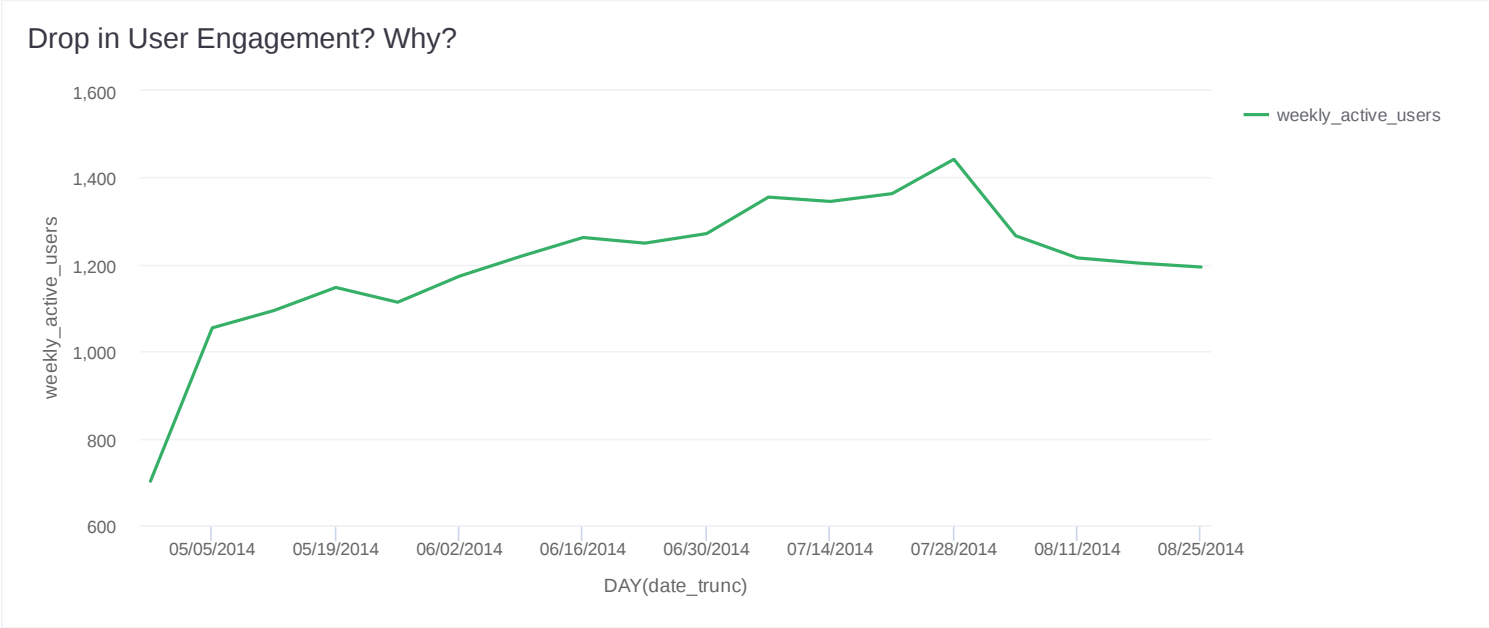
Investigating a Drop in User Engagement

Workshop setting: You show up to work Tuesday morning, September 2, 2014. The head of the Product team walks over to your desk and asks you what you think about the latest activity on the user engagement dashboards. You fire them up, and something immediately jumps out:



The task: The above chart shows the number of engaged users each week. Yammer defines engagement as having made some type of server call by interacting with the product (shown in the data as events of type "engagement"). Any point in this chart can be interpreted as "the number of users who logged at least one engagement event during the week starting on that date."
You are responsible for determining what caused the dip at the end of the chart shown above and, if appropriate, recommending solutions for the problem.

I start by thinking of possible explanations for the drop in engagements..

- There might be an issue with the tracking
- It might be due to seasonality, maybe a holiday season
- Perhaps a UI issue was introduced after the week of 07/28/2014
- There might have been a change in search crawler indexing which brought up the change
- ...

As this is a simulated assignment I cannot ask from the development team if there were changes to the code which might have caused issues coinciding with the drop so I'll have to rely purely on the data collected.

I decide to first check if there was a drop in sign up as well since it is an easy check.

