

# Improve User Engagement on Social Media Platforms Using A/B Testing

MSIN0094 Case Study

Dr Wei Miao

November 8, 2023

## 1 Business Objective<sup>1</sup>

### 1.1 Company background

Undoubtedly, user activity stands as a crucial objective pursued by platform managers, as it serves as the primary source of value creation. The world's largest social media platform, X (formerly Twitter), has over 450 million monthly active users in 2023 and at least 500 million tweets are sent every day. Heightened user activity leads to increased time spent by users on the platform, thereby contributing to higher user retention rates and more ads revenues. By monitoring user interactions, platforms could gain valuable insights into user preferences, behavior patterns, and content preferences. This information assists platform administrators in making informed decisions regarding feature enhancements, content curation, and overall improvements to the user experience. Additionally, continuous customer participation serves as the foundation for cultivating a sense of belonging and ownership. It is worth noting that platform managers can truly understand their customers only when they obtain rich data from their diverse behaviors. This understanding empowers the implementation of various innovative strategies such as recommendation systems.

In this case study, we are going to draw upon **social comparison theory** and **gamification** to help Twitter further improve its user engagement in its newly introduced feature called "Communities" on the platform. "Communities" is a twitter feature that aims to enrich user engagement by catering to specific interests and subjects. These Communities offer users a

---

<sup>1</sup>This case was prepared by Wei Miao, UCL School of Management, University College London for MSIN0094 Marketing Analytics module. This case was adapted from Wei Miao's research with his coauthors, "FIGHTING FOR MY IDOLS: THE VALUE OF GAMIFIED VOTING SYSTEM". The case study is developed to provide materials for class discussion rather than to illustrate either effective or ineffective handling of a business situation. Names and data may have been disguised or fabricated. Please do not circulate without permission. All copyrights reserved.

dedicated space to convene around shared topics of interest, spanning domains such as celebrity fandoms, movie enthusiasts, and various hobbies. The Communities feature empowers users to delve deeper into their chosen subjects, fostering vibrant interactions and discussions among like-minded individuals within the platform's ecosystem. Once a user joins a Community, he or she will receive up-to-date information, news, and images posted by fellow users within the same Community. Figure 1 presents illustrative instances of Communities for Taylor Swift.

Task: Conduct a situation analysis for Twitter in the UK market. Focus on the following point:

- What is Twitter's business model?
- How does Twitter make revenues?
- Who are Twitter's customers?
- What are the major competitors and their relative strengths and weaknesses compared with Twitter?
- Who are the collaborators of Twitter?
- PESTLE analysis

## 2 Theoretical Motivations

Despite the widely recognized value of boosting user activity on online platforms, only a few strategies have been utilized in both practice and theory. Our business recommendations should be driven by theories that are well proved in the field of psychology, social science, and economics.

### 2.1 Fan Economy

In recent years, practitioners have started to utilize the approach of leveraging internet celebrities or idols as a new business model on online shopping platforms. This strategy aims to create a new battleground to attract users and increase their engagement. Integrating internet celebrities and idols into the online shopping environment presents e-commerce platforms with new opportunities to tap into the vast fan base and social influence of these individuals. Platforms such as TikTok have successfully captured the attention and loyalty of users by incorporating popular influencers into the online shopping experience. Celebrity influencers serve as powerful tools to promote products, provide endorsements, and engage with customers through various interactive methods such as live streaming, product reviews, and personalized recommendations (Reilly 2018; Salge et al. 2022). This trend signifies the evolving landscape

