

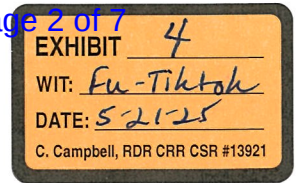
AMENDED Exhibit 549

PLAINTIFFS' OMNIBUS OPPOSITION TO DEFENDANTS' MOTIONS FOR SUMMARY JUDGMENT

Case No.: 4:22-md-03047-YGR

MDL No. 3047

In Re: Social Media Adolescent Addiction/Personal Injury Products Liability Litigation



A. The Success of ByteDance's Recommendation Engine

1. ByteDance is an innovative technology company founded as a start-up in 2012 by Chinese entrepreneur Yiming Zhang, headquartered in China. The company launched its first flagship app, Toutiao, the same year. Toutiao is a news and content aggregating app, developed for the Chinese market, that uses a proprietary "recommendation engine" developed entirely in China by ByteDance's team of elite engineers with advanced training and expertise—and based upon cutting-edge machine learning and artificial intelligence technology—to create a personalized content feed for each user.
2. Based in large part on the innovation and commercial appeal of ByteDance's recommendation engine, Toutiao was a huge success. The core technology later used in several of ByteDance's other apps drew heavily on the recommendation engine ByteDance developed for Toutiao. For example, in September 2016, ByteDance launched in China a short entertainment video app called Douyin, which incorporates a recommendation engine heavily influenced[yy1] [BA2] by the Toutiao engine to recommend videos to Douyin users. Like Toutiao, Douyin was highly successful in China.

B. TikTok's Business

3. On May 12, 2017, ByteDance launched TikTok globally in over 150 countries, including the United States. ByteDance developed TikTok to be a short entertainment video app that serves a user base outside of China. When it launched TikTok, ByteDance leveraged its experience with Toutiao and Douyin to create a recommendation engine that customizes each user's content feed based on how the user interacts with the content they watch. TikTok is operated separately from Douyin (and other ByteDance apps), and at no time has TikTok been available in mainland China.
4. The way the TikTok recommendation engine works is by analyzing user data to create parameters that map TikTok users to content they are likely to find interesting. These parameters are constantly changing depending on the user data analyzed by the recommendation engine. The engine itself, however, is the underlying set of mathematical algorithms [yy3] and logical rules that govern how these parameters[yy4] are created, and that core technology draws heavily on the technology first conceived and operationalized through Toutiao and Douyin. [yy5]
5. TikTok is operated in the United States by TikTok Inc., a California corporation with a U.S.-based management team, and its ultimate parent company, ByteDance, which is incorporated in the Cayman Islands, through ByteDance subsidiaries with offices in the United States, China, and elsewhere.

C. ByteDance's Acquisition of Musical.ly

6. Another app already in the marketplace at the time of TikTok's launch was Musical.ly, a music video app launched in 2014 and developed by a Cayman entity also named musical.ly. Musical.ly was founded by two Chinese entrepreneurs, headquartered in Shanghai, managed from China, and majority owned and controlled by Chinese shareholders. For clarity, references in this declaration to "Musical.ly" are to the Cayman entity and its subsidiaries, and references to the "Musical.ly app" are to the software application.

7. On November 23, 2017, ByteDance acquired Musical.ly, which also had a small U.S. presence. Out of nearly 300 Musical.ly employees worldwide, 20 were based in the United States, and they were not responsible for core operations, such as software and product development. While the Musical.ly app claimed more than 60 million registered users, the number of *active* monthly U.S. users was much smaller, approximately 9.9 million, whose data was stored in Japan. After completing the transaction, ByteDance integrated some of Musical.ly's U.S. assets—namely, the Musical.ly app's U.S. user base, some property leases, and some music licensing agreements and other copyright agreements—into its TikTok business.

8. At the time of the acquisition, ByteDance examined the Musical.ly app's source code and determined that the Musical.ly app's platform—the mobile software application, server and data storage infrastructure, and its algorithm powering recommendations for user content—was technically and commercially inferior to TikTok. ByteDance had significantly better engineering infrastructure than Musical.ly, with a more experienced engineering team that was ten times larger. The ByteDance development and engineering teams determined that, although the Musical.ly app was superficially similar to TikTok, the technology developed by ByteDance, and particularly TikTok's recommendation engine, was much more sophisticated.

9. For example, where the Musical.ly app's algorithms used limited signals such as video playtime and users' "like" histories to predict users' interest in potential videos, TikTok's recommendation engine uses a wider range of signals, such as "playtime," "like," "follow," "share" and "comment," to build more sophisticated parameters[AL6] that can better predict its users' interests and, consequently, provide a better user and more personalized experience. TikTok's recommendation engine also has the capacity to build a much larger real-time video candidate pool—consisting of tens of millions of videos—for the algorithm to choose from when building the recommendations to the users. In contrast, Musical.ly's recommendation engine could only calculate a smaller real-time video candidate pool that consisted of hundreds of thousands of videos. The larger real-time pool enables more videos to be discovered and consumed, and thus enhances the experience of both the viewers and creators.

