Università degli studi di Milano-Bicocca

Data Visualization

Project Report

Popularity of videogames on Twitch and Twitter

Authors:
Khaled Hechmi – 793085 – k.hechmi@campus.unimib.it
Gian Carlo Milanese – 848629 – g.milanese1@campus.unimib.it

July 14, 2019

UNIVERSITA' DEGLI STUDI DI MILANO BICOCCA

1 Introduction

The gaming sector is no longer confined to local and online matches: social networks such as Twitch and Twitter are benefiting from the ever-growing success of the industry as they are the de facto virtual square where people from all around the world share their progress and discuss outstanding gameplay moves or the latest rumors. An approach for measuring and quantifying the "buzz" around the most popular games of the past and present on these two social media will be proposed in this project, so that it will be possible to analyze the popularity of the selected games in a data-driven way.

This report will briefly go through the steps taken to collect the data and will then focus on the reasoning behind the visualization choices.

2 Sources of the data

The first task has been to identify a list of 50 suitable games to collect data about. In order to do so, games that satisfy at least one of the following criteria were considered:

- the game has achieved very high global sales numbers;

- the game is, on average, one of the most streamed games on Twitch.

The idea is that a game that satisfies either of these two criteria should be popular enough to be streamed on Twitch and tweeted about, so that data about it can be collected. There is also an interest to see if the best selling games of all times are still relevant today or they have become a niche, played only by a handful of gamers.

Firstly, games with high sales numbers were identified by scraping the *VGChartz*, a website and industry research firm that publishes over 7,000 unique estimates per week relating to worldwide game hardware and software sales and hosts a game database with over 40,000 titles listed and 1.5 million unique data points [1]. The following are some of the games featured in the resulting list:

- many *Call of Duty* games, such as *Black Ops* 1, 2 and 3, *Modern Warfare* 2 and 3, *Advanced Warfare* and *Ghosts*;

- *Grand Theft Auto San Andreas*, *IV* and *V*;

- *Mario Bros* games such as *Super Mario Bros, Super Mario World, New Super Mario Bros, New Super Mario Bros Wii*;

- *Mario Kart DS* and *Mario Kart Wii*;

1

- *Pokémon Red/Blue* and *Pokémon Gold/Silver*;
- *Tetris* (NES and GameBoy versions);
- Wii games like *Wii Sports*, *Wii Sports Resort* and *Wii Play*.

Some of the games found are not very recent, but still very popular within specific gaming communities – for instance, *Super Mario Bros.* and the speedrunning community, or the original NES *Tetris* and the competitive community established with the *Classic Tetris World Championship* –, so that collecting data about them still makes sense.

Next, the games that are, on average, the most streamed on Twitch were identified by requesting data about every streamed game through the Twitch API every 3 minutes for 48 hours; also in this case a list of 25 games was isolated (excluding games found in the previous step). For instance, this list contains the following titles:

- *Apex Legends*;
- *Call of Duty: Black Ops IV*;
- *Counter Strike: Global Offensive*;
- *Dota 2*;
- *Fifa 19*;
- *Fortnite*;
- *Hearhstone*;
- *League of Legends*;
- *Overwatch*;
- *PLAYERUNKOWN'S BATTLEGROUNDS*;
- *World of Warcraft*.

After the identification of the list of games to monitor, the collection of the desired data from Twitch and Twitter was carried out. As far as Twitch is concerned, data about games streamed on the platform was collected every 3 minutes: every downloaded document consisted of the list of games streamed at the time of the request, each with the number of viewers and channels. Regarding Twitter, for each game at most 200 tweets were collected every day, prioritizing popular ones thanks to the options offered by the Twitter API [3]. The downloaded data included the count of retweets and likes.

3   Data Visualization

The main goal of this project was to measure and compare the popularity of the selected games on Twitch and Twitter. For this reason a summary metric that takes into account the popularity of each game in these two social media was created: the *buzz* value therefore corresponds to the weighted sum of the standardized values of Twitch average views and Twitter likes and retweets related to each game on a given day.

