

OPERATION ANALYTICS AND INVESTIGATING METRIC SPIKE

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Description:

The project "Operation Analytics" is analysis done for the complete end to end operations of a company. Will this analytics company finds the areas on which it must improve upon. I have imagined here to work closely with the ops team, support team, marketing team, etc and help them derive insights out of the data they collect.

The other project "Investigating metric spike" is also an important part of operation analytics as being a Data Analyst we must be able to understand or make other teams understand questions like- Why is there a dip in daily engagement? Why have sales taken a dip? Etc. Questions like these must be answered daily and for that it's very important to investigate metric spike.

Being one of the most important parts of a company, this kind of analysis is further used to predict the overall growth or decline of a company's fortune.

I have imagined myself working for a company like Microsoft designated as Data Analyst Lead and have provided with different data sets, tables from which I have derive certain insights out of it and answer the questions asked by different departments.

Basic Approach:

I have prepared a database name 'job_data' and 'metric_spike' which contains important tables like users, events, and email_events. And using Advanced SQL have answered the day-to-day challenging questions that must be faced by Microsoft teams.

Here via Dbeaver (22.3) and SQL, I have used ER-diagram, Operators, Aggregated functions, Sorting functions, Joins, Sets, and Window Functions to create a database, storing data in the form of tables, modifying and extracting it.

With all the above tools and approach, I have collected, transformed and organized data to discover, interpret and communicate significant patterns in data to draw conclusions, make predictions, and drive informed decision making.

Quite simply, this focuses on using insights derived from data to make more informed decisions that will help Microsoft to have better understanding between cross-functional teams, and more effective workflows.

Case Study 1 (Job Data)

ER Diagram:

job.job_data		
🕒	ds	date NOT NULL
123	job_id	int NOT NULL
123	actor_id	int NOT NULL
ABC	event	varchar(8) NOT NULL
ABC	language	varchar(12) NOT NULL
123	time_spent	int NOT NULL
ABC	org	char(1) NOT NULL

Q1. What are the total number of jobs reviewed: Amount of jobs reviewed over time?

```
SELECT (COUNT(DISTINCT job_id))/(30)/24
      FROM job_data
WHERE EXTRACT(MONTH FROM ds) = 11 AND EXTRACT(YEAR FROM ds) =
      2020
```

```
(COUNT(DISTINCT job_id))/(30)/24
```

```
0.00833333
```

Calculated the number of jobs reviewed per hour per day for November 2020 which is 83%

Q2. Find **throughput**: It is the no. of events happening per second?

```
select ds,
       jobs_reviewed,
       avg(jobs_reviewed)over(order by ds rows between 6 preceding
                               and current row) as throughput_7
from
(
  select ds, count(distinct job_id) as jobs_reviewed
  from job_data
  where ds between '2020-11-01' and '2020-11-30'
  group by ds
)a
```

ds	jobs_reviewed	throughput_7
2020-11-25	1	1
2020-11-26	1	1
2020-11-27	1	1

2020-11-28	2	1.25
2020-11-29	1	1.2
2020-11-30	2	1.3333

We used the 7-day rolling average of throughput as it gives the average from day 1 to day 7 whereas, daily metric gives the average for only that particular day itself.

Q3. What is the percentage share of each language?

<pre> SELECT language, (num_jobs/total_jobs) * 100 AS lang_share FROM (SELECT language, COUNT(DISTINCT job_id) AS num_jobs FROM job_data WHERE EXTRACT(MONTH FROM ds) = 11 GROUP BY language) j CROSS JOIN (SELECT COUNT(job_id) AS total_jobs FROM job_data WHERE EXTRACT(MONTH FROM ds) = 11) t </pre>	
language	lang_share
Arabic	12.5
English	12.5
French	12.5
Hindi	12.5
Italian	12.5
Persian	12.5

The percentage share of Persian language is the most (37.5%).

