Operation Analytics and Investigating Metric Spike

Project Description:

In order to find insights that improve operational performance and efficiency, this project analyzes job data. Details about the job review, including events, time spent, language, and organization, are included in the dataset. Key goals such as determining the number of jobs reviewed per hour, assessing 7-day rolling throughput averages, identifying language shares, and identifying duplicate records are all addressed by the analysis using SQL. Through a methodical examination of the data and the extraction of significant metrics, the project seeks to detect patterns, irregularities, and inefficiencies, offering practical insights to enhance decision-making and streamline processes.

Approach:

To comprehend the schema, confirm the quality of the data, and find anomalies, the project started with data exploration. To accomplish each goal, SQL queries were created to compute language distribution, 7-day rolling throughput averages, and hourly job reviews. For time-based analysis, aggregation methods and filters were employed, and language shares were found through percentage computations. Grouping and comparison techniques were used to find duplicate records. The project's objectives of streamlining processes and improving performance were met by the actionable insights that were made possible by the iterative refinement and validation of the queries.

Tech-Stack Used:

MySQL Workbench (v8.0) was used in the project for database analysis and querying. The main tool for creating and running SQL queries, maintaining the database schema, and displaying data in result sets was MySQL Workbench. Effective data exploration, aggregation, and computation of metrics such as hourly job reviews and throughput averages were made possible by its strong features. When necessary, Microsoft Excel was also utilized for additional validation and visualization of SQL results, allowing for the production of tables and charts that effectively conveyed insights. This combination made sure that the analytical process ran smoothly and effectively.

Insights and Result:

Case Study 1: Job Data Analysis

A. ***Jobs Reviewed Over Time:*** Write an SQL query to calculate the number of jobs reviewed per hour for each day in November 2020.

Solution:

```sql
SELECT
    DATE_,
    ROUND(COUNT(*) / (SUM(TIME_SPENT) / 3600), 2) JOB_PER_HOUR

FROM JOB_DATA

WHERE DATE_ BETWEEN '2020-11-01' AND '2020-11-30'

GROUP BY DATE_

ORDER BY DATE_;
```

date_	job_per_hour
2020-11-25	80.00
2020-11-26	64.29
2020-11-27	34.62
2020-11-28	218.18
2020-11-29	180.00
2020-11-30	180.00

B. ***Throughput Analysis:*** Write an SQL query to calculate the 7-day rolling average of throughput. Additionally, explain whether you prefer using the daily metric or the 7-day rolling average for throughput, and why.

C. **Language Share Analysis:** Write an SQL query to calculate the percentage share of each language over the last 30 days.

Solution:

SELECT

LANGUAGE,

ROUND(COUNT(*)100.0/ (SELECT COUNT() FROM JOB_DATA **WHERE** DATE_ **BETWEEN '2020-11-01' AND '2020-11-30'), 2)** PERCENTAGE **FROM** JOB_DATA **GROUP BY** LANGUAGE;

language	percentage
English	12.50
Arabic	12.50
Persian	37.50
Hindi	12.50
French	12.50
Italian	12.50

D. **Duplicate Rows Detection:** Write an SQL query to display duplicate rows from the job_data table.

Solution:

SELECT

JOB_ID,

ACTOR_ID,

EVENT,

LANGUAGE,

TIME_SPENT,

ORG,

DATE_

FROM DATA

GROUP BY

      JOB_ID,

      ACTOR_ID,

      EVENT,

      LANGUAGE,

      TIME_SPENT,

      ORG,

      DATE_

HAVING COUNT(*) > 1;

No Duplicates

Case Study 2: Investigating Metric Spike

    A. *Weekly User Engagement:* Write an SQL query to calculate the weekly user engagement.

Solution:

SELECT

      WEEKOFYEAR(OCCURRED_AT**)** WEEK_NUM,

      COUNT(DISTINCT USER_ID**)** ACTIVE_USERS

FROM EVENTS

GROUP BY WEEK_NUM

ORDER BY WEEK_NUM;

week_num	active_users
18	701
19	1054
20	1094
21	1147
22	1113

23	1173
24	1219
25	1263
26	1249
27	1271
28	1355
29	1345
30	1363
31	1443
32	1266
33	1215
34	1203
35	1194

B. ***User Growth Analysis:*** Write an SQL query to calculate the user growth for the product.

Solution:

SELECT

    DATE_FORMAT(CREATED_AT, '%Y-%M') MONTH,

    COUNT() USERS_COUNT,

    SUM(COUNT()) OVER(ORDER BY DATE_FORMAT(CREATED_AT, '%Y-%M')) AS USER_GROWTH

FROM USERS

GROUP BY MONTH;

month	users_count	user_growth
2013-01	160	160
2013-02	160	320

2013-03	150	470
2013-04	181	651
2013-05	214	865
2013-06	213	1078
2013-07	284	1362
2013-08	316	1678
2013-09	330	2008
2013-10	390	2398
2013-11	399	2797
2013-12	486	3283
2014-01	552	3835
2014-02	525	4360
2014-03	615	4975
2014-04	726	5701
2014-05	779	6480
2014-06	873	7353
2014-07	997	8350
2014-08	1031	9381

C. *Weekly Retention Analysis:* Write an SQL query to calculate the weekly retention of users based on their sign-up cohort.

D. *Weekly Engagement Per Device:* Write an SQL query to calculate the weekly engagement per device.

Solution:

```
SELECT

WEEKOFYEAR(OCCURRED_AT) WEEK, DEVICE,
COUNT(DISTINCT USER_ID) ACTIVE_USERS

FROM EVENTS

GROUP BY WEEK , DEVICE

ORDER BY WEEK , DEVICE;
```

week	device	active_users
18	acer aspire desktop	10
18	acer aspire notebook	21
18	amazon fire phone	4
18	asus chromebook	23
18	dell inspiron desktop	21
18	dell inspiron notebook	49
18	hp pavilion desktop	15
18	htc one	16
18	ipad air	30
18	ipad mini	21
18	iphone 4s	21
18	iphone 5	70
18	iphone 5s	45
18	kindle fire	6
18	lenovo thinkpad	90
18	mac mini	8
18	macbook air	57
18	macbook pro	154
18	nexus 10	16
18	nexus 5	43
18	nexus 7	20
18	nokia lumia 635	19
18	samsumg galaxy tablet	8
18	samsung galaxy note	7
18	samsung galaxy s4	56
18	windows surface	10
19	acer aspire desktop	26
19	acer aspire notebook	34
19	amazon fire phone	9
19	asus chromebook	42
19	dell inspiron desktop	58
19	dell inspiron notebook	78

19	hp pavilion desktop	37
19	htc one	19
19	ipad air	52
19	ipad mini	29
19	iphone 4s	47
19	iphone 5	114
19	iphone 5s	70
19	kindle fire	26
19	lenovo thinkpad	155
19	mac mini	12
19	macbook air	119
19	macbook pro	248
19	nexus 10	30
19	nexus 5	73
19	nexus 7	29
19	nokia lumia 635	34
19	samsumg galaxy tablet	11
19	samsung galaxy note	15
19	samsung galaxy s4	80
19	windows surface	10
20	acer aspire desktop	22
20	acer aspire notebook	40
20	amazon fire phone	12
20	asus chromebook	26
20	dell inspiron desktop	36
20	dell inspiron notebook	82
20	hp pavilion desktop	40
20	htc one	32
20	ipad air	53
20	ipad mini	37
20	iphone 4s	40
20	iphone 5	113
20	iphone 5s	77
20	kindle fire	20