Thanks to this new feature it is possible to compute, for instance, the games with the highest and lowest buzz on each day, which game has reached the highest buzz and which the lowest, or which is the game with the highest (or lowest) total buzz in a given time range.

The proposed infographic[1], created with *Tableau Desktop*, consists of two visualizations, described in the following subsections.

3.1   The Line Chart

The goal of the main visualization (the line chart) is to show how the buzz of each game changes over time, so that it is easy to compare games and locate peaks.

While the whole graphic shows many lines, it is possible to select games to *highlight* for easy comparison. A *filter action* was also considered in order to exclude all the unselected lines, but the *highlight action* was chosen in the end in order to make it possible to see how a game stands out from the crowd.

Opening the visualization on *Tableau Public* shows a couple of lines already selected: the purpose of this choice is to make the user understand that the goal of the visualization is to compare few games at a time, or to compare a selected game against all the unselected ones. A *hint* is given on how to select more than one game simultaneously.

A *logarithmic scale* for the *buzz* axis was chosen in order to better show the small differences in buzz values among the games that did not have significant peaks. One drawback of this choice is that huge differences among peaks may be more difficult to spot, but this scenario is far less frequent than the one that led to the final choice.

3.2   The Horizontal Bar Chart

The second visualization, consisting of an horizontal bar chart, has the objective of exploring how the buzz value changes when data is filtered according to the *Date*

---

[1]`https://public.tableau.com/views/VideogamesBuzz/Dashboard1`

field, and shows the ranking of the games in the selected time range. This range is usually made of two or more consecutive days, even though the users can also choose a specific day: the visualization title is updated dynamically according to the selected time interval, so that users are reminded of their choice.

The buzz value that is shown is the average of the buzz values in the selected date intervals: because the average operator is heavily influenced by outliers, the median value is also displayed, using a small gray vertical line in each bar, so that users are encouraged to look for potential anomalies and explore them with further changes in the time range.

This visualization also has a "filter" utility that makes it a more visually appealing alternative to the drop-down list: by clicking on the single bars users can select the games they are interested in and at the same time it is easy to see which is the color associated with a particular game.

3.3   Interactive fields

Besides the filter on dates for the second chart, for both visualizations it is possible to select and deselect the components that constitute the buzz. This filter is achieved with the use of a custom pivot field, whose components are the original standardized buzz components (Twitch viewers, Twitter likes and retweets): therefore the displayed buzz value is dynamically computed according to the filter, summing the selected components. This filter is essential, since it represents the core reason behind this work: with a couple of clicks users have the opportunity to see for themselves which are the eventual similarities and dissimilarities between the reactions on Twitch and Twitter, or which of the two platforms contributes the most to the buzz of a game on a given day.

4   Evaluation of the infographic

The proposed infographic was evaluated using the following methodologies.

- Heuristic evaluation through the *think-aloud protocol*: the feedback from three users was collected.

- Interactive task: 28 users were asked to answer three distinct questions by interacting with the infographic.

- Questionnaire-based assessment with the Cabitza-Locoro scale [4]: 28 users evaluated the infographic according to different aspects.

4

A more detailed description of each methodology is given in the following subsections, with a particular focus on results.

4.1   Heuristic evaluation

The goal of this task was to locate the main problems that arise when interacting with the infographic.

One issue that users found in this infographic is the position of the "Hint" textbox. Its utility was clearly recognized but it is not evident when the users start interacting with the second chart. A more suitable position would be just above the visualization, so that users can notice it and benefit from it immediately.

Another problem regards how the "Choose a Time interval" filter works, since a user expected that both visualizations would change after filtering. This criticism was expected, as the behavior of the filter was discussed during the creation phase: the reason of the final choice is due to the fact that the first chart should focus on overviewing the data in order to quickly find peaks and falls on the buzz value, while the second chart is more suitable for fine-grained tasks. Another reason is that, for one-day intervals, the chart would no longer be a line chart, but a mere display of points with different heights, making it less visually appealing. The easiest solution would be to better explain the chart, with the addition of the keyword "overview" in its title. Nonetheless, it would be really interesting to follow the PDCA cycle and test another version of the visualization where the filter works on both charts, in order to see users reactions and choose the best version.

