Registrations and active users

ANALYZING BUSINESS DATA IN SQL

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User-centric KPIs

KPIs

- Registrations
- Active users
- Growth
- Retention

Benefits

- Measure performance well in B2Cs
- Used by investors to assess pre-revenue and -profit startups

Registrations - overview

- **Registration:** When a user first signs up for an account on Delivr through its app
- **Registrations KPI**: Counts registrations over time, usually per month
  - Good at measuring a company's success in attracting new users
- For Delivr, a user's registration date is the date of that user's first order

Registrations - setup

Query

```
SELECT
  user_id,
  MIN(order_date) AS reg_date
FROM orders
GROUP BY user_id
ORDER BY user_id
LIMIT 3;
```

Result

```
user_id  reg_date
-------  ----------
0        2018-06-01
1        2018-06-01
2        2018-06-01
```

Registrations - query

```sql
WITH reg_dates AS (
  SELECT
    user_id,
    MIN(order_date) AS reg_date
  FROM orders
  GROUP BY user_id)

SELECT
  DATE_TRUNC('month', reg_date) :: DATE AS delivr_month,
  COUNT(DISTINCT user_id) AS regs
FROM reg_dates
GROUP BY delivr_month
ORDER BY delivr_month ASC
LIMIT 3;
```

Registrations - result

Result

```
delivr_month  regs
------------  ----
2018-06-01     123
2018-07-01     140
2018-08-01     157
```

Active users - overview

- **Active users KPI**: Counts the active users of a company's app over a time period
    - by day (daily active users, or DAU)
    - by month (monthly active users, or MAU)
- Stickiness (DAU / MAU), measures how often users engage with an app on average
    - **Example**: If Delivr's stickiness is DAU / MAU = 0.3 (30%), users use Delivr for $30% x 30$ days = 9 days each month on average

Active users - query

```
SELECT
  DATE_TRUNC('month', order_date) :: DATE AS delivr_month,
  COUNT(DISTINCT user_id) AS mau
FROM orders
GROUP BY delivr_month
ORDER BY delivr_month ASC
LIMIT 3;
```

```
delivr_month  mau
------------  ---
2018-06-01      123
2018-07-01      226
2018-08-01      337
```

Registrations and active users

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Window functions

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Window functions - overview

- **Window functions**: Perform an operation across a set of rows related to the current row
- **Examples**
  - Calculate a running total
  - Fetch the value of a previous or following row

Running total

Running total: A cumulative sum of a variable's previous values

Example

```
x    x_rt
---  ----
1    1
2    3
3    6
4    11
5    16
```

Registrations running total - query

```
WITH reg_dates AS (
  SELECT
    user_id,
    MIN(order_date) AS reg_date
  FROM orders
  GROUP BY user_id),
  registrations AS (
  SELECT
    DATE_TRUNC('month', reg_date) :: DATE AS delivr_month,
    COUNT(DISTINCT user_id) AS regs
  FROM reg_dates
  GROUP BY delivr_month)

SELECT
  delivr_month,
  regs,
  SUM(regs) OVER (ORDER BY delivr_month ASC) AS regs_rt
FROM registrations
ORDER BY delivr_month ASC LIMIT 3;
```

Registrations running total - result

```
delivr_month  regs  regs_rt
------------  ----  -------
2018-06-01    123    123
2018-07-01    140    263
2018-08-01    157    420
```

Lagged MAU - query

```
WITH maus AS (
  SELECT
    DATE_TRUNC('month', order_date) :: DATE AS delivr_month,
    COUNT(DISTINCT user_id) AS mau
  FROM orders
  GROUP BY delivr_month)

SELECT
  delivr_month,
  mau,
  COALESCE(
    LAG(mau) OVER (ORDER BY delivr_month ASC),
  1) AS last_mau
FROM maus
ORDER BY delivr_month ASC
LIMIT 3;
```

Lagged MAU - result

```
delivr_month  mau  last_mau
------------  ---  --------
2018-06-01    123  1
2018-07-01    226  123
2018-08-01    337  226
```

Window functions

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Growth rate

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Deltas - query

```
WITH maus AS (
  SELECT
    DATE_TRUNC('month', order_date) :: DATE AS delivr_month,
    COUNT(DISTINCT user_id) AS mau
  FROM orders
  GROUP BY delivr_month),
  maus_lag AS (
  SELECT
    delivr_month,
    mau,
    COALESCE(
      LAG(mau) OVER (ORDER BY delivr_month ASC),
    1) AS last_mau
  FROM maus)
```

Deltas - result

Query

```
WITH maus AS (...),
  maus_lag AS (...)

SELECT
  delivr_month,
  mau,
  mau - last_mau AS mau_delta
FROM maus_lag
ORDER BY delivr_month
LIMIT 3;
```

Result

```
delivr_month  mau  mau_delta
------------  ---  ---------
2018-06-01    123  1
2018-07-01    226  103
2018-08-01    337  111
```

Deltas - pitfalls

- Raw, absolute number
- Only shows one of three things about a variable
  - Decreasing if $\delta < 0$
  - Stable if $\delta = 0$
  - Increasing if $\delta > 0$

