth Findings

The user growth analysis showed that Lemmy experienced a steady user growth, with notable spikes corresponding to events related to Reddit, such as announcements and policy changes. In total, the migration in June/July 2023 marked a significant increase in user registrations on Lemmy. The number of instances also grew, indicating the beginning of new communities and a more diverse user base.

Lemmy.world was created in June and grew to be the biggest lemmy instance, while lemmy.ml follows in second place. These two alone contain 18% of Lemmy users. This pattern suggests a centralization trend even within decentralized platforms, a trend also observed in Mastodon [3].

Users who engage frequently are more likely to stay [44]. The growth in posts and comments and the evidence of more user interaction in these communities hint at lemmy.world and lemmy.ml's capacity to not only attract but also accommodate and engage newcomers effectively. Such sustained engagement may very well be an outcome of sound community management practices. The ability of these communities to thrive amidst massive user migration suggests that they might have employed strategies focused on robust community management, clear community guidelines, and the flexibility to adapt—qualities vital for the successful integration of new users in online platforms [45]. As a decentralized platform, it might be challenging or even impossible for Lemmy as a whole to employ such strategies, but the instances, or even communities who do might be able to stay more stable and have a more durable lifespan.

4.1.2. Lemmy User Sentiment Analysis Findings

Before the migration, the overall sentiment in the selected communities was positive, albeit discussions about migration were still extremely limited, seeing as the Lemmy userbase was small. The VADER sentiment analysis revealed a positive sentiment regarding discussions related to Reddit and other decentralized platforms.

Post-migration, the sentiment regarding the migration re-

mained predominantly positive. A notable amount of negative comments was observed in the lemmy.world Reddit and Ask Lemmy communities. These were mainly attributed to criticisms of Reddit as a platform and complaints over lack of activity and technical issues with Lemmy.

4.1.3. Quantitative Survey Analysis Findings

The survey analysis confirmed the data found both in the user growth and the sentiment analysis. The majority of respondents migrated due to dissatisfaction with Reddit's policies/API changes and were seeking alternatives to mainstream platforms. The support for third-party apps in Lemmy was a significant attractor. A large proportion of users expressed negative or slightly negative views about Reddit as a platform post-migration. Most users also found it easy to adapt to Lemmy, but some still had problems grasping the concept of federation. Users also encountered technical issues in Lemmy, as observed in the first part of this study. However, until now these issues were able to be resolved. Despite complaints over the lack of content in Lemmy, a big proportion of users intends to use the platform long term.

4.1.4. Open-Ended Questionnaire Qualitative Findings

As was similar to the survey, users cited dissatisfaction with Reddit's API changes as an important reason for migration. Through detailed discussion, they also added that Reddit's leadership and administration were also primary reasons for migration. The migration was also seen as an opportunity for exploring alternative platforms, with Lemmy's open-source and federated structure being attractive.

Both original Lemmy users and Reddit migrants noted the change to community dynamics and the diversity brought about by the migration. As corroborated by the user growth data, before the migration the number of Lemmy users was small, making so that it could take days or weeks to get a reply to a post. As seen in the survey, the existing Lemmy community was generally welcoming. However, through qualitative insight it was possible to see some smaller existing Lemmy instances had concerns about preserving their community culture and were not all as open as lemmy.ml. There were instances that wanted to preserve their space, and that made use of defederation. Instances were also created with the intention of taking on new users, corroborating with the increase in server number observed in the user growth analysis.

As was also observed in the quantitative survey, users praise Lemmy's decentralization, open-source nature absence of advertisements; however, they miss the diversity of content and community base of Reddit. A unanimous intention to continue using Lemmy was expressed, despite some uncertainties. Users hope that Lemmy's userbase can

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grow and become more active.