The third problem that was highlighted by users concerns the number of games displayed and the corresponding lines in the chart. The fact that visualizing too many lines at once would make the visualization less appealing with all the games selected was considered during the creation of the infographic, but keeping the whole list of games was deemed valuable for the goal of the project and for the intended use of the infographic, which is to compare the performances of few selected games at a time, or to see how the buzz of a selected game fares against that of all the other games in the background. A possible improvement might involve the addition of a custom filter that would help the users choose a subset of the available titles, for instance by using a simple criterion such as the top N games.

4.2   Interactive task

The users were asked to interact with the infographic in order to solve the following three tasks, with increasing difficulty.

- The first task consisted of finding the game that achieved the highest value of buzz, and its solution could be found by locating the highest peak in the line chart.

- The second task asked the user to find the game with the highest average buzz between 21 June and 27 June 2019, which involved choosing the correct time interval and reading the first entry in the bar chart.

- Finally, the user was asked to find the game with the third highest average buzz within the same dates, but only considering the Twitter components of the buzz, which required interaction with the relevant filter.

The time required by each user to answer all these tasks was recorded: its distribution is shown in Figure 1.
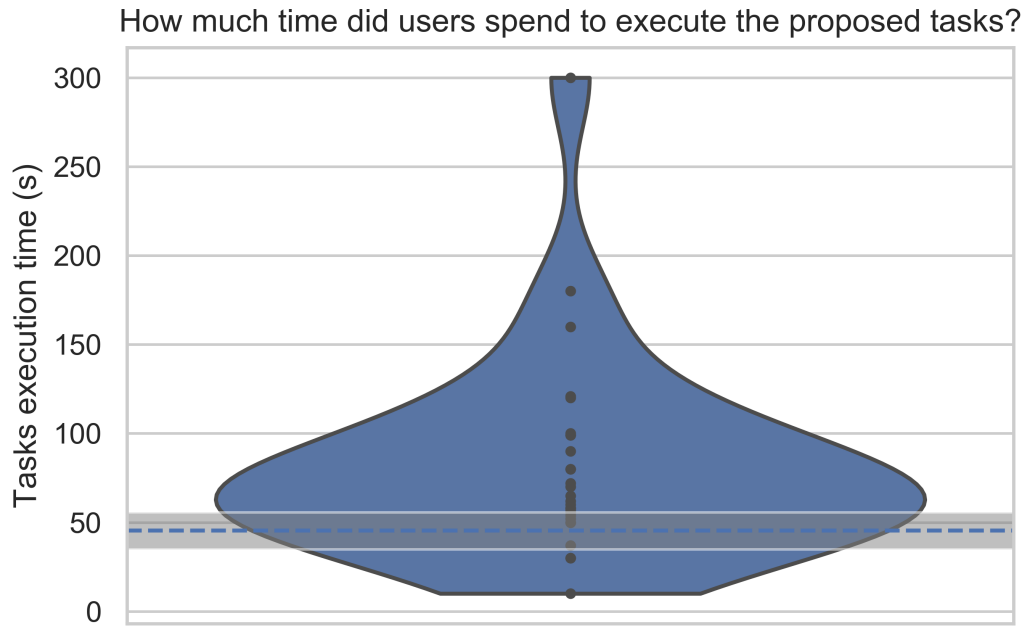
Figure 1: Distribution of execution times

As expected, the majority of the values are above the normality band ($\mu = 45.3$, $\sigma = 10.4$): the reason is that, even though the values were obtained by trying the

three tasks at different speeds, the authors had more familiarity with the visualization compared to test users.