20	lenovo thinkpad	176
20	mac mini	19
20	macbook air	110
20	macbook pro	261
20	nexus 10	25
20	nexus 5	84
20	nexus 7	41
20	nokia lumia 635	22
20	samsumg galaxy tablet	6
20	samsung galaxy note	11
20	samsung galaxy s4	90
20	windows surface	15
21	acer aspire desktop	23
21	acer aspire notebook	40
21	amazon fire phone	10
21	asus chromebook	39
21	dell inspiron desktop	52
21	dell inspiron notebook	84
21	hp pavilion desktop	31
21	htc one	27
21	ipad air	54
21	ipad mini	32
21	iphone 4s	56
21	iphone 5	128
21	iphone 5s	75
21	kindle fire	22
21	lenovo thinkpad	177
21	mac mini	25
21	macbook air	119
21	macbook pro	256
21	nexus 10	23
21	nexus 5	99
21	nexus 7	31
21	nokia lumia 635	21

21	samsumg galaxy tablet	9
21	samsung galaxy note	18
21	samsung galaxy s4	92
21	windows surface	19
22	acer aspire desktop	28
22	acer aspire notebook	47
22	amazon fire phone	4
22	asus chromebook	38
22	dell inspiron desktop	41
22	dell inspiron notebook	81
22	hp pavilion desktop	42
22	htc one	20
22	ipad air	51
22	ipad mini	25
22	iphone 4s	46
22	iphone 5	136
22	iphone 5s	71
22	kindle fire	30
22	lenovo thinkpad	164
22	mac mini	18
22	macbook air	107
22	macbook pro	244
22	nexus 10	24
22	nexus 5	94
22	nexus 7	29
22	nokia lumia 635	25
22	samsumg galaxy tablet	6
22	samsung galaxy note	20
22	samsung galaxy s4	84
22	windows surface	17
23	acer aspire desktop	25
23	acer aspire notebook	39
23	amazon fire phone	5
23	asus chromebook	51

23	dell inspiron desktop	53
23	dell inspiron notebook	91
23	hp pavilion desktop	38
23	htc one	24
23	ipad air	57
23	ipad mini	32
23	iphone 4s	41
23	iphone 5	122
23	iphone 5s	71
23	kindle fire	21
23	lenovo thinkpad	170
23	mac mini	24
23	macbook air	145
23	macbook pro	254
23	nexus 10	28
23	nexus 5	95
23	nexus 7	44
23	nokia lumia 635	25
23	samsumg galaxy tablet	11
23	samsung galaxy note	19
23	samsung galaxy s4	103
23	windows surface	15
24	acer aspire desktop	21
24	acer aspire notebook	43
24	amazon fire phone	16
24	asus chromebook	48
24	dell inspiron desktop	53
24	dell inspiron notebook	100
24	hp pavilion desktop	55
24	htc one	21
24	ipad air	42
24	ipad mini	32
24	iphone 4s	52
24	iphone 5	151

24	iphone 5s	80
24	kindle fire	25
24	lenovo thinkpad	176
24	mac mini	17
24	macbook air	122
24	macbook pro	259
24	nexus 10	43
24	nexus 5	87
24	nexus 7	37
24	nokia lumia 635	31
24	samsumg galaxy tablet	14
24	samsung galaxy note	12
24	samsung galaxy s4	95
24	windows surface	16
25	acer aspire desktop	23
25	acer aspire notebook	42
25	amazon fire phone	11
25	asus chromebook	41
25	dell inspiron desktop	57
25	dell inspiron notebook	102
25	hp pavilion desktop	56
25	htc one	19
25	ipad air	58
25	ipad mini	38
25	iphone 4s	52
25	iphone 5	143
25	iphone 5s	78
25	kindle fire	25
25	lenovo thinkpad	164
25	mac mini	29
25	macbook air	149
25	macbook pro	251
25	nexus 10	38
25	nexus 5	85