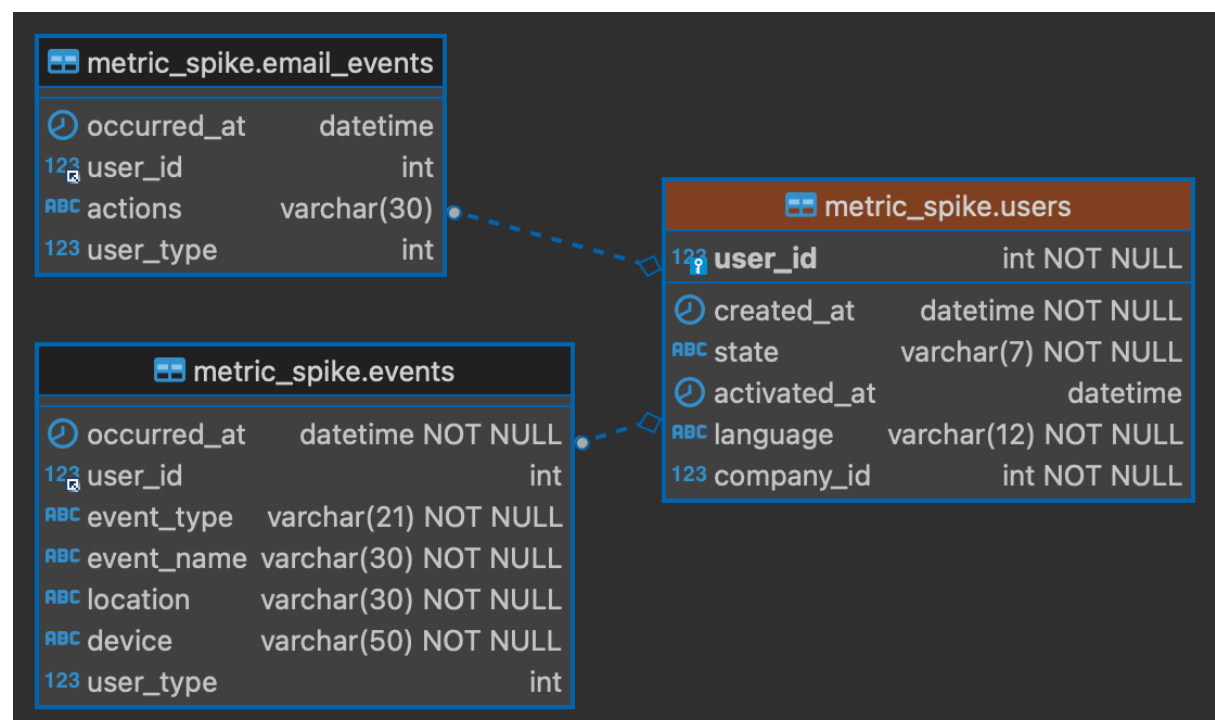
Q4. Find Duplicate Rows?

<pre>SELECT * FROM (SELECT *, RANK()OVER(PARTITION BY job_id ORDER BY actor_id ROWS BETWEEN UNBOUNDED PRECEDING AND UNBOUNDED FOLLOWING) AS rept_row FROM job_data) j WHERE rept_row>1</pre>							
ds	job_id	actor_id	event	language	time_spent	org	rept_row
2020-11-26	23	1,004	skip	Persian	56	A	2
2020-11-28	23	1,005	transfer	Persian	22	D	3

There are two duplicate rows if partitioned by job_id. But overall all the rows are unique.

Case Study 2 (Metric Spike)

ER Diagram:



Q1. What is the User Engagement: To measure the activeness of a user. Measure if the user finds quality in a product/service.

SELECT EXTRACT (week from occurred_at) AS weeks, COUNT (DISTINCT user_id) AS weekly_engagement FROM events WHERE event_type = 'engagement' GROUP BY weeks	
weeks	weekly_engagement
17	663
18	1,068
19	1,113
20	1,154
21	1,121
22	1,186
23	1,232
24	1,275
25	1,264
26	1,302
27	1,372
28	1,365
29	1,376
30	1,467
31	1,299
32	1,225
33	1,225
34	1,204
35	104

The weekly user engagement increased from week 18th to week 31st and then started declining onwards. This means that some of the users do not find much quality in the product/service in the ending weeks.

Q2. Find amount of users growing over time for a product?

