SSW 533 Software Estimation and Measurement

Final Project Report

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"I pledge in my honor that I have not given or received any unauthorized assistance on this assignment/examination."

Abstract

Software development communities utilize communication platforms to communicate with other developers to debug their code and get other developers' views on their issues. This project looks to analyze how engaging different communication platforms are for these software development communities. Specifically, this report aims to look at how engaging Gitter and Discord are for their users in a software development community. The community that will be examined is the Angular community, a software development community centered around developers working with Angular projects. This report starts by giving a brief history and background between the two communication platforms. Additionally, this report will show metrics extracted from chat logs from both Gitter and Discord to help measure how engaging the platforms are. From the metrics, one will be able to see how the Angular community is engaged on the Gitter and Discord platforms. When one looks at the metrics, both platforms are very similar in their engagement per user even though Gitter has a bigger community. The report then talks about potential threats to validity and limitations of the report, pointing out different flaws to the approach taken and how the flaws were handled. Finally, The report ends with some conclusions about the data analyzed followed by future work that should be done to learn more about how effective these communication platforms are and a reflection on the overall process of getting the data, analyzing data, and writing this report. After reading this report, the reader should have a better understanding of how different communication platforms could potentially create a better working atmosphere based on which platform is used.

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Introduction

Companies have several methods of communication, including phone calls, emails, in-person meetings. Many utilize collaboration tools such as Slack, Microsoft Teams, or Google Meet to communicate with one another. However, since there are so many different tools available, not all companies use the same application. These tools have different user interfaces, make use of different features, have different methods of chat, and more. Regardless, they still serve the same general purpose: team collaboration and internal messaging.

The purpose of our research is to see where one application may surpass the other, in which one is more engaging than the other. We decided to focus on two popular collaboration tools: Discord and Gitter. We analyzed chat logs within the Angular communities of both platforms to determine how active users were, how big each community was, how quickly they responded, and overall, how engaged were users on each application. Chat logs from this community on both applications had very similar formats; this allowed us to run virtually the same scripts on each chat log to achieve our results.

Background

1. Discord

History

Discord was founded in 2015 as a communication tool for people who wanted to play video games together, talk with friends, and stay connected to relevant gaming communities. Over the course of 6 years, they have gained 150 million monthly active users, 19 million active servers per week, and 4 billion server conversation minutes daily[1].

Discord has extended much further than its humble beginnings as a gaming community. By 2020, it rebranded to be inclusive to more than just people who enjoy video games. They host conferences, tech communities, homework sessions and much more[2][3]. This is also reflected in the changes in their user interface, the inclusion and development of features, and the inclusion of a premium subscription service to accommodate those who need larger upload size limits and better quality screen sharing[1].

Features

Some of Discord's staple features include: desktop and mobile screen sharing, video and audio calls, server creation, user roles, text channels, and voice chat rooms. Furthermore, video conferences can be held with large volumes of people, similar to Zoom, and screen sharing can be done simultaneously by multiple users[4]. The practicality to companies is very straightforward: companies may create their own servers, assign users to teams, create separate chat rooms for teams, and share their screens for conferences.

2. Gitter

History

Gitter is an open source, GitHub-based platform and chat tool that allows its users to communicate with each other, communities, and collaborate with one another within these communities. Unlike Discord, it's target audience is specifically Software Developers[5][6].

Gitter came out of beta and was released to the public in 2014. The UX was built around GitHub's design for sharing and commenting on code, and creating chat rooms for public and private repositories[7]. By 2017, it had been acquired by GitLab, and by 2020, it had been acquired by Element[8][9]. Regardless of these acquisitions, Gitter is still available for users to access and utilize with all of its features intact.

Features

According to Gitter, it's key features include unlimited public and private chat rooms, unlimited and searchable chat history, unlimited integrations, and being built on GitHub, which itself hosts the projects of a large volume of Software Developers. Just as with Discord, companies, especially Software Development teams, have great use for these features to collaborate in-house and with other Software Developers who may be encountering the same problems[10][11].

3. Differences

One of the key differences between the two platforms is the ability to make voice and video calls on Discord. However, Gitter is more closely associated with Software Development collaboration than Discord; Discord recently rebranded itself to include this community. Most

importantly, Gitter is integrated with GitHub, where a large volume of users are Software Developers; allowing users to create chat rooms based on public and private repositories is not something Discord offers. Regardless of how both platforms operate, they are both currently recognized as tools that can be used to enhance collaboration between Software Developers.