25	nexus 7	47
25	nokia lumia 635	32
25	samsumg galaxy tablet	11
25	samsung galaxy note	19
25	samsung galaxy s4	102
25	windows surface	21
26	acer aspire desktop	29
26	acer aspire notebook	44
26	amazon fire phone	12
26	asus chromebook	40
26	dell inspiron desktop	53
26	dell inspiron notebook	108
26	hp pavilion desktop	50
26	htc one	20
26	ipad air	57
26	ipad mini	31
26	iphone 4s	39
26	iphone 5	134
26	iphone 5s	80
26	kindle fire	24
26	lenovo thinkpad	196
26	mac mini	22
26	macbook air	119
26	macbook pro	276
26	nexus 10	30
26	nexus 5	90
26	nexus 7	49
26	nokia lumia 635	37
26	samsumg galaxy tablet	12
26	samsung galaxy note	14
26	samsung galaxy s4	100
26	windows surface	19
27	acer aspire desktop	28
27	acer aspire notebook	35

27	amazon fire phone	13
27	asus chromebook	47
27	dell inspiron desktop	59
27	dell inspiron notebook	90
27	hp pavilion desktop	47
27	htc one	23
27	ipad air	55
27	ipad mini	41
27	iphone 4s	49
27	iphone 5	150
27	iphone 5s	92
27	kindle fire	26
27	lenovo thinkpad	188
27	mac mini	11
27	macbook air	134
27	macbook pro	259
27	nexus 10	29
27	nexus 5	86
27	nexus 7	45
27	nokia lumia 635	41
27	samsumg galaxy tablet	12
27	samsung galaxy note	10
27	samsung galaxy s4	114
27	windows surface	22
28	acer aspire desktop	29
28	acer aspire notebook	47
28	amazon fire phone	10
28	asus chromebook	52
28	dell inspiron desktop	52
28	dell inspiron notebook	91
28	hp pavilion desktop	56
28	htc one	28
28	ipad air	57
28	ipad mini	35

28	iphone 4s	68
28	iphone 5	159
28	iphone 5s	79
28	kindle fire	25
28	lenovo thinkpad	195
28	mac mini	15
28	macbook air	140
28	macbook pro	301
28	nexus 10	38
28	nexus 5	83
28	nexus 7	41
28	nokia lumia 635	31
28	samsumg galaxy tablet	15
28	samsung galaxy note	14
28	samsung galaxy s4	119
28	windows surface	31
29	acer aspire desktop	27
29	acer aspire notebook	50
29	amazon fire phone	6
29	asus chromebook	51
29	dell inspiron desktop	55
29	dell inspiron notebook	100
29	hp pavilion desktop	55
29	htc one	26
29	ipad air	55
29	ipad mini	34
29	iphone 4s	58
29	iphone 5	148
29	iphone 5s	93
29	kindle fire	29
29	lenovo thinkpad	220
29	mac mini	28
29	macbook air	145
29	macbook pro	295

29	nexus 10	28
29	nexus 5	83
29	nexus 7	39
29	nokia lumia 635	34
29	samsumg galaxy tablet	9
29	samsung galaxy note	10
29	samsung galaxy s4	120
29	windows surface	33
30	acer aspire desktop	29
30	acer aspire notebook	52
30	amazon fire phone	12
30	asus chromebook	47
30	dell inspiron desktop	52
30	dell inspiron notebook	114
30	hp pavilion desktop	57
30	htc one	32
30	ipad air	50
30	ipad mini	36
30	iphone 4s	61
30	iphone 5	147
30	iphone 5s	92
30	kindle fire	36
30	lenovo thinkpad	209
30	mac mini	28
30	macbook air	146
30	macbook pro	291
30	nexus 10	25
30	nexus 5	81
30	nexus 7	43
30	nokia lumia 635	42
30	samsumg galaxy tablet	13
30	samsung galaxy note	17
30	samsung galaxy s4	117
30	windows surface	28