SELECT year, num_week, num_active_users, SUM(num_active_users) OVER(ORDER BY year, num_week ROWS BETWEEN UNBOUNDED PRECEDING AND CURRENT ROW) AS cum_active_users FROM (SELECT EXTRACT(YEAR FROM activated_at) AS year, EXTRACT(WEEK FROM activated_at) AS num_week, COUNT(DISTINCT user_id) AS num_active_users FROM users WHERE state='active' GROUP BY year, num_week ORDER BY year, num_week) a			
year	num_week	num_active_users	cum_active_users
2,013	0	23	23
2,013	1	30	53
2,013	2	48	101
2,013	3	36	137
2,013	4	30	167
2,013	5	48	215
2,013	6	38	253
2,013	7	42	295
2,013	8	34	329
2,013	9	43	372
2,013	10	32	404
2,013	11	31	435
2,013	12	33	468
2,013	13	39	507
2,013	14	35	542
2,013	15	43	585
2,013	16	46	631
2,013	17	49	680
2,013	18	44	724
2,013	19	57	781
2,013	20	39	820
2,013	21	49	869
2,013	22	54	923
2,013	23	50	973
2,013	24	45	1,018
2,013	25	57	1,075
2,013	26	56	1,131
2,013	27	52	1,183

2,013	28	72	1,255
2,013	29	67	1,322
2,013	30	67	1,389
2,013	31	67	1,456
2,013	32	71	1,527
2,013	33	73	1,600
2,013	34	78	1,678
2,013	35	63	1,741
2,013	36	72	1,813
2,013	37	85	1,898
2,013	38	90	1,988
2,013	39	84	2,072
2,013	40	87	2,159
2,013	41	73	2,232
2,013	42	99	2,331
2,013	43	89	2,420
2,013	44	96	2,516
2,013	45	91	2,607
2,013	46	88	2,695
2,013	47	102	2,797
2,013	48	97	2,894
2,013	49	116	3,010
2,013	50	124	3,134
2,013	51	102	3,236
2,013	52	47	3,283
2,014	0	83	3,366
2,014	1	126	3,492
2,014	2	109	3,601
2,014	3	113	3,714
2,014	4	130	3,844
2,014	5	133	3,977
2,014	6	135	4,112
2,014	7	125	4,237
2,014	8	129	4,366
2,014	9	133	4,499
2,014	10	154	4,653
2,014	11	130	4,783

2,014	12	148	4,931
2,014	13	167	5,098
2,014	14	162	5,260
2,014	15	164	5,424
2,014	16	179	5,603
2,014	17	170	5,773
2,014	18	163	5,936
2,014	19	185	6,121
2,014	20	176	6,297
2,014	21	183	6,480
2,014	22	196	6,676
2,014	23	196	6,872
2,014	24	229	7,101
2,014	25	207	7,308
2,014	26	201	7,509
2,014	27	222	7,731
2,014	28	215	7,946
2,014	29	221	8,167
2,014	30	238	8,405
2,014	31	193	8,598
2,014	32	245	8,843
2,014	33	261	9,104
2,014	34	259	9,363
2,014	35	18	9,381

There are in total 9381 active users from 1st week of 2013 to the 35th week of 2014.

Q3. Find Weekly Retention i.e. how many users getting retained weekly after signing-up for a product?

```

SELECT
    COUNT(user_id) as users,
    SUM(CASE WHEN retention_week = 1 THEN 1 ELSE 0 END ) AS
        week_1,
    SUM(CASE WHEN retention_week = 2 THEN 1 ELSE 0 END ) AS
        week_2,
    SUM(CASE WHEN retention_week = 3 THEN 1 ELSE 0 END ) AS
        week_3,
    SUM(CASE WHEN retention_week = 4 THEN 1 ELSE 0 END ) AS
        week_4,
    SUM(CASE WHEN retention_week = 5 THEN 1 ELSE 0 END ) AS
        week_5
FROM
    (
        SELECT a.user_id,
            a.sign_up_week,
            b.engagement_week,
            b.engagement_week - a.sign_up_week as retention_week
        FROM
            (
                (select distinct user_id, extract(week from occurred_at) as
                    sign_up_week
                from events
                where event_type='signup_flow'
                and event_name='complete_signup'
                and extract(week from occurred_at)=18
                ) a
            left JOIN
            (
                select distinct user_id,
                    extract(week from occurred_at) as engagement_week
                from events
                where event_type='engagement'
                ) b
            on a.user_id=b.user_id
        )
    order by
        a.user_id ) a

```

users	week_1	week_2	week_3	week_4	week_5
615	114	73	49	37	26

Q4. Find weekly engagement to measure the activeness of a user. Measuring if the user finds quality in a product/service weekly?