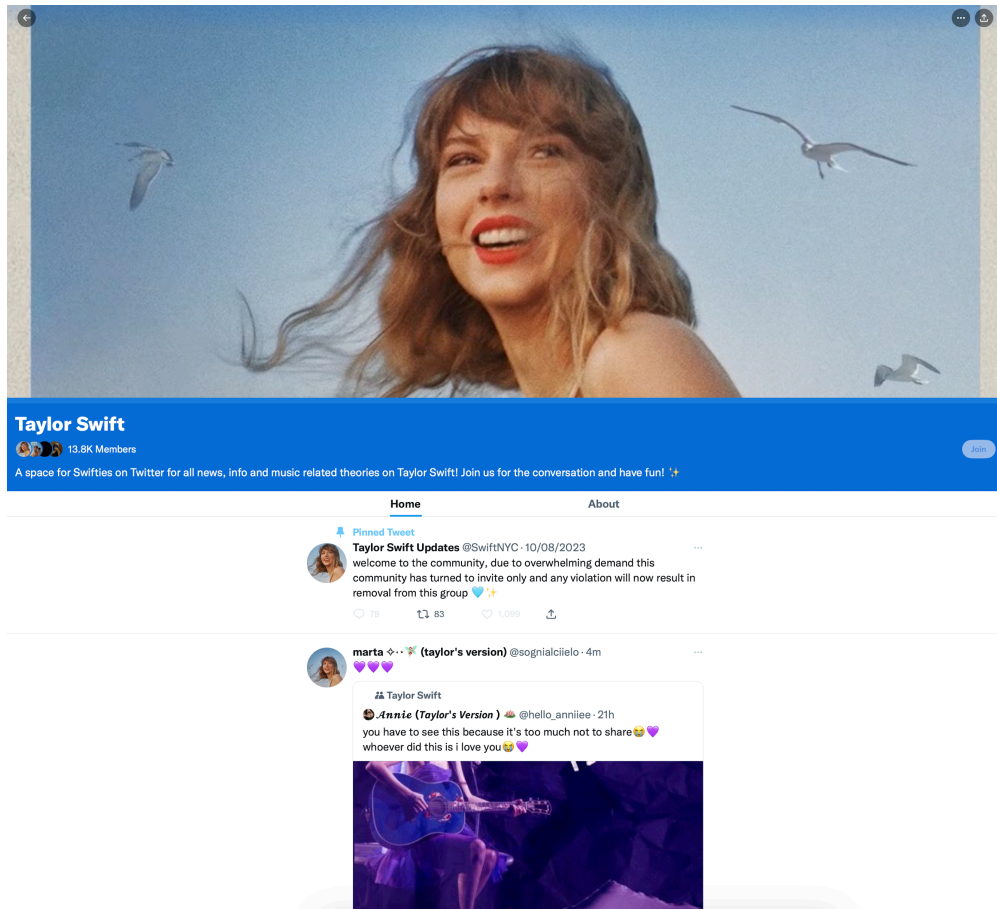


Figure 1: Twitter Community for Taylor Swift

of marketing strategies in the digital age, with platforms leveraging this approach to boost user activity.

## 2.2 Gamification and Social Comparison Theory

Gamification refers to a central strategy that involves designing game-like elements to incentivize users, thereby enhancing engagement, motivation, and overall user experience. By integrating game mechanics into non-gaming contexts, platforms can effectively drive user behavior, increase participation, and achieve specific business objectives. Studies from various perspectives have consistently demonstrated the effectiveness of gamification in platform governance, as it leads to increased user engagement, motivation, attainment, behavioral guidance, social interaction, competition, and skill development.

Social comparison theory (SCT) suggests that individuals determine their own worth and evaluate their abilities and opinions by comparing themselves to others (Festinger 1954). It states that people have an inherent drive to evaluate themselves by comparing their abilities, opinions, and social status to those of others. Social comparisons provide individuals with reference points to assess their own worth, skills, and achievements. In the context of online platforms, social comparison plays a significant role in driving user engagement and activity. Users on online platforms engage in social comparison by observing the activities and achievements of others (Yan 2018). Platforms that facilitate social comparison by providing visibility to user actions, achievements, and rankings can effectively drive user activity. Gamified designs such as leaderboards or progress indicators create a sense of competition and motivate users to increase their engagement to achieve higher rankings or recognition (Spohrer et al. 2021).