Figure 2 show the percentages of wrong and correct responses for each task, together with their 95% confidence intervals.
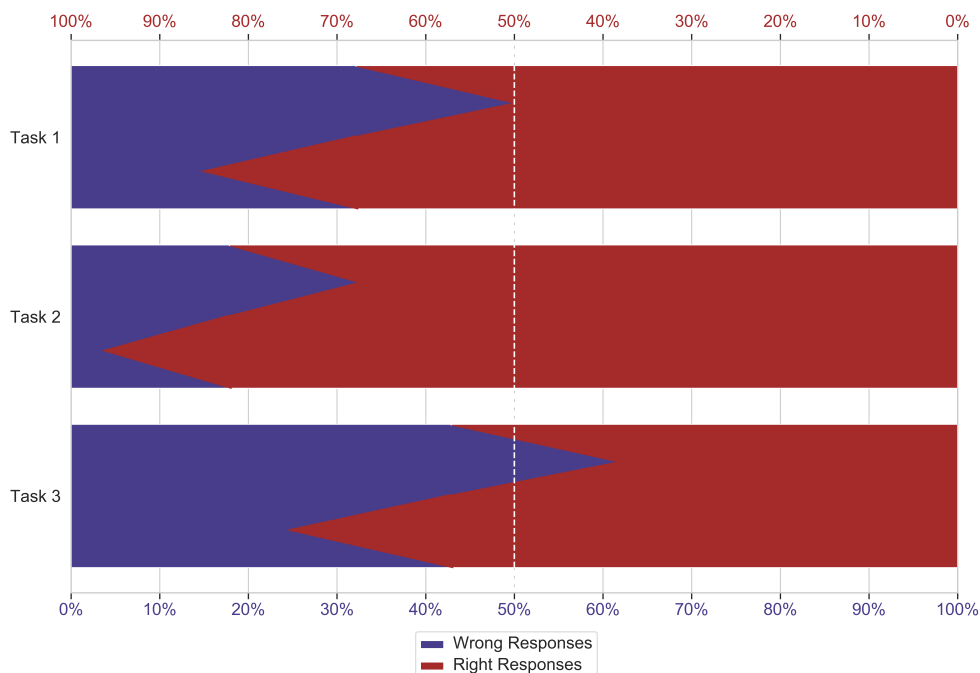

Figure 2: Percentages of wrong and correct answers for the three tasks

Figure 3 shows the percentages of responses to the three tasks for each given option. A few hypotheses can be made regarding the wrong answers for some of the tasks. For instance, *Fortnite* is the second most chosen option after *Minecraft* in the first task: a user might have opted for the first option by looking at the game with the highest average *buzz* over the full time interval, instead of looking at the game with the highest peak. Regarding the third task, users might have looked at *Minecraft*, the game with the highest average *buzz* with respect to the Twitter components, instead of *Apex Legends*, which is the one with the *third* highest score as was asked by the task.
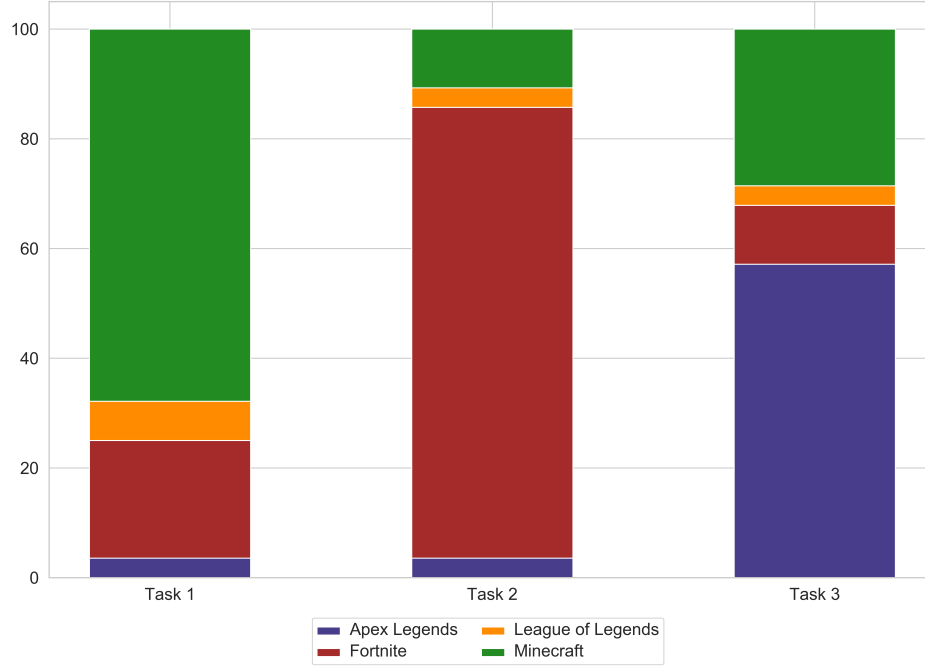
Figure 3: Percentages of responses to the three tasks