Growth rate - overview

- **Growth rate**: A percentage that show the change in a variable over time relative to that variable's initial value
- **Formula:** $\frac{Current\ value - Previous\ value}{Previous\ value}$
- **Example:** $\frac{67-50}{50} = 0.34 = 34\%$

Growth rate - query

Query

```
WITH maus AS (...),
  maus_lag AS (...)

SELECT
  delivr_month,
  mau,
  ROUND(
    (mau - last_mau) :: NUMERIC / last_mau,
  2) AS growth
FROM maus_lag
ORDER BY delivr_month
LIMIT 3;
```

Result

```
delivr_month  mau  growth
------------  ---  ------
2018-06-01    123  122.00
2018-07-01    226  0.84
2018-08-01    337  0.49
```

Growth

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Retention

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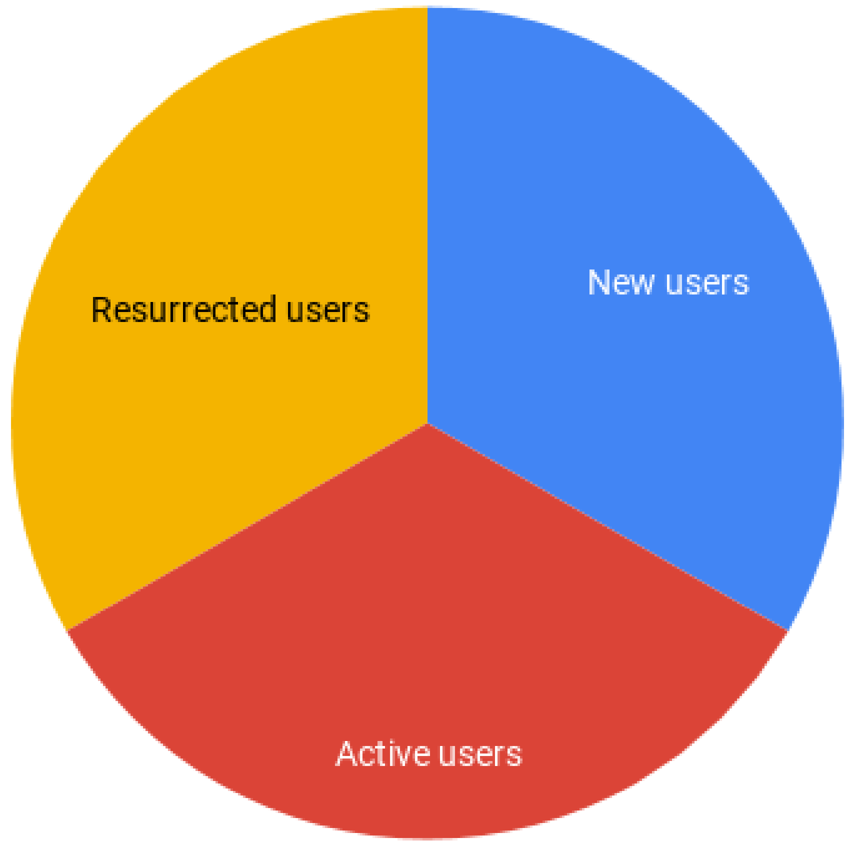
MAU - pitfalls

- Doesn't show the breakdown of active users by tenure
- Doesn't distinguish between different patterns of user activity
  - **Case 1**: 100 users register every month, and are active for one month only
  - **Case 2**: Only 100 users register in the first month, and no one ever registers after, but these 100 users are active every single month
  - **Both cases' MAUs will be 100!**

MAU - breakdown



Breakdown

- New users joined this month
- Retained users were active in the previous month, and stayed active this month
- Resurrected users weren't active in the previous month, but returned to activity this month

Retention rate - overview

- **Retention rate**: A percentage measuring how many users who were active in a previous month are still active in the current month
- **Formula:** $\frac{Uc}{Up}$, where Uc is the count of distinct users who were active in both the current and previous months, and Up is the count of distinct users who were active in the previous period
- **Example**: $\frac{80}{100} = 0.8 = 80\%$

Retention rate - query

```
WITH user_activity AS (
  SELECT DISTINCT
    DATE_TRUNC('month', order_date) :: DATE AS delivr_month,
    user_id
  FROM orders)

SELECT
  previous.delivr_month,
  ROUND(
    COUNT(DISTINCT current.user_id) :: NUMERIC /
    GREATEST(COUNT(DISTINCT previous.user_id), 1),
  2) AS retention
FROM user_activity AS previous
LEFT JOIN user_activity AS current
ON previous.user_id = current.user_id
AND previous.delivr_month = (current.delivr_month - INTERVAL '1 month')
GROUP BY previous.delivr_month
ORDER BY previous.delivr_month ASC
LIMIT 3;
```

Retention rate - result

```
delivr_month  retention
------------  ---------
2018-06-01    0.70
2018-07-01    0.70
2018-08-01    0.76
```

Retention

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