31	acer aspire desktop	32
31	acer aspire notebook	62
31	amazon fire phone	12
31	asus chromebook	56
31	dell inspiron desktop	53
31	dell inspiron notebook	125
31	hp pavilion desktop	39
31	htc one	30
31	ipad air	70
31	ipad mini	34
31	iphone 4s	63
31	iphone 5	151
31	iphone 5s	100
31	kindle fire	24
31	lenovo thinkpad	208
31	mac mini	23
31	macbook air	156
31	macbook pro	317
31	nexus 10	35
31	nexus 5	81
31	nexus 7	60
31	nokia lumia 635	33
31	samsumg galaxy tablet	9
31	samsung galaxy note	15
31	samsung galaxy s4	104
31	windows surface	18
32	acer aspire desktop	31
32	acer aspire notebook	56
32	amazon fire phone	14
32	asus chromebook	59
32	dell inspiron desktop	42
32	dell inspiron notebook	111
32	hp pavilion desktop	52
32	htc one	13

32	ipad air	53
32	ipad mini	23
32	iphone 4s	52
32	iphone 5	133
32	iphone 5s	71
32	kindle fire	14
32	lenovo thinkpad	196
32	mac mini	24
32	macbook air	143
32	macbook pro	317
32	nexus 10	19
32	nexus 5	65
32	nexus 7	39
32	nokia lumia 635	30
32	samsumg galaxy tablet	7
32	samsung galaxy note	14
32	samsung galaxy s4	99
32	windows surface	18
33	acer aspire desktop	37
33	acer aspire notebook	56
33	amazon fire phone	12
33	asus chromebook	61
33	dell inspiron desktop	57
33	dell inspiron notebook	101
33	hp pavilion desktop	51
33	htc one	18
33	ipad air	45
33	ipad mini	31
33	iphone 4s	35
33	iphone 5	119
33	iphone 5s	65
33	kindle fire	12
33	lenovo thinkpad	177
33	mac mini	21

33	macbook air	124
33	macbook pro	307
33	nexus 10	31
33	nexus 5	66
33	nexus 7	24
33	nokia lumia 635	26
33	samsumg galaxy tablet	6
33	samsung galaxy note	12
33	samsung galaxy s4	85
33	windows surface	10
34	acer aspire desktop	36
34	acer aspire notebook	45
34	amazon fire phone	14
34	asus chromebook	48
34	dell inspiron desktop	35
34	dell inspiron notebook	111
34	hp pavilion desktop	34
34	htc one	19
34	ipad air	39
34	ipad mini	27
34	iphone 4s	34
34	iphone 5	105
34	iphone 5s	69
34	kindle fire	14
34	lenovo thinkpad	190
34	mac mini	32
34	macbook air	134
34	macbook pro	308
34	nexus 10	22
34	nexus 5	71
34	nexus 7	29
34	nokia lumia 635	27
34	samsumg galaxy tablet	12
34	samsung galaxy note	13

34	samsung galaxy s4	76
34	windows surface	14
35	acer aspire desktop	30
35	acer aspire notebook	63
35	amazon fire phone	11
35	asus chromebook	48
35	dell inspiron desktop	48
35	dell inspiron notebook	104
35	hp pavilion desktop	37
35	htc one	26
35	ipad air	36
35	ipad mini	25
35	iphone 4s	50
35	iphone 5	100
35	iphone 5s	68
35	kindle fire	15
35	lenovo thinkpad	186
35	mac mini	29
35	macbook air	135
35	macbook pro	290
35	nexus 10	23
35	nexus 5	67
35	nexus 7	31
35	nokia lumia 635	17
35	samsumg galaxy tablet	13
35	samsung galaxy note	13
35	samsung galaxy s4	89
35	windows surface	20

E. ***Email Engagement Analysis:*** Write an SQL query to calculate the email engagement metrics.

Solution:

SELECT

```sql
    ACTION,
    COUNT(*) ACTION_OCCURRED_COUNT,
    COUNT(DISTINCT(USER_ID)) UNIQUE_USERS
FROM EMAIL_EVENTS
GROUP BY ACTION
ORDER BY ACTION_OCCURRED_COUNT DESC;
```

action	action_occurred_count	unique_users
sent_weekly_digest	57267	4111
email_open	20459	5927
email_clickthrough	9010	5277
sent_reengagement_email	3653	3653