Metrics

The metrics used in the project were from our original proposed GQM model, which has changed throughout the course of the project. The original GQM model included additional metrics such as what type of stakeholders the users were, which features in the tools were utilized, and the number of tasks opened and closed. These metrics would be valuable in evaluating the effectiveness of the tools for software development, however the project team was unable to extract such metrics, but were able to extract the rest of the metrics from our GQM model which are the time of responses, number of users, number of chats, user contribution to the chat, number of chats with mentions, and number of words in the chat.

Metrics to measure engagement of users in each chat

1. Time of responses
    a. Average time of responses
    b. Median time of responses
2. Number of users
3. Number of chat (duration of)
    a. Gitter 8/30/2018 to 12/6/2019
    b. Discord 08/30/2020 to 12/06/21

4. Users contribution to chat (average and 5 number summary)
    a. Average
    b. Min
    c. 25% percentile
    d. Median
    e. 75% percentile
    f. Max
5. Number of words in each chat (average and 5 number summary)
    a. Average
    b. Min
    c. 25% percentile
    d. Median
    e. 75% percentile
    f. Max
6. Number of chats with mentions “@”

Results

1. Raw Data

The chat data for the Angular community in Gitter was collected from the public Github repository, LiveChat2021/LiveChat that contains raw chat data for several Gitter communities. After properly formatting the data to Google Colab, the environment for analyzing the data in Python, aforementioned metrics were applied to analyze the data.

	DateTime	User	Chat
1	1 [2018-08-30T01:09:23]	niniyzni	hi,I am trying to include google maps in angu...
2	2 [2018-08-30T03:04:19]	niniyzni	hi,can you tell me how to fix the below error...
3	3 [2018-08-30T03:06:29]	rohitsodhia	First problem, you have javascript in your t...
4	4 [2018-08-30T03:07:22]	rohitsodhia	second problem, you're using classes in your ...
5	5 [2018-08-30T03:07:39]	rohitsodhia	you never setgoogleas a class property, so wh...

Figure 1) Chat Data for Angular Community in Gitter

The chat data for the Angular community in Discord was collected directly from the Discord API after joining the Angular community's Discord server. We chose to look at the chat data from their active channel of questions, where users would post questions about their Angular project and the community would be able to answer them.

	AuthorID	Author	Date	Content	Attachments	Reactions
1	523331765348073472	ChandlerBaskins#7616	30-Aug-20 01:00 PM	I have two different APIs that I'll be calling...	NaN	NaN
2	523331765348073472	ChandlerBaskins#7616	30-Aug-20 01:00 PM	Im trying to think about the way to be the eas...	NaN	NaN
3	176804557475545089	alx#0001	30-Aug-20 01:02 PM	I like to split stuff like that up as much as ...	NaN	💯 (1)
4	190470535900168194	CreativeInstinct#6762	30-Aug-20 01:02 PM	I'd choose the latter as well, unless the aggr...	NaN	NaN
5	523331765348073472	ChandlerBaskins#7616	30-Aug-20 01:03 PM	Awesome thanks all!	NaN	NaN

Figure 2) Chat Data for Angular Community in Discord

The two obtained data originally cover a different span of time, however, to result in comparison and analysis with a high validity, the time span of both data had to be fixed to one year. Both cover a duration of 463 days, but Discord covers starting from August 30th, 2020 to December 6th 2021, while Gitter covers it from August 30th, 2018 to December 6th 2019.

2. Unique Users

Unique users for each community during the set time of 463 days were counted. 2,093 unique users were recorded for Discord, and 3,214 unique users were recorded for Gitter.