V. CONCLUSION AND FUTURE WORK

Through a mixed methods approach, this study was able to gather data from diverse sources in order to understand the impact that the Reddit migration had on Lemmy as a decentralized platform. This impact brings forth important insights on how a decentralized platform like Lemmy works. The dissatisfaction with Reddit's policies leading to users migrating to a decentralized platform like Lemmy instead of utilizing Reddit's official app resembles what happened to Mastodon and Twitter, making a trend of users that are in search for more democratic, less corporate and advertisement focused platforms.

Lemmy users are favorable towards concepts like federation; however, they feel the lack of a thriving community, like the one that can be found in a centralized website like Reddit. Lemmy is following centralization patterns by having so much of its population in the same instances. Ideally, instances, federated or not, would have their own growing communities. This will take effort and involvement of users to create diverse content.

Some users faced difficulties in grasping the concept of federation and instances, indicating a learning curve associated with decentralized platforms. Users also encountered technical issues on Lemmy, they were generally resolvable, however, addressing such issues promptly will be essential for maintaining a positive user experience in the future.

This paper had several limitations. First, the data collected by fediverse.observer in the use growth analysis is an estimate, so it might not be representative of Lemmy as a whole, as it doesn't have access to all Lemmy servers. The sentiment analysis was conducted using the VADER sentiment analysis tool, which is specifically designed for social media content. However, like all automated sentiment analysis tools, VADER may not always capture the nuances of human emotions, especially sarcasm or context-specific sentiments. Due to the limited availability of pre-migration data, the insights gleaned from this period were not as extensive as those derived from the post-migration data. The quantitative survey data were collected from three communities: Ask Lemmy and Reddit in lemmy.world, and Reddit in lemmy.ml. These are large communities within Lemmy, but they don't represent all of the Lemmy userbase. This limitation could result in missing nuanced trends, user sentiments, or emerging concerns that were present in other instances. The open-ended questionnaire had a sample of 16 people, which is a reasonable number; however, it is not representative of all of Lemmy and may reflect the biases of the respondents. Overall, each method tried to compensate for what another method was missing, however not all instances and communities could be accounted for, so in-

formation that leads to different insights might have been missed.

Despite constraints, this study has provided a comprehensive exploration of the migration from Reddit to Lemmy, showcasing the multifaceted impacts and user experiences within a decentralized platform. The findings underscore the importance of effective community management, the balance between decentralization and centralization, and the nuanced motivations and challenges faced by users. The unanimous intention to continue using Lemmy signals a promising future for the platform, contingent on its ability to nurture diversity, address technical issues, and foster a vibrant and engaged community.

For future work, it would be valuable to delve deeper into the mechanisms and strategies employed by thriving instances to accommodate and retain newcomers. Analyzing Lemmy instances that were undiscussed might also produce more information about the decentralized platform. Additionally, it would be beneficial to explore enhancements to moderation tools and find ways to accommodate users who are unfamiliar with the Fediverse and the Decentralized Web. Another important route is to explore the impact of the observed centralization trend on the long-term sustainability and democratic nature of decentralized platforms. Finally, studying these platforms over a more extended period may reveal additional effects on the community. Conducting studies on these dynamics could be pivotal for the future development of decentralized platforms, ensuring their viability and expansion in a constantly changing digital environment.

REFERENCES

[1] K. Michael, "Fixing social media: Toward a democratic digital commons," *Markets, Globalization & Development Review*, vol. 5, no. 1, p. 4, 2020.

[2] Z. Alan, "Moderating the Fediverse: Content moderation on distributed social media," *Journal of Free Speech Law,* vol. 3, no. 217, pp. 23-19, Sep. 2022.

[3] R. Aravindh, S. Joglekar, De C. Emiliano, S. Nishanth, and T. Gareth, "Challenges in the decentralised web: The Mastodon case," in *Proceedings of the Internet Measurement Conference (IMC '19). Association for Computing Machinery*, New York, Oct. 2019, pp. 217-229.

[4] L. Schwittmann, C. Boelmann, M. Wander, and T. Weis, "SoNet -- privacy and replication in federated Online social networks," in *Proceedings of presented at the 33rd IEEE International Conference on Distributed Computing Systems Workshops*, Philadelphia, PA, Jul. 2013.