SELECT EXTRACT(YEAR FROM occurred_at) AS year, EXTRACT(WEEK FROM occurred_at) AS week, device, COUNT(DISTINCT user_id) AS no_of_users FROM events WHERE event_type = 'engagement' GROUP BY year, week, device ORDER BY device, no_of_users			
year	week	device	no_of_users
2,014	35	acer aspire desktop	1
2,014	17	acer aspire desktop	9
2,014	23	acer aspire desktop	22
2,014	20	acer aspire desktop	23
2,014	19	acer aspire desktop	23
2,014	24	acer aspire desktop	24
2,014	22	acer aspire desktop	25
2,014	18	acer aspire desktop	26
2,014	25	acer aspire desktop	28
2,014	29	acer aspire desktop	28
2,014	26	acer aspire desktop	29
2,014	21	acer aspire desktop	29
2,014	27	acer aspire desktop	29
2,014	34	acer aspire desktop	30
2,014	28	acer aspire desktop	30
2,014	31	acer aspire desktop	31
2,014	30	acer aspire desktop	33
2,014	32	acer aspire desktop	35
2,014	33	acer aspire desktop	39
2,014	35	acer aspire notebook	3
2,014	17	acer aspire notebook	20
2,014	18	acer aspire notebook	33
2,014	26	acer aspire notebook	35
2,014	24	acer aspire notebook	40
2,014	20	acer aspire notebook	40
2,014	19	acer aspire notebook	41
2,014	22	acer aspire notebook	41
2,014	23	acer aspire notebook	43
2,014	33	acer aspire notebook	46
2,014	21	acer aspire notebook	47
2,014	25	acer aspire notebook	47
2,014	27	acer aspire notebook	49

2,014	28	acer aspire notebook	49
2,014	29	acer aspire notebook	53
2,014	31	acer aspire notebook	55
2,014	32	acer aspire notebook	55
2,014	30	acer aspire notebook	60
2,014	34	acer aspire notebook	63
2,014	17	amazon fire phone	4
2,014	21	amazon fire phone	5
2,014	22	amazon fire phone	5
2,014	28	amazon fire phone	6
2,014	18	amazon fire phone	9
2,014	27	amazon fire phone	10
2,014	20	amazon fire phone	11
2,014	24	amazon fire phone	11
2,014	34	amazon fire phone	11
2,014	30	amazon fire phone	12
2,014	29	amazon fire phone	12
2,014	19	amazon fire phone	12
2,014	32	amazon fire phone	12
2,014	26	amazon fire phone	13
2,014	25	amazon fire phone	13
2,014	33	amazon fire phone	14
2,014	31	amazon fire phone	14
2,014	23	amazon fire phone	16
2,014	35	asus chromebook	6
2,014	17	asus chromebook	21
2,014	19	asus chromebook	27
2,014	21	asus chromebook	38
2,014	25	asus chromebook	38
2,014	20	asus chromebook	41
2,014	18	asus chromebook	42
2,014	24	asus chromebook	43
2,014	34	asus chromebook	47
2,014	26	asus chromebook	49
2,014	33	asus chromebook	49
2,014	23	asus chromebook	49
2,014	29	asus chromebook	49
2,014	28	asus chromebook	50
2,014	27	asus chromebook	52