The leaderboard is a popular feature that represents social comparison and is also the focus of our study. It is a visual display that ranks and shows the performance or achievements of players on an online platform. It often lists the top players or teams based on their scores, levels, or other relevant metrics such as the points voted. The leaderboard serves as a means of comparison among players, creating a competitive environment and fostering engagement.

In this study, we propose to design **a gamified leaderboard that focuses on voting for celebrities or idols, rather than the players themselves**. This means that social comparison occurs not between fans competing with other fans for themselves, but rather in the context of fans fighting for their celebrities or idols. The social comparison theory suggests that individuals have a natural tendency to compare themselves to others to establish their social identity and sense of belongingness. By participating in voting on a leaderboard, fans can align themselves with a particular internet celebrity or fan community, which strengthens their sense of belonging. The act of voting allows fans to show support for their favorite celebrity and solidify their connection to the fan community.

## 2.3 Proposed Strategy

Based on the social comparison theory and gamification. We propose to introduce a gamified voting system and a leaderboard for Twitter Communities as follows.

First, users need to earn points by completing a series of quests set by the platform, which include (1) daily log-in (up to 8 times a day, each time 1-5 points based on users' level in the Communities); (2) retweeting or comment on a post (up to 8 times a day; each time 2 points); (3) getting comments from more than 5 users (up to 4 times a day; each time 4 points); (4) joining new Communities (with no upper limit; each time 8 points). A screenshot of such tasks is attached in Figure 2 .

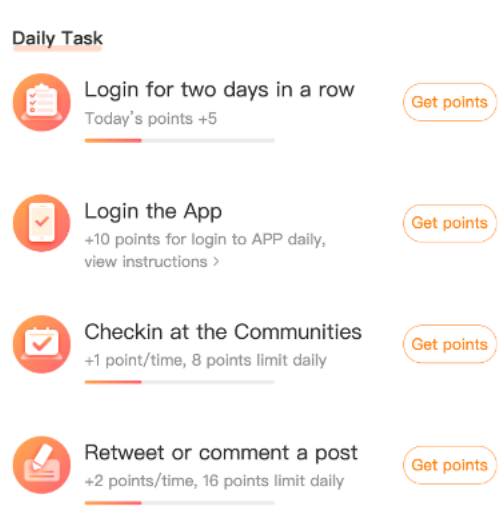


Figure 2: How to get points

After gathering points from the above channels, users can then contribute their points to a specific Community in order to boost the ranking of that Community on the public leaderboard. Figure 3 shows an example of how users can contribute points: For instance, under the Community of Taylor Swift, a user can choose from a list of options (1, 10, 66, all points) and click the “contribute” button to donate the chosen points to the Community.

The platform will then compute the accumulative points for each Community and then rank all Communities on a public leaderboard which is updated in real-time. Figure 4 shows a screenshot of the leaderboard. On the leaderboard, users can observe the name of the Community, the corresponding rankings, the points accumulated under the celebrity names, and a button to join the Community. On the other hand, Taylor Swift had the most contributed points (100 million points as in Figure 4) and ranked first.

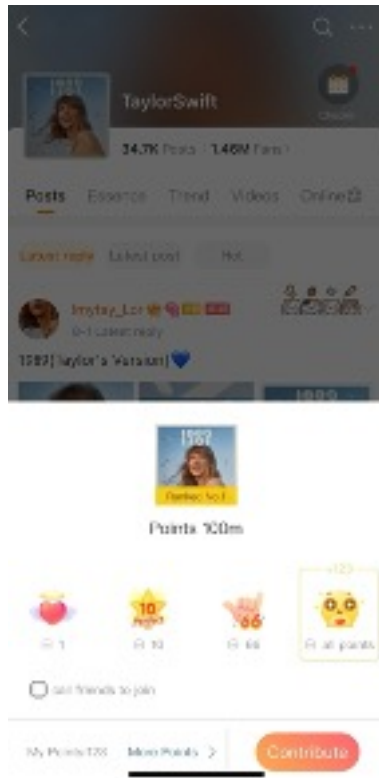


Figure 3: How to contribute points






	<b>TaylorSwift</b> 100m points	<a href="#">Join</a>
	<b>LadyGaga</b> 91m points	<a href="#">Join</a>
	<b>TroyeSivan</b> 82m points	<a href="#">Join</a>
	<b>SelenaGomez</b> 78m points	<a href="#">Join</a>
	<b>BillieEilish</b> 73m points	<a href="#">Join</a>

Figure 4: Leaderboard

### 3 Data collection using A/B testing

To test whether gamified leaderboard can indeed improve user engagement on social media platforms, we need to run a randomized controlled trial, or A/B testing. When designing a A/B testing, we can follow the following 5 steps.