[5] H. B. Zia, J. He, A. Raman, I. Castro, N. R. Sastry, and G. Tyson, "Flocking to Mastodon: Tracking the great Twitter migration," *arXiv preprint arXiv:2302.14294,* Feb. 2023.

[6] U. Jeong, P. Sheth, A. Tahir, F. H. Alatawi, H. R. Bernard, and H. Liu, "Exploring platform migration patterns between Twitter and Mastodon: A user behavior study," *arXiv preprint arXiv:2305.09196,* May 2023.

[7] J. Nicholas, Jan. 2023. Elon Musk Drove More than a Million People to Mastodon – But Many Aren't Sticking Around, https://www.theguardian.com/news/data-blog/2023/jan/08/elon-musk-drove-more-than-a-million-people-to-mastodon-but-many-arent-sticking-around

[8] C. Wilfred, Apr. 2023. Thousands Fled to Mastodon after Musk bought Twitter. Are they Still 'Tooting'?, https://www.theguardian.com/technology/2023/apr/18/mastodon-users-twitter-elon-musk-social-media

[9] N. Josh and T. Josh, Twitter Traffic Sinks in Wake of Changes and Launch of Rival Platform Threads, Jul. 2023. https://www.theguardian.com/technology/2023/jul/10/twitter-traffic-sinks-in-wake-of-changes-and-launch-of-rival-platform-threads-elon-musk

[10] P. Sarah, As Twitter Destroys Its Brand by Renaming Itself X, Mastodon User Numbers Are Again Soaring," Jul. 2023. https://techcrunch.com/2023/07/24/as-twitter-destroys-its-brand-by-renaming-itself-x-mastodon-usage-numbers-are-again-soaring/

[11] P. Jay, Reddit Protest Updates: News on the Apps Shutting Down and Reddit's Fights with Mods - The Verge, Aug. 2023. https://www.theverge.com/2023/6/8/23754780/reddit-api-updates-changes-news-announcements

[12] N. Gideon, Exploring the Fediverse: Lemmy's Surge and Stagnation Amidst Growing Interest in Decentralized Platforms, Jul. 2023. https://kr-asia.com/exploring-the-fediverse-lemmys-surge-and-stagnation-amidst-growing-interest-in-decentralized-platforms

[13] Fediverse Observer, https://fediverse.observer/, 2023.

[14] L. La Cava, S. Greco, and A. Tagarelli, "Understanding the growth of the fediverse through the lens of Mastodon, " *Applied Network Science*, vol 6, pp.1-35, Dec. 2021.

[15] I. H. Anaobi, A. Raman, I. Castro, H. B. Zia, D. Ibosiola, and G. Tyson, "Will admins cope? Decen-tralized moderation in the fediverse" in *Proceedings of the ACM Web Conference 2023*, Apr. 2023, pp. 3109-3120.

[16] A. Mansoux and R. Roscam Abbing, "Seven theses on the fediverse and the becoming of FLOSS," *The Eternal Network: The Ends and Becomings of Network Culture*, pp. 124-140, 2020.

[17] R. Ahooja, "Section 230 and the Fediverse: The 'instances' of mastodon's immunity and liability," *Available at SSRN 4421665*, Apr. 2023.

[18] A. Jacopo and B. M. Carlo, "Emerging forms of sociotechnical organisation: The case of the fediverse", *Digital Platforms and Algorithmic Subjectivities*, vol. 24, pp. 167, 2022.

[19] S. Stieger, C. Burger, M. Bohn, and M. Voracek, "Who commits virtual identity suicide? Differences in privacy concerns, internet addiction, and personality between Facebook users and quitters," *Cyberpsychology, Behavior, and Social Networking*, vol. 16, no. 9, pp. 629-634, Sep. 2013.