2,014	22	asus chromebook	52
2,014	30	asus chromebook	56
2,014	31	asus chromebook	56
2,014	32	asus chromebook	62
2,014	35	dell inspiron desktop	1
2,014	17	dell inspiron desktop	18
2,014	19	dell inspiron desktop	36
2,014	33	dell inspiron desktop	37
2,014	21	dell inspiron desktop	41
2,014	31	dell inspiron desktop	44
2,014	34	dell inspiron desktop	49
2,014	22	dell inspiron desktop	52
2,014	25	dell inspiron desktop	52
2,014	20	dell inspiron desktop	52
2,014	27	dell inspiron desktop	53
2,014	23	dell inspiron desktop	53
2,014	30	dell inspiron desktop	54
2,014	29	dell inspiron desktop	54
2,014	28	dell inspiron desktop	56
2,014	32	dell inspiron desktop	57
2,014	18	dell inspiron desktop	58
2,014	24	dell inspiron desktop	59
2,014	26	dell inspiron desktop	60
2,014	35	dell inspiron notebook	9
2,014	17	dell inspiron notebook	46
2,014	18	dell inspiron notebook	77
2,014	21	dell inspiron notebook	80
2,014	19	dell inspiron notebook	83
2,014	20	dell inspiron notebook	84
2,014	26	dell inspiron notebook	89
2,014	27	dell inspiron notebook	89
2,014	22	dell inspiron notebook	92
2,014	24	dell inspiron notebook	99
2,014	28	dell inspiron notebook	103
2,014	23	dell inspiron notebook	103
2,014	32	dell inspiron notebook	104
2,014	25	dell inspiron notebook	105
2,014	34	dell inspiron notebook	105
2,014	33	dell inspiron notebook	110

2,014	31	dell inspiron notebook	113
2,014	29	dell inspiron notebook	113
2,014	30	dell inspiron notebook	127
2,014	35	hp pavilion desktop	1
2,014	17	hp pavilion desktop	14
2,014	20	hp pavilion desktop	30
2,014	34	hp pavilion desktop	36
2,014	18	hp pavilion desktop	37
2,014	22	hp pavilion desktop	38
2,014	33	hp pavilion desktop	38
2,014	19	hp pavilion desktop	40
2,014	30	hp pavilion desktop	42
2,014	21	hp pavilion desktop	44
2,014	26	hp pavilion desktop	46
2,014	32	hp pavilion desktop	51
2,014	31	hp pavilion desktop	51
2,014	25	hp pavilion desktop	52
2,014	23	hp pavilion desktop	54
2,014	28	hp pavilion desktop	56
2,014	27	hp pavilion desktop	56
2,014	24	hp pavilion desktop	56
2,014	29	hp pavilion desktop	58
2,014	35	htc one	2
2,014	31	htc one	13
2,014	17	htc one	16
2,014	32	htc one	18
2,014	33	htc one	19
2,014	18	htc one	19
2,014	23	htc one	20
2,014	24	htc one	20
2,014	21	htc one	21
2,014	25	htc one	21
2,014	26	htc one	23
2,014	22	htc one	24
2,014	34	htc one	25
2,014	28	htc one	26
2,014	27	htc one	27
2,014	20	htc one	29
2,014	19	htc one	30

2,014	29	htc one	31
2,014	30	htc one	31
2,014	17	ipad air	27
2,014	34	ipad air	39
2,014	33	ipad air	40
2,014	23	ipad air	41
2,014	32	ipad air	48
2,014	21	ipad air	51
2,014	18	ipad air	52
2,014	29	ipad air	52
2,014	28	ipad air	54
2,014	31	ipad air	55
2,014	19	ipad air	55
2,014	27	ipad air	55
2,014	26	ipad air	56
2,014	24	ipad air	57
2,014	25	ipad air	57
2,014	22	ipad air	58
2,014	20	ipad air	59
2,014	30	ipad air	70
2,014	35	ipad mini	2
2,014	17	ipad mini	19
2,014	21	ipad mini	23
2,014	34	ipad mini	25
2,014	31	ipad mini	27
2,014	33	ipad mini	28
2,014	32	ipad mini	30
2,014	25	ipad mini	30
2,014	18	ipad mini	30
2,014	20	ipad mini	32
2,014	23	ipad mini	33
2,014	22	ipad mini	34
2,014	29	ipad mini	34
2,014	27	ipad mini	35
2,014	28	ipad mini	35
2,014	30	ipad mini	35
2,014	19	ipad mini	36
2,014	24	ipad mini	39
2,014	26	ipad mini	43

