Bare face of K-pop chart
Analysis of fairness in music charts through statistics

Background problems

The biggest difference between Korean and overseas music services is the presence of a real-time charts. Non – Korean music services (such as, Apple Music, Sportify, YouTube Red) do not offer listeners any real-time charts. However, Korean music services offer a variety of such charts, including real-time, daily, weekly, and monthly charts on their main screens. Lots of Korean consumers simply listen to real-time charts without thinking about it. That's why the ranking of real-time charts have become one of the main criteria for judging singers. However, the phenomenon of idol fandom and chart brokers manipulating the charts has emerged. The so-called "chart all-kill," which is the filling of real-time charts into songs by certain idol group, is recognized as a criterion for The popularity of idol groups. Yet, this problem is harmful and it's damaging the fairness or credibility of K-pop charts, which is why we wanted to analyze this issue statistically.

* 'Sming' is a Korean term used for playing music continuously in music services to raise the ranking of songs by certain singers .

Methodology

Explore materials that give insight into the overall characteristics of music.

Investigate the route students use to listen to music , the time they listen, propensity, the type of music students enjoy listening to , and how they listen to music.

Find out and analyze statistically different types and characteristics of how people use music contents.

We tried to find out why the rankings differ by the music charts and what undermines the fairness of the music charts. In particular, we utilized various methods to analyze whether a ranking is artificially manipulated.
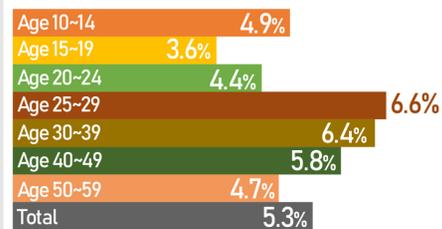
We used a Python Web crawler to collect real-time rankings from each of the music service websites. Then, we analyzed these data to understand the characteristics of the K-POP charts.

Finally, we conducted an online survey with our school students to determine if they knew the rankings are manipulated.
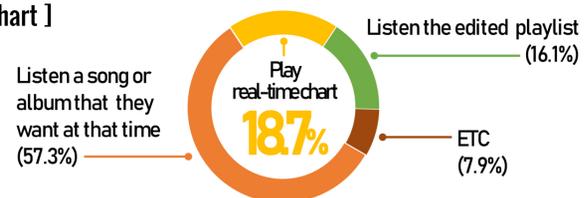
Research2 : Real-time Charts, is this fair and trustable?

[Average change in chart ranking per hour]

In the case of Mnet, Naver, and Melon the average of the standard deviation of the song ranking exceeded 10, indicating that the order of the songs' rankings varied greatly per hour. On the other hand, Bugs and Soribada, showed a low value in the song rank standard deviation or in the average difference between the highest and lowest ranking of songs. So we divided the songs into two groups and concentrated on the group with the greatest difference.

mnet	naver	melon	bugs	soribada
12.32	10.08	10.65	7.3	5.91

Average standard deviation of the rankings (1 day)

mnet	naver	melon	bugs	soribada
47.17	40.94	38.67	34.4	26.85

Average of lowest – highest rank for each song (1 day)

Average change in chart ranking per hour (rank) – time (date)

| Dawn (0h~ 4h) | → | Service users ↓ | → | Easy ranking manipulation by specific groups | → | Large chart movement |
| Rush hour (6h~10h) | → | Service users ↑ | → | Reflects various opinions | → | Large chart movement |

Mnet, Naver: it changes slightly to an average of 3,4 ranks per hour
Melon : Due to dinner time and quitting-time, service users increase, chart fluctuates

For the weekend of July 7 and 8 and the weekdays of July 9 and 10. As illustrated by the graph – Utilization time of music– in Research 1, the number of users during 7:00 AM to 8:00 AM on weekends is less than the number of users on weekdays. Furthermore, the fluctuation between 7:00 AM and 8:00 AM on weekdays is twice as big as on weekends. The graph shows a similar trend for each date. From this, it can be determined that the results have a daily periodicity. Analysis of data for two weeks after this time period showed a similar results.