[20] L. La Cava, L. M. Aiello, A. Tagarelli, "Get out of the nest! drivers of social influence in the# TwitterMigration to Mastodon," *arXiv preprint arXiv:2305. 19056*, May 2023.

[21] F. Casey and D. Brianna, "Moving across lands: Online platform migration in fandom communities," in *Proceedings of the ACM on Human-Computer Interaction*, May. 2020, pp.1-25.

[22] Z. Drus and H. Khalid, "Sentiment analysis in social media and its application: Systematic literature review," *Procedia Computer Science,* vol. 161, pp. 707-714, Jan. 2019.

[23] T. Saha, A. Upadhyaya, S. Saha and P. Bhattacharyya, "Towards sentiment and emotion aided multi-modal speech act classification in twitter" in *Proceedings of the 2021 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies*, Jun. 2021, pp. 5727-5737.

[24] l. Yue, W. Chen, X. Li, W. Zuo, and M. Yin, "A survey of sentiment analysis in social media," *Knowledge and Information Systems*, vol. 60, pp. 617-663, 2019.

[25] C. Cerisara, S. Jafaritazehjani, A. Oluokun, and H. Le, "Multi-task dialog act and sentiment recognition on mastodon," *arXiv preprint arXiv:1807.05013*, Jul. 2018.

[26] Lemmy, 2023. A link aggregator and forum for the f ediverse, https://github.com/LemmyNet/lemmy

[27] Getting Started (join-lemmy.org), 2023. https://join-lemmy.org/docs/users/01-getting-started.html

[28] J. N. Matias, "Going dark: Social factors in collective action against platform operators in the Reddit blackout", in *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems*, San Jose, May 2016, pp. 1138-1151.

[29] @dessalines and @nutomic, Update from Lemmy after the Reddit blackout, https://join-lemmy.org/news/2023-06-17_-_Update_from_Lemmy_after_the_Reddit_blackout, 2023.

[30] Google Trends 2023. "lemmy" search term, https://trends.google.com/trends/explore?q=lemmy

[31] Google Trends, 2023. "reddit alternative" search term, https://trends.google.com/trends/explore?q=reddit%20alternative

[32] SimilarWeb Data, 2023. https://www.similarweb.com/website/join-lemmy.org/#overview

[33] Lemmy.world, 2023. https://blog.mastodon.world/july-2023

[34] Lemmy.world Status, 2023. https://lemmy-world.statuspage.io/

[35] Lemmy Status, 2023. https://lemmy-status.org/

[36] Lemmy World Announcement, 2023. https://lemmy.world/post/2923697

[37] C. Hutto, G. Eric, "Vader: A parsimonious rule-based model for sentiment analysis of social media text," in *Proceedings of the International AAAI Conference on Web and Social Media*, Ann Harbor, May 2014, pp. 216-225.

[38] Lemmy API documentation, 2023. https://join-lemmy.org/docs/contributors/04-api.html

[39] Lemmy.py repository, 2023. https://codeberg.org/retiolus/Lemmy.py

[40] W. McKinney," Data structures for statistical computing in python, " in *Proceedings of the 9th Python in Science Conference*, Austin, Jun. 2010, pp. 51-56.

[41] The pandas development team, "Pandas-dev/pandas: Pandas", Zenodo, Feb. 2020.

[42] Lemmy Apps page, 2023. https://join-lemmy.org/apps

[43] V. Braun and V Clarke, "Using thematic analysis in psychology", *Qualitative Research in Psychology*, vol. 3, no. 2, pp. 77-101, 2006.

[44] S. Tsugawa and S. Niida, "The impact of social network structure on the growth and survival of online communities" in *Proceedings of the 2019 IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining*, Vancouver, Aug. 2019, pp. 1112-1119.

[45] C. Kiene, A. Monroy-Hernández, and B. M. Hill, "Surviving an "eternal september" how an online community managed a surge of newcomers" in *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems*, San Jose, May 2016, pp. 1152-1156.

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