4.3   Questionnarie-based assessment

Finally, the users were asked to give a rating between 1 (very low) and 6 (very high) to aspects of the infographic (such as *beauty*, *intuitivity* and *clarity*), according to the *Cabitza-Locoro scale* [4]. Figure 4 shows the percentages of scores in the $1-3$ range and in the $4-6$ range, while Figure 5 shows the correlation between the scores of the different aspects that were evaluated.

For exploratory reasons it was chosen to also create a scatter plot where the scores of the five adjectives were plotted against some of the user characteristics that were collected: the results can be viewed in Figure 6. According to the collected data the *gamers* cluster tended to rate the infographic with higher values compared to the *non-gamers* cluster. Another relevant difference in behaviour is the one between "High School" and "Bachelor degree" users, with the former ones avoiding the two lowest scores (with an exception on *Beauty*) while the latter ones tended to vote in a more heterogeneous way.
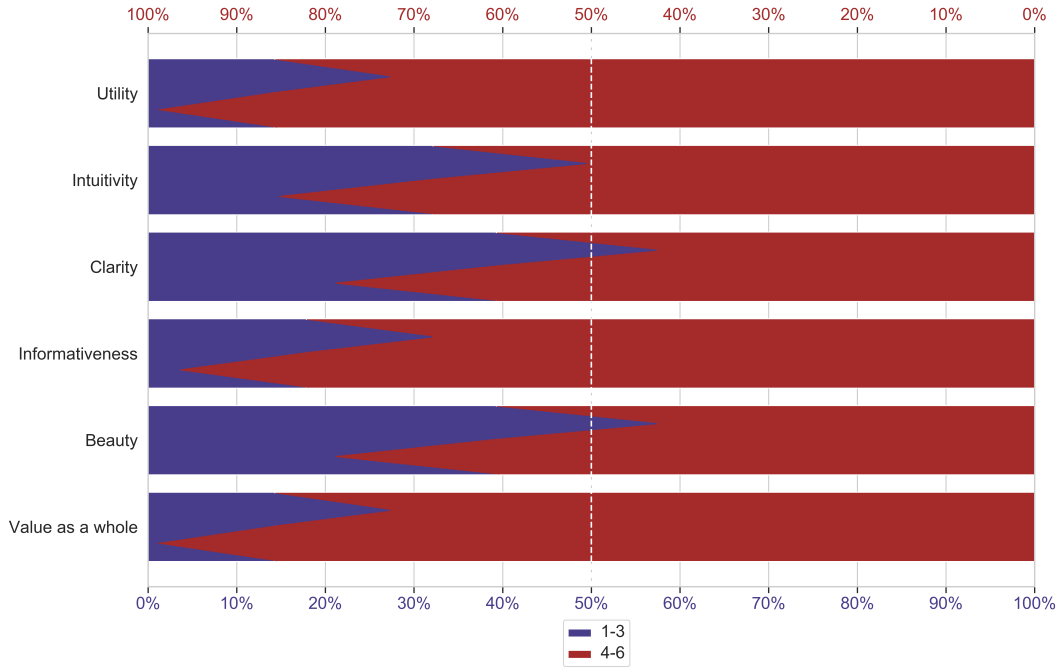
Figure 4: Results of the evaluation

Conclusion

For this project data from Twitch and Twitter was collected in order to monitor the popularity of a selected list of videogames on these platforms. An analysis of this kind can be useful in order to find out which games are more popular and during which hours or circumstances, so that a company could decide, for instance:

- when to insert ads on twitch;
- which games to sponsor;
- which Twitter or gaming personalities to sponsor or hire in its e-sports team;
- which games should be considered when hosting an e-sports tournament for maximising the number of visitors and participants;
- which games references to make during advertising campaigns in order to attract the attention of a particular niche.
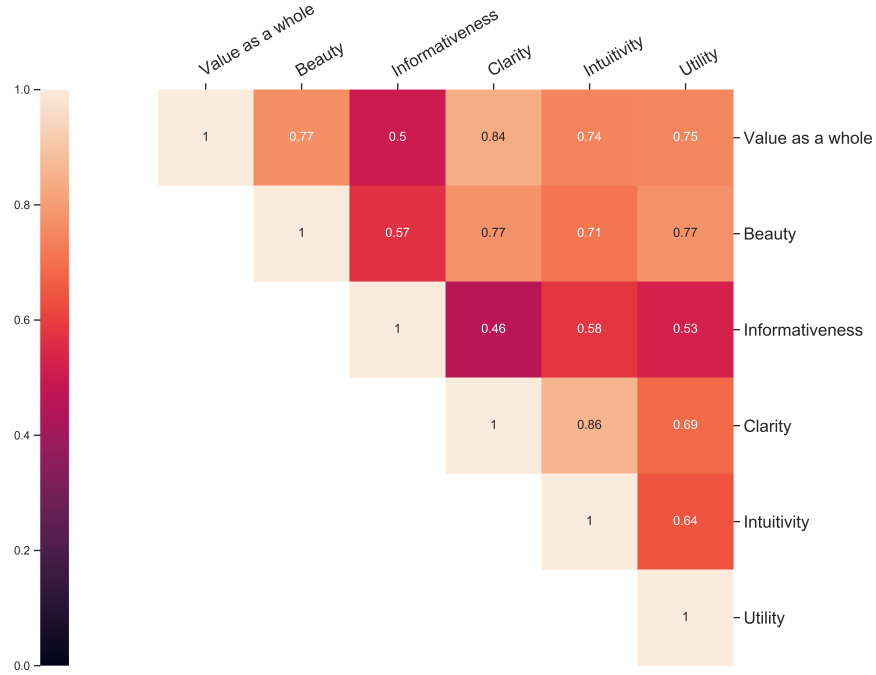
Figure 5: Correlogram of scores for the

This analysis could be extended by considering more games or periodically changing the list of selected games, in order to be up to date with new releases. The Twitch data could also be expanded by collecting data about streams, so that it could be possible to identify which are the most popular streamers for each game.

Another possible development of this work is the possibility to use other data sources in order to have a broader picture of the gaming movement. In particular the two sources that would be ideal to use, together with Twitch, Twitter and VGChartz, are *YouTube* and *Reddit*. The first one is the most popular video streaming platform in the world and a valid competitor of Twitch in the gaming sector. The reason is that together with streaming channels, users can watch news, reviews and gameplay published by traditional media, specialized game websites and popular YouTubers such as *PewDiePie*, who is followed by more than 96 million people. The second one is a trending social media, where many strong and specialized gaming-related communities exist, some counting millions of users, like *r/gaming*, *r/leagueoflegends* and *r/PS4* just to cite a few. In these places users share and discuss the main news

of the day, in a similar way to *Twitter*, without having any limits on the number of characters.

References

[1] VGChartz (June 2019). *About VGChartz*. Retrieved from `http://www.vgchartz.com/about.php`.

[2] Twitch Api v5 (June 2019). *Games Reference*. Retrieved from `https://dev.twitch.tv/docs/v5/reference/games/`.

[3] Tweepy Documentation (June 2019). *Cursors tutorial*. Retrieved from `http://docs.tweepy.org/en/v3.7.0/cursor_tutorial.html`.