[Analysis of real-time ranking graph type according to rank - time graph form]

As a result of analyzing the characteristics of the chart, Mnet chart was most changing and fluctuating per hour. So, after analyzing the Mnet chart, we could sort the songs in the chart into following three groups. Dawn time ranking up group and Dawn time ranking down group were divided by following criteria.
1. Comparison → total average ranking / average ranking of the 4 o' clock
2. Determine whether the lowest ranking was achieved in early morning (1amto6am)
3. Difficult to judge by above criteria→ judged by viewing at song rank graph form
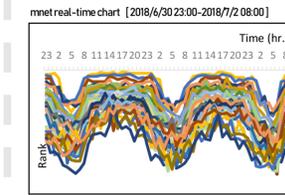
Type 1 : Rank dropping at dawn time
- Average lowest rank achievement time: 5 o' clock (dawn time)
- 36songs/30artist → variety of songs/artist
- Dawn time rank ↓ (user number small) → Type1 songs are often heard by people who listen to music in morning or evening rather than dawn time
- Average of gradient standard deviation / max (type 1 graph form similarity) : 14.4%

Average lowest – highest rank: 51.19 / Number of Artists: 30 / Total number of songs: 36
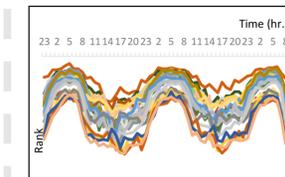
Type 2A : Rank rising at dawn time
- 24songs / 5artist → concentrated in a particular artist or group
- Most of type 2A Artist : Male idol or have huge fandom
- Causes : idol fandom sming, music chart manipulation
- Average of gradient standard deviation / max (type 2 graph form similarity) : 12.3%

Average lowest – highest rank: 50.88 / Number of Artists: 5 / Total number of songs: 24
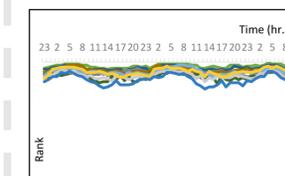
Type 2B : Slightly rising at dawn time (under 20th place)
- Dawn time average rank : 10.55 << type 2
- Shows top 100 dependence of the general public people
- Focused on specific idol-groups (2 group, 9 songs), by idol fandom the rank was reached high causing general people to listen

Average lowest – highest rank: 10.55 / Number of Artists: 2 / Total number of songs: 9

Research1 : The Public VS. Fandom & Brokers

[The ratio of people who use music services to raise the rankings of specific singers]

Age 10~14	4.9%
Age 15~19	3.6%
Age 20~24	4.4%
Age 25~29	6.6%
Age 30~39	6.4%
Age 40~49	5.8%
Age 50~59	4.7%
Total	5.3%

[Utilization time of Music]   Unit : %

— Weekdays — Weekends

In Korean music charts, there are fandom and chart brokers who repeat streaming and downloading to raise the rankings of specific singers. They account for about 5% of total users, based on above research.

The public usually uses music during the times they are moving, such as 7 to 9 and 20 to 22. Therefore, the songs that rise in rank during this time period can be seen as popular favorites.

[Utilization method of music chart]

About 20 percent of people said that they listen to music using real-time charts. This means that chart manipulation by brokers or fandom can have a huge impact on the public as well.

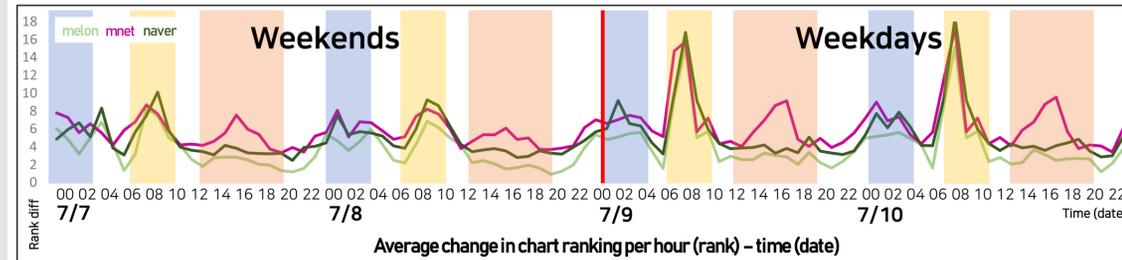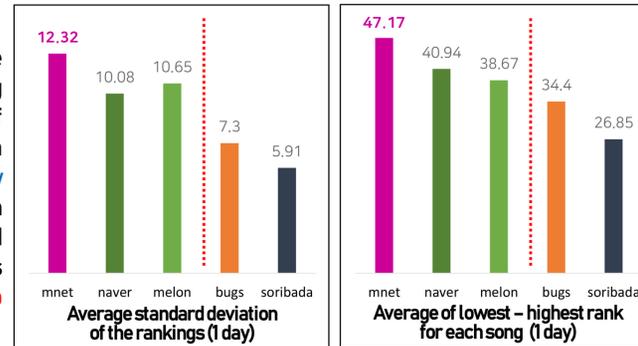Play real-time chart 18.7%
Listen the edited playlist (16.1%)
Listen a song or album that they want at that time (57.3%)
ETC (7.9%)