10. Additionally, TikTok's recommendation engine updates the parameters in real time—that is, users' behaviors can be reflected into the personalized recommendation immediately. Musical.ly's algorithm could not, and instead took hours to incorporate user behaviors into the personalized recommendations[BA7].

11. TikTok's technology enables TikTok's content moderation teams to detect harmful videos more accurately than those of the Musical.ly app and in real time, which Musical.ly's algorithms were incapable of doing.

12. As a result, starting in February 2018, ByteDance abandoned the Musical.ly app's code base and technology, including Musical.ly's recommendation engine, operation system, user growth, and marketing tools. ByteDance kept, for a time, the Musical.ly name, but over the course of 2018, it phased out the Musical.ly app's back-end operations and technology and, in August 2018, combined its user base with the users of the app that ByteDance had started, namely, TikTok. After the combination, both TikTok and Musical.ly active user data [yy8] [AL9] from the United States, Latin America, Europe and India was available to TikTok's recommendation engine to create parameters[AL10] to customize user content feeds for U.S. users.

13. In terms of user engagement, the effects of switching from the Musical.ly recommendation engine to the TikTok recommendation engine were dramatic and immediate. Comparing Musical.ly usage data before the switch with TikTok usage data after the switch, time spent in the app—a key metric of success and a predictor of future growth—doubled.

14. Even when ByteDance's developers identified two ancillary features from the Musical.ly app that they thought were attractive, ByteDance's developers wrote separate software to create those features for TikTok, rather than importing those features from the Musical.ly app. First, ByteDance created a duet feature similar to that of the Musical.ly app which allows users to collaborate using a split-screen format. Second, ByteDance adopted in TikTok the Musical.ly app's video profile thumbnail which allowed users to post a video rather than a photo as their profile thumbnail image. The source code for these two features was newly developed by ByteDance engineers.

15. In short, the TikTok technology platform—which is among the most important drivers of its astounding growth and popularity—was not acquired by ByteDance as part of Musical.ly but instead was developed by ByteDance before the Musical.ly acquisition had even occurred.

16. In August 2018, ByteDance stopped offering the Musical.ly app. ByteDance changed the name of musical.ly (the Cayman entity) to TikTok Ltd. on April 10, 2019, and changed the name of the Musical.ly U.S. subsidiary, musical.ly Inc., to TikTok Inc. on May 28, 2019.

Redacted - Attorney Client

[yy3]...algorithms and logics

[yy4]parameters

[yy5]The way the TikTok recommendation engine works is by analyzing user data to create PARAMETERS that map TikTok users to content they are likely to find interesting. These PARAMETERS are constantly changing depending on the user data analyzed by the recommendation engine. The engine itself, however, is the underlying set of mathematical algorithms AND LOGICS that governs how these PARAMETERS are created, and that core

technology draws heavily on the technology first conceived and operationalized through Toutiao and Douyin.

FYI: How recommendation works -> Please refer to my note sent to [REDACTED]

[AL6]Is this correct, per the changes from models to parameters elsewhere?

[BA7]Edit to eliminate use of the word "models" given the change from "models" to "parameters"

[yy8]The combination of TikTok and Musical.ly data happened on 2018/08/01. Before then, the TikTok user data was not used for Musical.ly US users' algo training.

However, US users' algo is also trained by US, LATAM and India data. India was removed from the dataset from 2019/07.

[AL9]Thanks, Yuyi. We have included the August 2018 date to clarify when the combination occurred.

[AL10]Is this correct, per the change from "models" to "parameters" elsewhere?

DOCUMENT METADATA

Bates Number: TIKTOK3047MDL-072-LARK-01062915-TIKTOK3047MDL-072-LARK-01062918

BEGATTACH: TIKTOK3047MDL-072-LARK-01062915

ENDATTACH: TIKTOK3047MDL-072-LARK-01062918

Attachment Count: 0

PRODVOL: MDL-072

Custodian: FU, YUYI

File Path: /TIKTOK3047MDL-072-LARK-01062915.PDF

Confidentiality Designation:

HASHVALUE: 70231FF949D2A7EBA6492F5EE70A6114

DocType:

Author:

Create Date: 11/30/2020 12:00 AM

Last Modified Date: 11/30/2020 12:00 AM

LAST MODIFIED BY:

TRACK CHANGES:

COMMENTS:

HASHIDDENDATA:

Filename: TIKTOK3047MDL-072-LARK-01062915.PDF

Title:

DOCEXT:

Email From:

Email To:

Email CC:

Email BCC:

Received Date:

Sent Date:

TIMEZONE:

THREADID:

REDACTIONS: Y

REDACTION TYPE: PRIV