2,014	35	iphone 4s	6
2,014	17	iphone 4s	21
2,014	32	iphone 4s	34
2,014	33	iphone 4s	35
2,014	25	iphone 4s	40
2,014	19	iphone 4s	44
2,014	21	iphone 4s	45
2,014	22	iphone 4s	45
2,014	18	iphone 4s	46
2,014	34	iphone 4s	50
2,014	26	iphone 4s	50
2,014	24	iphone 4s	53
2,014	23	iphone 4s	53
2,014	20	iphone 4s	55
2,014	31	iphone 4s	56
2,014	29	iphone 4s	60
2,014	28	iphone 4s	61
2,014	30	iphone 4s	65
2,014	27	iphone 4s	67
2,014	35	iphone 5	2
2,014	17	iphone 5	65
2,014	34	iphone 5	101
2,014	33	iphone 5	110
2,014	18	iphone 5	113
2,014	19	iphone 5	115
2,014	32	iphone 5	119
2,014	20	iphone 5	125
2,014	22	iphone 5	125
2,014	31	iphone 5	135
2,014	21	iphone 5	137
2,014	25	iphone 5	137
2,014	24	iphone 5	142
2,014	29	iphone 5	144
2,014	28	iphone 5	151
2,014	26	iphone 5	152
2,014	23	iphone 5	152
2,014	30	iphone 5	152
2,014	27	iphone 5	163
2,014	35	iphone 5s	3

2,014	17	iphone 5s	42
2,014	33	iphone 5s	65
2,014	32	iphone 5s	67
2,014	34	iphone 5s	70
2,014	22	iphone 5s	71
2,014	31	iphone 5s	71
2,014	18	iphone 5s	73
2,014	21	iphone 5s	74
2,014	25	iphone 5s	78
2,014	20	iphone 5s	79
2,014	24	iphone 5s	79
2,014	19	iphone 5s	79
2,014	23	iphone 5s	79
2,014	27	iphone 5s	83
2,014	29	iphone 5s	90
2,014	28	iphone 5s	93
2,014	26	iphone 5s	94
2,014	30	iphone 5s	103
2,014	35	kindle fire	3
2,014	17	kindle fire	6
2,014	32	kindle fire	12
2,014	34	kindle fire	13
2,014	31	kindle fire	14
2,014	33	kindle fire	14
2,014	22	kindle fire	21
2,014	19	kindle fire	21
2,014	20	kindle fire	23
2,014	25	kindle fire	24
2,014	27	kindle fire	25
2,014	30	kindle fire	25
2,014	23	kindle fire	25
2,014	24	kindle fire	25
2,014	26	kindle fire	26
2,014	18	kindle fire	27
2,014	21	kindle fire	30
2,014	28	kindle fire	31
2,014	29	kindle fire	37
2,014	35	lenovo thinkpad	16
2,014	17	lenovo thinkpad	86

2,014	18	lenovo thinkpad	153
2,014	24	lenovo thinkpad	165
2,014	21	lenovo thinkpad	167
2,014	20	lenovo thinkpad	173
2,014	22	lenovo thinkpad	176
2,014	23	lenovo thinkpad	176
2,014	19	lenovo thinkpad	178
2,014	32	lenovo thinkpad	179
2,014	33	lenovo thinkpad	191
2,014	26	lenovo thinkpad	192
2,014	34	lenovo thinkpad	193
2,014	25	lenovo thinkpad	197
2,014	27	lenovo thinkpad	202
2,014	30	lenovo thinkpad	206
2,014	31	lenovo thinkpad	207
2,014	29	lenovo thinkpad	209
2,014	28	lenovo thinkpad	220
2,014	35	mac mini	2
2,014	17	mac mini	6
2,014	26	mac mini	11
2,014	18	mac mini	13
2,014	27	mac mini	15
2,014	19	mac mini	18
2,014	23	mac mini	18
2,014	21	mac mini	18
2,014	32	mac mini	20
2,014	25	mac mini	21
2,014	30	mac mini	23
2,014	31	mac mini	24
2,014	22	mac mini	25
2,014	20	mac mini	26
2,014	28	mac mini	28
2,014	24	mac mini	29
2,014	34	mac mini	30
2,014	29	mac mini	31
2,014	33	mac mini	32
2,014	35	macbook air	10
2,014	17	macbook air	54
2,014	21	macbook air	110