Research3 : Survey about real-time charts

[Q: What kind of charts do you usually watch?]

Real-time charts (74%)
Weekly charts (12%)
Monthly charts (7%)
Daily charts (6%)

[Q: Should we regulate the sming of Idol fans?]

| YES (85%) | NO (15%) |

[Q: Have you ever heard of a chart broker who gets paid to rank the charts?]

YES (75%)

[Q: Do you feel that sming of Idol fans affects the charts?]

YES (90%)   NO (10%)   NO (25%)

[Q: Why do you need a real-time chart?]

(36%) To decide what to listen to
(30%) Because I usually see it
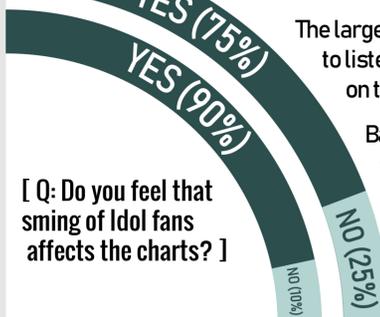**(22%) Weekly and monthly charts don't reflect trends**
(12%) Other

[Q: What path did you use to find out about the existence of chart brokers?]

NEWS 70%   (facebook/instagram/youtube) 20%   Etc. 10%

The largest number of people reported looking at the real-time charts. To determine what to listen to when they were asked why they used them. We could see that the reliance on the real-time chart was great.
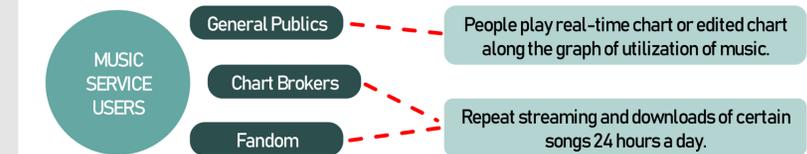
Based on survey results, the existence of chart brokers has been publicized in many ways. Seventy percent of people reported learning about chart brokers from the news. Eighty five percent of respondents reported that 'sming' of idol fans should be regulated to ensure that Idol fandoms have less influence. It is desirable to operate by giving a lower weight to idol fandoms.

Conclusion

As shown in Research 1, The largest number of users of real-time charts are during times of movement, 7~9 and 20~22, and the least at dawn. On one hand, if a particular song has a high rank at dawn, it is probably due to chart manipulation. Hence, the songs in Type 2 are constantly being listened to by fandom. On the other hand, if the songs in Type 1 are highly ranked at peaktime and ranked low at dawn, this most likely means they are favored by people. And this trend stood out in Mnet, Naver, and Mnet – they are vulnerable to chart manipulation.

MUSIC SERVICE USERS
- General Publics → People play real-time chart or edited chart along the graph of utilization of music.
- Chart Brokers
- Fandom → Repeat streaming and downloads of certain songs 24 hours a day.

Based on the student survey results, students are aware of 'sming,' which is the Korean term for playing music continuoulsly in music services to raise the ranking of songs by a specific singer. And many students (90%) reported that 'sming' affects real-time chart rankings. Students also reported knowing that the songs of some specific singers are manipulated through brokers.

To make K-POP real-time charts more credible, about 85% of survey students believed that idol fandoms and brokers SHOULD BE REGULATED to prevent manipulation.

IN CONCLUSION,
1. Regulations on chart brokers should be tightened.
2. Music services should give greater influence on chart to the general public than to fandom.