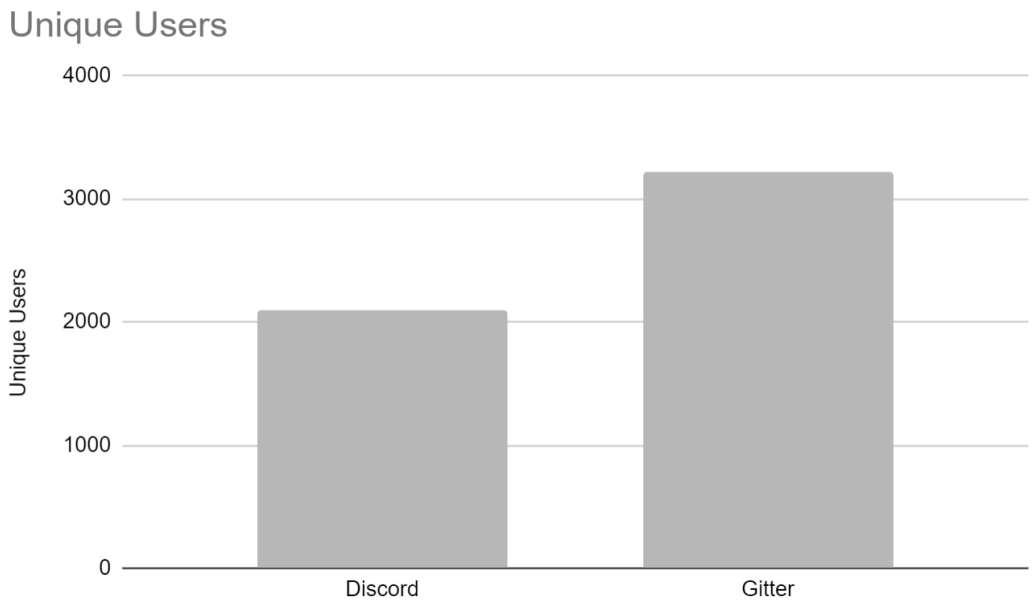

Figure 3) Unique Users for Angular Community in Discord and Gitter

Since Gitter recorded a 30% higher number of unique users than that of Discord, Gitter might be seen as a more engaging community. However, other various factors heavily impact the activeness of chats as well, such as activity of individual or response time. Therefore, the final evaluation has to come after analyzing the data based on all of the metrics.

3. Response Time

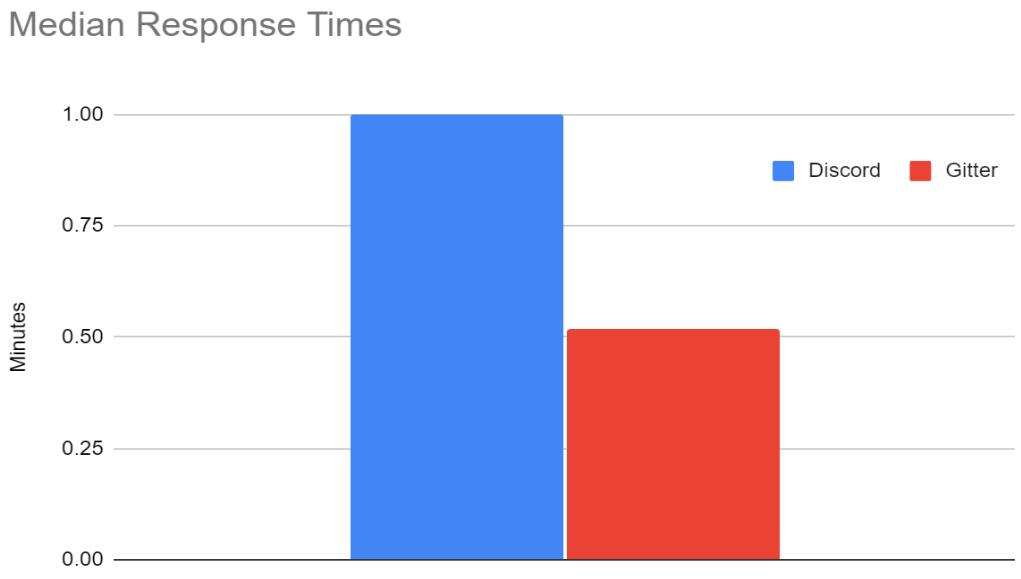

Figure 4) Median Response Time for Angular Community in Discord and Gitter

The difference in response time between the two platforms was surprisingly high. This metric was evaluated using the median response time, as there were outliers that hindered the performance of each platform. For example, when the community is inactive for a night and the next response is the following morning and there are hours between a message. The Gitter response time was almost twice as fast as the Discord response time, however there are significantly more users in the Angular Gitter community than the Discord community. This is the probable cause of the gitter's faster response time.