#### 3.1 Step 1: Decide on the Unit of Randomization

- What would be the best unit of randomization?

#### 3.2 Step 2: Mitigate Spillover and Crossover Effects

- What are the potential problems for spillover and crossover?

#### 3.3 Step 3: Decide on Randomization Allocation Scheme

- How should we determine the randomization scheme?

```
1 # load the user characteristics data
2 data_user <- read.csv('https://www.dropbox.com/scl/fi/xn8koj0wuwbm0wurfkfi7/data_twitter_s
3
4 # how to randomize the treatment?
5
6 set.seed(888)
7 treatment_probability <- 0.1
8 treated_index <- sample( ,
9
10
11
12 data_user <- data_user %>%
13   mutate(treated = ifelse(,
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100
101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
128
129
130
131
132
133
134
135
136
137
138
139
140
141
142
143
144
145
146
147
148
149
150
151
152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167
168
169
170
171
172
173
174
175
176
177
178
179
180
181
182
183
184
185
186
187
188
189
190
191
192
193
194
195
196
197
198
199
200
201
202
203
204
205
206
207
208
209
210
211
212
213
214
215
216
217
218
219
220
221
222
223
224
225
226
227
228
229
230
231
232
233
234
235
236
237
238
239
240
241
242
243
244
245
246
247
248
249
250
251
252
253
254
255
256
257
258
259
260
261
262
263
264
265
266
267
268
269
270
271
272
273
274
275
276
277
278
279
280
281
282
283
284
285
286
287
288
289
290
291
292
293
294
295
296
297
298
299
300
301
302
303
304
305
306
307
308
309
310
311
312
313
314
315
316
317
318
319
320
321
322
323
324
325
326
327
328
329
330
331
332
333
334
335
336
337
338
339
340
341
342
343
344
345
346
347
348
349
350
351
352
353
354
355
356
357
358
359
360
361
362
363
364
365
366
367
368
369
370
371
372
373
374
375
376
377
378
379
380
381
382
383
384
385
386
387
388
389
390
391
392
393
394
395
396
397
398
399
400
401
402
403
404
405
406
407
408
409
410
411
412
413
414
415
416
417
418
419
420
421
422
423
424
425
426
427
428
429
430
431
432
433
434
435
436
437
438
439
440
441
442
443
444
445
446
447
448
449
450
451
452
453
454
455
456
457
458
459
460
461
462
463
464
465
466
467
468
469
470
471
472
473
474
475
476
477
478
479
480
481
482
483
484
485
486
487
488
489
490
491
492
493
494
495
496
497
498
499
500
501
502
503
504
505
506
507
508
509
510
511
512
513
514
515
516
517
518
519
520
521
522
523
524
525
526
527
528
529
530
531
532
533
534
535
536
537
538
539
540
541
542
543
544
545
546
547
548
549
550
551
552
553
554
555
556
557
558
559
560
561
562
563
564
565
566
567
568
569
570
571
572
573
574
575
576
577
578
579
580
581
582
583
584
585
586
587
588
589
590
591
592
593
594
595
596
597
598
599
600
601
602
603
604
605
606
607
608
609
610
611
612
613
614
615
616
617
618
619
620
621
622
623
624
625
626
627
628
629
630
631
632
633
634
635
636
637
638
639
640
641
642
643
644
645
646
647
648
649
650
651
652
653
654
655
656
657
658
659
660
661
662
663
664
665
666
667
668
669
670
671
672
673
674
675
676
677
678
679
680
681
682
683
684
685
686
687
688
689
690
691
692
693
694
695
696
697
698
699
700
701
702
703
704
705
706
707
708
709
710
711
712
713
714
715
716
717
718
719
720
721
722
723
724
725
726
727
728
729
730
731
732
733
734
735
736
737
738
739
740
741
742
743
744
745
746
747
748
749
750
751
752
753
754
755
756
757
758
759
760
761
762
763
764
765
766
767
768
769
770
771
772
773
774
775
776
777
778
779
780
781
782
783
784
785
786
787
788
789
790
791
792
793
794
795
796
797
798
799
800
801
802
803
804
805
806
807
808
809
810
811
812
813
814
815
816
817
818
819
820
821
822
823
824
825
826
827
828
829
830
831
832
833
834
835
836
837
838
839
840
841
842
843
844
845
846
847
848
849
850
851
852
853
854
855
856
857
858
859
860
861
862
863
864
865
866
867
868
869
870
871
872
873
874
875
876
877
878
879
880
881
882
883
884
885
886
887
888
889
890
891
892
893
894
895
896
897
898
899
900
901
902
903
904
905
906
907
908
909
910
911
912
913
914
915
916
917
918
919
920
921
922
923
924
925
926
927
928
929
930
931
932
933
934
935
936
937
938
939
940
941
942
943
944
945
946
947
948
949
950
951
952
953
954
955
956
957
958
959
960
961
962
963
964
965
966
967
968
969
970
971
972
973
974
975
976
977
978
979
980
981
982
983
984
985
986
987
988
989
990
991
992
993
994
995
996
997
998
999
1000
```