2,014	19	macbook air	112
2,014	20	macbook air	119
2,014	18	macbook air	121
2,014	25	macbook air	121
2,014	23	macbook air	124
2,014	32	macbook air	125
2,014	33	macbook air	133
2,014	26	macbook air	134
2,014	34	macbook air	136
2,014	27	macbook air	142
2,014	22	macbook air	145
2,014	31	macbook air	147
2,014	28	macbook air	148
2,014	29	macbook air	148
2,014	24	macbook air	152
2,014	30	macbook air	159
2,014	35	macbook pro	17
2,014	17	macbook pro	143
2,014	21	macbook pro	247
2,014	22	macbook pro	251
2,014	18	macbook pro	252
2,014	24	macbook pro	255
2,014	20	macbook pro	256
2,014	19	macbook pro	266
2,014	23	macbook pro	266
2,014	26	macbook pro	269
2,014	25	macbook pro	275
2,014	34	macbook pro	292
2,014	29	macbook pro	295
2,014	28	macbook pro	295
2,014	27	macbook pro	302
2,014	32	macbook pro	307
2,014	33	macbook pro	312
2,014	31	macbook pro	321
2,014	30	macbook pro	322
2,014	35	nexus 10	2
2,014	17	nexus 10	16
2,014	20	nexus 10	22
2,014	33	nexus 10	23

2,014	31	nexus 10	24
2,014	21	nexus 10	25
2,014	34	nexus 10	25
2,014	19	nexus 10	25
2,014	29	nexus 10	25
2,014	28	nexus 10	26
2,014	22	nexus 10	27
2,014	26	nexus 10	29
2,014	25	nexus 10	29
2,014	18	nexus 10	30
2,014	32	nexus 10	30
2,014	30	nexus 10	36
2,014	27	nexus 10	37
2,014	24	nexus 10	38
2,014	23	nexus 10	45
2,014	35	nexus 5	4
2,014	17	nexus 5	40
2,014	32	nexus 5	67
2,014	31	nexus 5	69
2,014	34	nexus 5	70
2,014	33	nexus 5	70
2,014	18	nexus 5	73
2,014	29	nexus 5	77
2,014	30	nexus 5	84
2,014	27	nexus 5	84
2,014	28	nexus 5	85
2,014	26	nexus 5	87
2,014	24	nexus 5	87
2,014	19	nexus 5	87
2,014	23	nexus 5	88
2,014	25	nexus 5	89
2,014	21	nexus 5	91
2,014	22	nexus 5	96
2,014	20	nexus 5	103
2,014	35	nexus 7	2
2,014	17	nexus 7	18
2,014	32	nexus 7	25
2,014	21	nexus 7	29
2,014	33	nexus 7	30

2,014	18	nexus 7	30
2,014	20	nexus 7	32
2,014	34	nexus 7	33
2,014	23	nexus 7	36
2,014	31	nexus 7	38
2,014	28	nexus 7	39
2,014	27	nexus 7	40
2,014	19	nexus 7	41
2,014	22	nexus 7	45
2,014	29	nexus 7	45
2,014	26	nexus 7	46
2,014	24	nexus 7	49
2,014	25	nexus 7	51
2,014	30	nexus 7	62
2,014	35	nokia lumia 635	2
2,014	17	nokia lumia 635	17
2,014	34	nokia lumia 635	17
2,014	20	nokia lumia 635	22
2,014	19	nokia lumia 635	23
2,014	22	nokia lumia 635	25
2,014	21	nokia lumia 635	25
2,014	33	nokia lumia 635	27
2,014	31	nokia lumia 635	28
2,014	32	nokia lumia 635	28
2,014	23	nokia lumia 635	31
2,014	27	nokia lumia 635	31
2,014	18	nokia lumia 635	33
2,014	30	nokia lumia 635	34
2,014	24	nokia lumia 635	35
2,014	28	nokia lumia 635	35
2,014	25	nokia lumia 635	37
2,014	26	nokia lumia 635	42
2,014	29	nokia lumia 635	43
2,014	19	samsung galaxy tablet	6
2,014	21	samsung galaxy tablet	6
2,014	32	samsung galaxy tablet	6
2,014	17	samsung galaxy tablet	8
2,014	31	samsung galaxy tablet	8
2,014	28	samsung galaxy tablet	9