4. Number of Chats

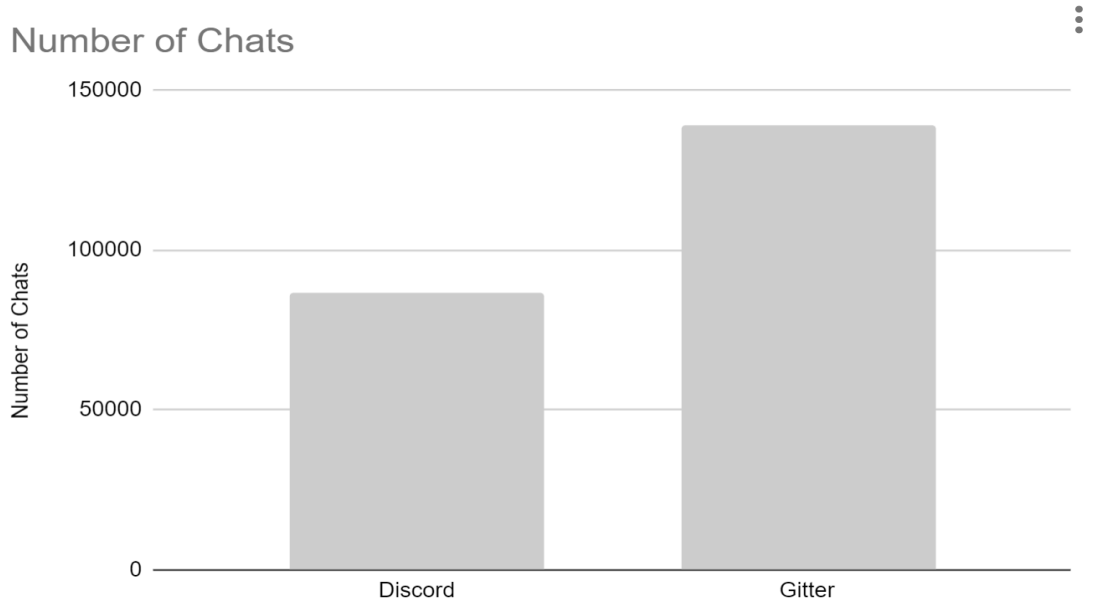

Figure 5) Number of Chats for Angular Community in Discord and Gitter

The difference in the number of chats between Discord and Gitter are very high, with Gitter having almost double the amount of chat messages sent than discord. However, like the response time, gitter has a higher number of users in the Angular community than discord. This higher volume of users is the probable cause for the higher number of chat messages and evaluating metrics unaffected by user population would give a better evaluation of the platforms.