[4] Angela Locoro, Federico Cabitza, Rossana Actis-Grosso, Carlo Batini. *Static and interactive infographics in daily tasks: A value-in-use and quality of interaction user study*, Computers in Human Behavior, Volume 71, 2017, Pages 240-257, `https://doi.org/10.1016/j.chb.2017.01.032`.
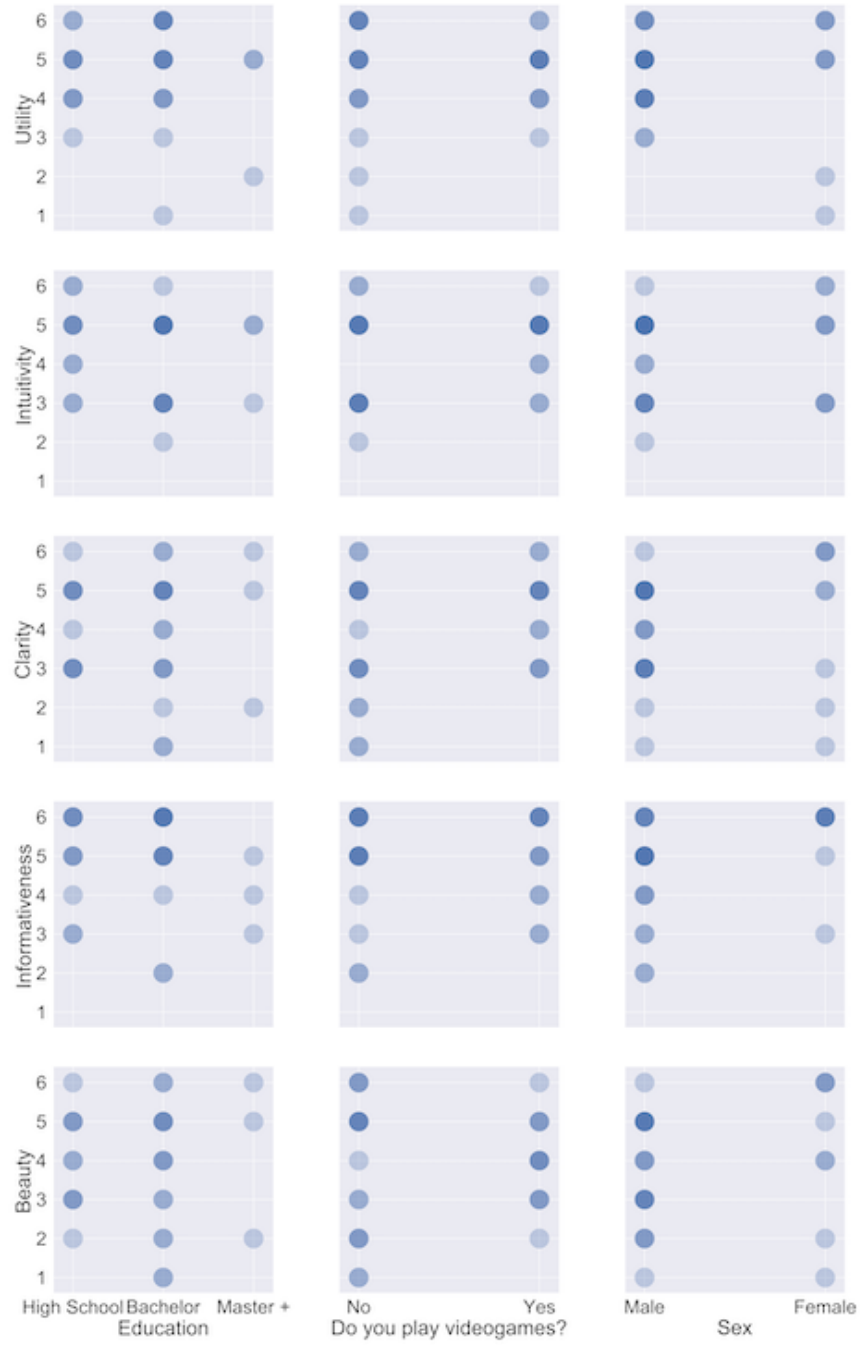
Figure 6: Association between qualitative scores and user characteristics