2,014	30	samsung galaxy tablet	9
2,014	20	samsung galaxy tablet	9
2,014	22	samsung galaxy tablet	10
2,014	18	samsung galaxy tablet	11
2,014	24	samsung galaxy tablet	11
2,014	25	samsung galaxy tablet	12
2,014	26	samsung galaxy tablet	12
2,014	33	samsung galaxy tablet	12
2,014	29	samsung galaxy tablet	13
2,014	34	samsung galaxy tablet	14
2,014	23	samsung galaxy tablet	14
2,014	27	samsung galaxy tablet	15
2,014	35	samsung galaxy note	1
2,014	17	samsung galaxy note	7
2,014	26	samsung galaxy note	9
2,014	28	samsung galaxy note	10
2,014	19	samsung galaxy note	11
2,014	32	samsung galaxy note	12
2,014	34	samsung galaxy note	13
2,014	33	samsung galaxy note	13
2,014	23	samsung galaxy note	14
2,014	31	samsung galaxy note	14
2,014	25	samsung galaxy note	14
2,014	18	samsung galaxy note	15
2,014	30	samsung galaxy note	15
2,014	27	samsung galaxy note	15
2,014	29	samsung galaxy note	16
2,014	20	samsung galaxy note	18
2,014	22	samsung galaxy note	19
2,014	21	samsung galaxy note	20
2,014	24	samsung galaxy note	20
2,014	35	samsung galaxy s4	6
2,014	17	samsung galaxy s4	52
2,014	33	samsung galaxy s4	80
2,014	32	samsung galaxy s4	82
2,014	18	samsung galaxy s4	82
2,014	21	samsung galaxy s4	84
2,014	34	samsung galaxy s4	90
2,014	19	samsung galaxy s4	91

2,014	20	samsung galaxy s4	93
2,014	23	samsung galaxy s4	99
2,014	25	samsung galaxy s4	99
2,014	31	samsung galaxy s4	100
2,014	24	samsung galaxy s4	101
2,014	30	samsung galaxy s4	103
2,014	22	samsung galaxy s4	105
2,014	26	samsung galaxy s4	112
2,014	27	samsung galaxy s4	116
2,014	28	samsung galaxy s4	122
2,014	29	samsung galaxy s4	123
2,014	35	windows surface	3
2,014	32	windows surface	10
2,014	18	windows surface	10
2,014	17	windows surface	10
2,014	23	windows surface	14
2,014	33	windows surface	15
2,014	22	windows surface	15
2,014	19	windows surface	16
2,014	21	windows surface	17
2,014	34	windows surface	18
2,014	31	windows surface	19
2,014	30	windows surface	19
2,014	26	windows surface	21
2,014	20	windows surface	21
2,014	24	windows surface	22
2,014	25	windows surface	22
2,014	29	windows surface	28
2,014	28	windows surface	33
2,014	27	windows surface	33

Weekly engagement is most for MacBook users and iPhone users

Q5. Find email engagement of users engaging with the email service.

```
select
100.0 * sum(case when email_cat = 'email_opened' then 1 else
0 end)
/sum(case when email_cat = 'email_sent' then 1 else 0 end)
as email_opening_rate,
100.0 * sum(case when email_cat = 'email_clicked' then 1 else
0 end)
/sum(case when email_cat = 'email_sent' then 1 else 0 end)
as email_clicking_rate
from
(
select *,
case when actions in ('sent_weekly_digest',
'sent_reengagement_email')
then 'email_sent'
when actions in ('email_open')
then 'email_opened'
when actions in ('email_clickthrough')
then 'email_clicked'
end as email_cat
from email_events
)a
```

email_opening_rate	email_clicking_rate
33.58339	14.78989

The email opening rate is around 34% and email clicking rate is around 15%. The users are engaging with the email service which is good for the company to expand.