5. User Appearance

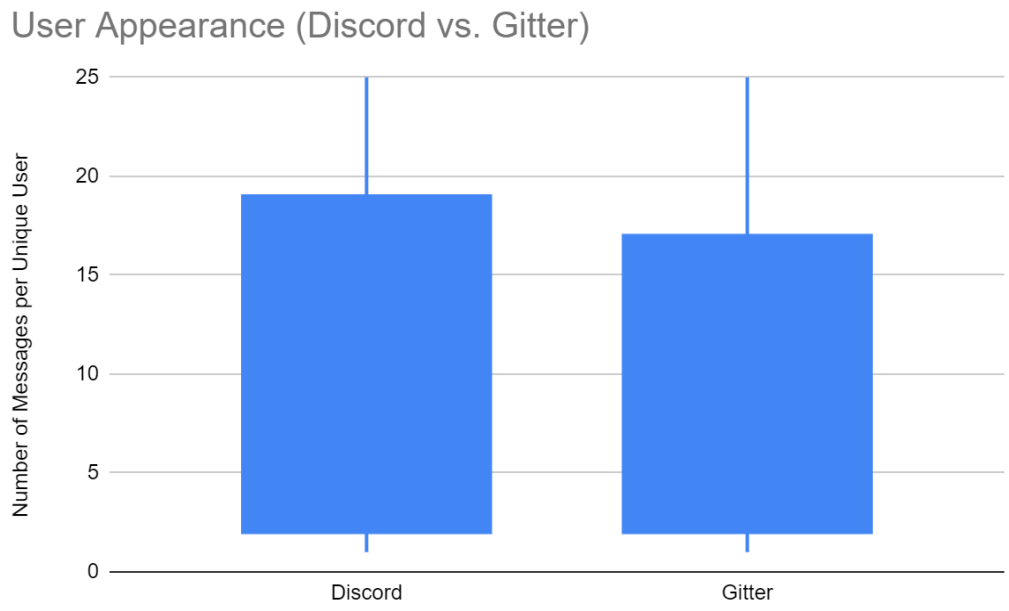

Figure 6) User Appearance for Angular Community in Discord and Gitter

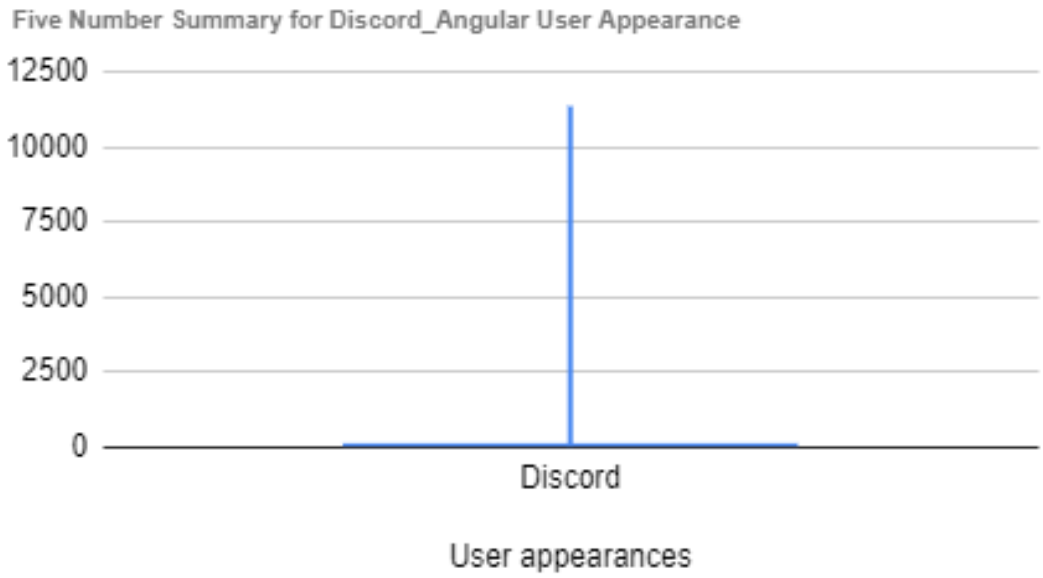

Figure 7) User Appearance for Angular Community in Discord Outliers Included

The user appearance measures how many messages are sent per user in the community. This metric gives a better evaluation of how engaged users are across the

community itself. With the users appearances being very similar in their median value with Discord being 16 and Gitter being 15, it is clear to see that both communities have relatively similar engagement among the Angular community. It is important to note that there was a user who participated in chat much more frequently than everyone else, skewing the data with a large maximum. This leads to the data being very hard to evaluate as one can see in Figure 7. The project removed a couple outliers to get a better representation of the Angular community as a whole on the respective platforms.

6. Number of Words in Chat

Not only evaluating the communities by the frequency of user appearance and pings of chats, the number of words contained by each chat message was taken into consideration to assess the quality of each message. For example, a chat with one word like “Yeah” or “Good” will deliver much less information than a chat with more than 10 words.