#### 3.4 Step 4: Collect Data

- What is the sample size we need?

We can do a power analysis using `pwr` package in R, or simply some websites, e.g., this [link](#).

- What data should we collect?

### 3.5 Step 5: Data analytics

- First, we need to do a randomization check to ensure that the treatment group and control group users have similar characteristics before the A/B testing takes place.

```

1  pacman::p_load(dplyr)
2  data_twitter <- read.csv("https://www.dropbox.com/scl/fi/f4e4ub0t7cpffty2oo723/data_twitter")
3
4
5  # examine if there is any difference across the treatment and control groups
6  t.test(age~treated,
7         data = data_twitter)
8
9  t.test(
10     data = data_twitter)
11
12  t.test(
13     data = data_twitter)

```

- Then, we can aggregate the raw user log data into user-day level panel data, and estimate the treatment effects accordingly.

```

1  data_twitter_avg <- data_twitter %>%
2    group_by(treated) %>%
3    summarise() %>%
4    ungroup()
5
6  data_twitter_avg$avg_post_n_activity[2] - data_twitter_avg$avg_post_n_activity[1]
7
8  # is the difference statistically significant?
9  t.test()

```

## 4 Business recommendations

Our A/B testing has explored the strategies for increasing user activity on social media platforms in the case of Twitter, with a particular focus on the effectiveness of gamification and the integration of celebrity influencers. It highlights the significance of user activity in platform



governance, as it directly impacts value creation and platform sustainability. By incorporating game-like elements through gamification, platforms can effectively drive user behavior, increase participation, and achieve specific business objectives. The findings show that the gamification design by voting for celebrities or idols significantly increases users' key activity behavior, including the tweets, retweets, and comments, thus potentially helping the platform to achieve greater user engagement and potential monetization.

Moreover, this project has discussed the emergence of celebrity influencers as a new business model in the online shopping environment. Integrating internet celebrities and idols into the platform provides opportunities for platforms to tap into their vast fan base and social influence. By leveraging the popularity of these influencers, platforms can effectively promote products, provide endorsements, and engage with customers through various interactive methods. This approach reflects the evolving landscape of marketing strategies in the digital age, and platforms utilizing this approach have witnessed increased user activity and engagement. As theorized, the findings of our study reveal that gamified voting system has significantly positive effects on users' tweeting, retweeting, and commenting behavior.