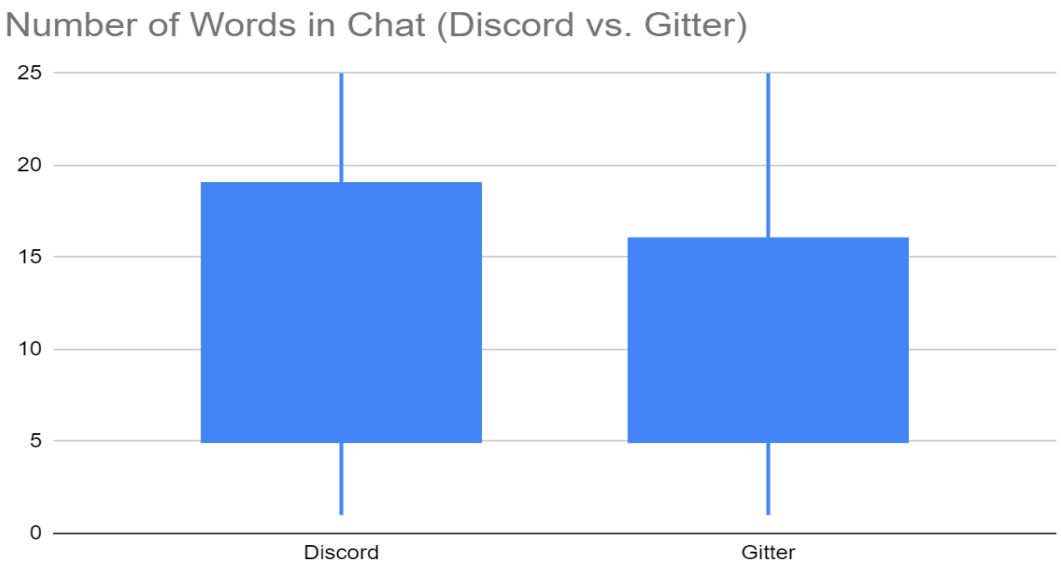

Figure 8) Number of Words in Chats for Angular Community in Discord and Gitter

The median words in a chat in Discord is 10, and similarly in Gitter is 9. Similar to graphing the result of user appearance, outliers were removed to capture the median length of chats better. The maximum length of the Discord Angular community was 1,233 words, and when queried out to verify, the content of the longest chat contains long snippets of code with tags.

```html
<div fxLayout="row" fxLayout.xs="column" fxLayout.sm="column">
  <div fxFlex="100" style="position: relative;">
    <mat-card class="box-shadow-none border-1" style="min-height:calc(90vh -
      <div class="toolbar border-none z-index-12" id="toolbar-toolbar">
        <span class="ql-formats">
          <select class="ql-font">
            <option selected=""></option>
            <option value="serif"></option>
            <option value="monospace"></option>
          </select>
          <select class="ql-size">
            <option value="small"></option>
            <option selected=""></option>
            <option value="large"></option>
            <option value="huge"></option>
          </select>
        </span>
        <span class="ql-formats">
          <button class="ql-bold"></button>
          <button class="ql-italic"></button>
          <button class="ql-underline"></button>
          <button class="ql-strike"></button>
        </span>
        <span class="ql-formats">
```

Figure 9) Contents in the longest chat sent in Discord Angular Community.

7. Number of Mentions (@)

Usage of "@" helps users to speak directly to a specific user and help him or her come back to conversation regarding certain issues. Total of 6,722 mentions were used in chats for Discord, and 5,134 mentions were used in Gitter. However, when compared to the

number of total chats, Discord has a slightly higher percentage, with about 8% of total chats mentioning other users, while Gitter recorded about 4 % of total chats with “@”.

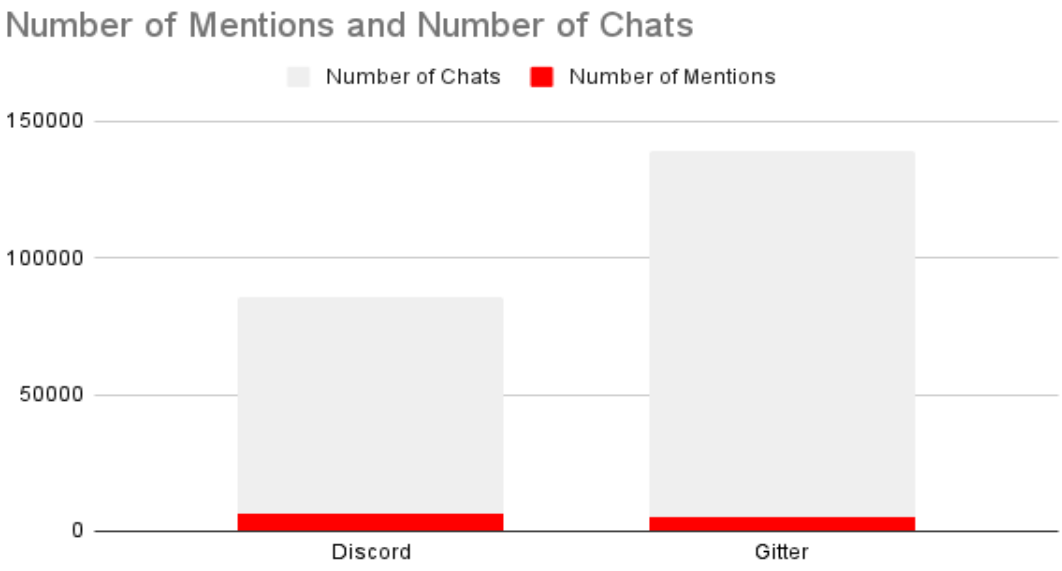

Figure 10) Number of Mentions and Total Chats for Angular Community in Discord and Gitter

Threats to Validity

A threat to validity is that the data comes from different time segments in the communities, where the Gitter data is extracted from a year before the Discord data. This could mean that the communities could possibly have been more active or lively during the different time periods. However, the time was only one year apart and for how mature the Angular community is, it should not be an issue. Another threat to validity is that the chat data for Gitter was disentangled, meaning the chat conversations were normalized and do not include any emoji characters, images or other non-word messages.This threat could lead to a skew in data when it comes to different lengths of

chat messages. However, the overall data results between Discord and Gitter roughly have the same number of words per chat message with the outliers removed from the data, and the slight difference in the median numbers of words in chat could be because of the disentangled data. With the difference being as low as it is, this project does not take any mitigation strategies against this threat. Furthermore, another threat to validity is that we collected data from the same community, and it is possible that the community is more inclined to use one tool over the other. The way this project handled this threat was that there was simply a higher number of users in the Gitter Angular community, so the metrics heavily considered for analysis were ones that did not necessarily have bias towards a higher number of users like average length of chat message and user appearance. Additionally, comparing the same community across multiple platforms to better understand the platforms could also be a threat to validity because the average user appearance could be consistent with the Angular community rather than both communication platforms having consistent engagement levels.

Limitations

This project's limitations come from the data collection and available metrics to be extracted from the data. This project leverages on the idea that a community using multiple communication platforms for software development would in return favor one over the other for specific reasons. However, the community analyzed utilized both Discord and Gitter evenly. This limitation on data collection on only one software community could hinder the results, and more communities should be analyzed. Additionally, this project has some limitations with the metrics collected. The metrics gathered from the data were all that was able to be collected given the timeframe and the data itself.

The proposed GCM models list more metrics that could be helpful data to analyze. However, there needs to be more data accumulated on these community chat logs to acquire more metrics.

Conclusion

This project analyzed two Software Communication tools Gitter and Discord for user data. This research project measured different types of the matrix in user communication chat like the time of responses between users - evaluated using the median response time, number of users joined in community, number of chats - the number of chats between Discord and Gitter are very high, with Gitter having almost double the amount of chat messages sent than Discord, user contribution to the chat, unique users for each community during the set time were counted and number of words in the chat to analyze which tool is best for Software Development. The data results between Discord and Gitter approximately have the same number of observations per chat message, and the tiny discrepancy in the median numbers of words in chat could be because of the disentangled data set. Here, the research project leverages the presumption that a community utilizing numerous communication tools would prefer one over the other for straightforward explanations. The measured differences between Gitter and Discord are not significantly acceptable to conclude one to be incomparable to the different communication tools. If possible, it could be just a subject of the presence or any company's needs.

Future Work

In the future, further research is needed on the engagement of different software communication tools for Software Development like Slack. Further research could be analyzing the

communication tools through the same metrics, however for the future, it would be ideal if one could extract more metrics from the data as mentioned in the original GQM model. Further research is also needed to conduct the same data collection from multiple Software development communities rather than just Angular. This would allow one to get a better understanding of how well these software communication tools operate across the field of software development.

Reflection

Extracting the data proved to be a little difficult at first. Many of us on the team did not know how to pull data from any of the collaboration tools' APIs. Although we could see what was available in the documentation for Discord and Gitter, we had to determine which metrics would be meaningful when determining how engaging or effective either tool was. We settled on pulling chat logs; we downloaded the chat logs from Discord's Angular community itself and a public repository that contained Gitter's Angular community chat logs. What we could have done differently was to automate extracting data from not only these two platforms' APIs but other communication tools as well. Not only would that make extraction cleaner, but we would be able to analyze additional metrics not investigated in this report.

Another problem we had was running scripts on each txt file to analyze the data. We had come up with several workarounds, including manual adjustment of the Gitter.txt file in order to compare both datasets using the same script. Had we automated data extraction from the APIs, not only could we have done this project with less manual labor, but we could have compared many more communication tools as well. Additionally, another issue presented itself; we needed a more formal method for disentangling the chat logs. If we can accomplish this in the future, we would reduce the threats to validity in our analysis.

Overall, the conclusions we came to were not what we expected initially. Since Gitter was released out of beta one year earlier than Discord and Discord only recently rebranded to include collaboration last year, we believed there would be a much larger gap between the two. However, we came to the conclusion that there was not a significant difference between them in terms of engagement. We only extracted data for that one year period since Discord was not considered a collaboration tool beforehand; it was a communication tool for gaming. If we want to analyze the effectiveness, engagement, or impact of each communication tool over time, including those outside of Discord and Gitter, we may need to wait a few more years to accurately portray and analyze that.

References

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5. https://gitter.im/
6. https://play.google.com/store/apps/details?id=im.gitter.gitter&hl=en_US&gl=US
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9. https://blog.gitter.im/2020/09/30/gitter-element-acquisition/
10. https://appmus.com/vs/gitter-vs-discord-app
11. https://stackshare.io/stackups/discord-vs-gitter

Appendices

1. Charts and simple mathematical computations

9	DISCORD			GITTER	
10	unique_users	2093		unique_users	3214
11	number of chats(r	86915		number of chat	139124
12					
13	mean	41.526517		mean	43.28687
14	std	325.004212		std	258.737895
15	min	1		min	1
16	25%	2		25%	2
17	50%	6		50%	5
18	75%	19		75%	17
19	max	11373		max	5315
20					
21	First Time Stamp	8/30/2020		First Time Stamp	8/30/2018
22	Last Time Stamp	06-Dec-21		Last Time Stamp	12/6/2019
23	Time Span	463		Time Span	463
24					
25		Discord	Gitter		
26	Data Ratio	1	1	<-- which we manually changed fr	
27					
28	(For Plot)User app	min	25%	75%	max
29	Discord	1	2	19	25
30	Gitter	1	2	17	25

https://docs.google.com/spreadsheets/d/1hCZBChPi8FfORMHGfoZdjD54RQvvuoc7rnvP0

2pHfsU/edit#gid=0

2. Collaborative analysis of data in Python

```
[ ] import pandas as pd
    import numpy as np # linear algebra

    #import from Google Drive
    from google.colab import drive
    drive.mount('/content/drive' , force_remount=True)

    # gitter = pd.read_table("/content/drive/MyDrive/SSW533-Team2/data/disentangle/angular_angular.txt", header=None)
    gitter_angular = pd.read_csv("/content/drive/MyDrive/SSW533-Team2/data/gitter/angular_data.csv", header=None)
```

```
Mounted at /content/drive
/usr/local/lib/python3.7/dist-packages/IPython/core/interactiveshell.py:2718: DtypeWarning: Columns (13,14,15,16,1
  interactivity=interactivity, compiler=compiler, result=result)
```

```
[ ] gitter_angular["Chat"].str.contains("@").value_counts()
```

```
False    133990
True       5134
Name: Chat, dtype: int64
```

```
[ ] len(discord_angular["Author"].unique())
```

```
2093
```

```
[ ] print(type(discord_angular["Author"].value_counts()))
```

```
<class 'pandas.core.series.Series'>
```

```
[ ] discord_angular_user = discord_angular["Author"].value_counts()
```

```
[ ] discord_angular_user.describe()
```

```
count     2093.000000
mean        41.526517
std        325.004212
min          1.000000
25%          2.000000
50%          6.000000
75%         19.000000
max      11373.000000
Name: Author, dtype: float64
```

```
[ ] discord_angular["Authors"]
```

https://colab.research.google.com/drive/1wsnixmGsxIA-esubaklZAOy-tnaF168G?authuser=2#scrollTo=9RM_rqjVGEDS