I use the following query to look into this:

```
SELECT DATE_TRUNC('week', e.occurred_at) AS week,
  e.event_name,
  COUNT(e.user_id) AS Users
FROM tutorial.yammer_events e
```

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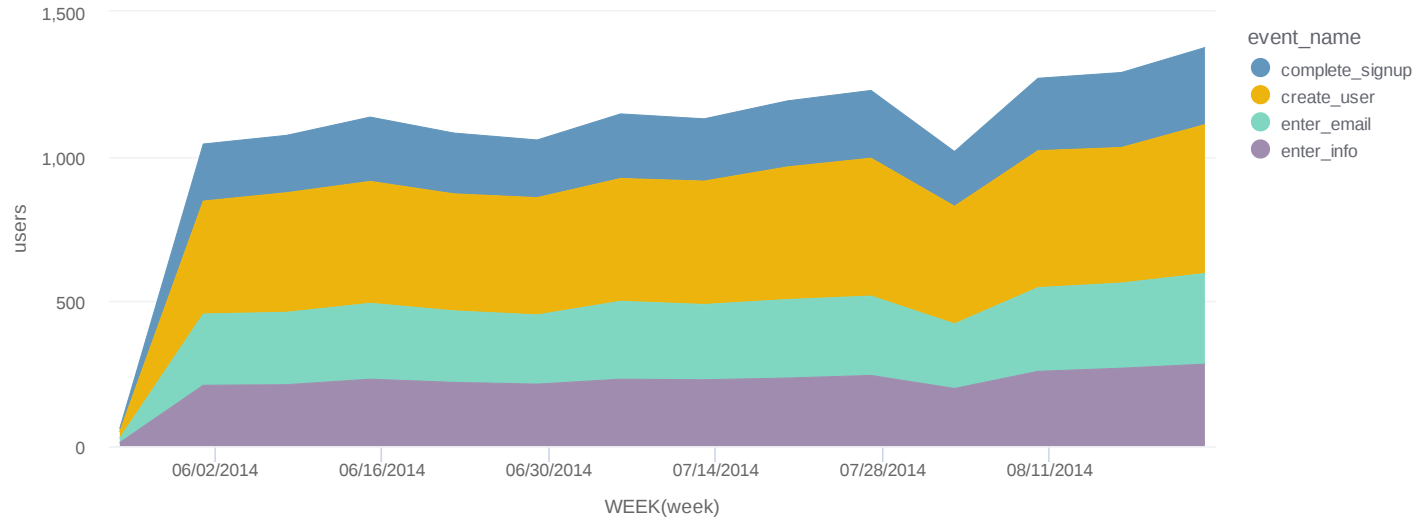
```
WHERE e.event_type = 'signup_flow'
  AND e.occurred_at >= '2014-06-01'
  AND e.occurred_at < '2014-09-01'
GROUP BY 1,2
ORDER BY 1,2
```

A Temporary Drop in Signup Completion



There seems to be a temporary drop in user creation. But it bounces back up.

As the user creation is not an issue (at least any more) I want to look into older users.

I divide the user engagement numbers into groups by the user creation date:

```
SELECT DATE_TRUNC('week', e.occurred_at) AS week,
    COUNT(DISTINCT (CASE WHEN u.created_at > '2014-08-25' THEN e.user_id ELSE NULL END)) AS "1 week",
    COUNT(DISTINCT (CASE WHEN u.created_at < '2014-08-25' AND u.created_at > '2014-08-18' THEN e.user_id ELSE NULL END)) AS
"2 weeks",
    COUNT(DISTINCT (CASE WHEN u.created_at < '2014-08-18' AND u.created_at > '2014-08-11' THEN e.user_id ELSE NULL END)) AS
"3 weeks",
    COUNT(DISTINCT (CASE WHEN u.created_at < '2014-08-11' AND u.created_at > '2014-08-04' THEN e.user_id ELSE NULL END)) AS
"4 weeks",
    COUNT(DISTINCT (CASE WHEN u.created_at < '2014-08-04' AND u.created_at > '2014-07-28' THEN e.user_id ELSE NULL END)) AS
"5 weeks",
    COUNT(DISTINCT (CASE WHEN u.created_at < '2014-07-28' AND u.created_at > '2014-07-21' THEN e.user_id ELSE NULL END)) AS
"6 weeks",
    COUNT(DISTINCT (CASE WHEN u.created_at < '2014-07-21' AND u.created_at > '2014-07-14' THEN e.user_id ELSE NULL END)) AS
"7 weeks",
    COUNT(DISTINCT (CASE WHEN u.created_at < '2014-07-14' AND u.created_at > '2014-07-07' THEN e.user_id ELSE NULL END)) AS
"8 weeks",
    COUNT(DISTINCT (CASE WHEN u.created_at < '2014-07-07' AND u.created_at > '2014-06-30' THEN e.user_id ELSE NULL END)) AS
"9 weeks",
    COUNT(DISTINCT (CASE WHEN u.created_at < '2014-06-30' THEN e.user_id ELSE NULL END)) AS "10+ weeks"
 FROM tutorial.yammer_events e
```

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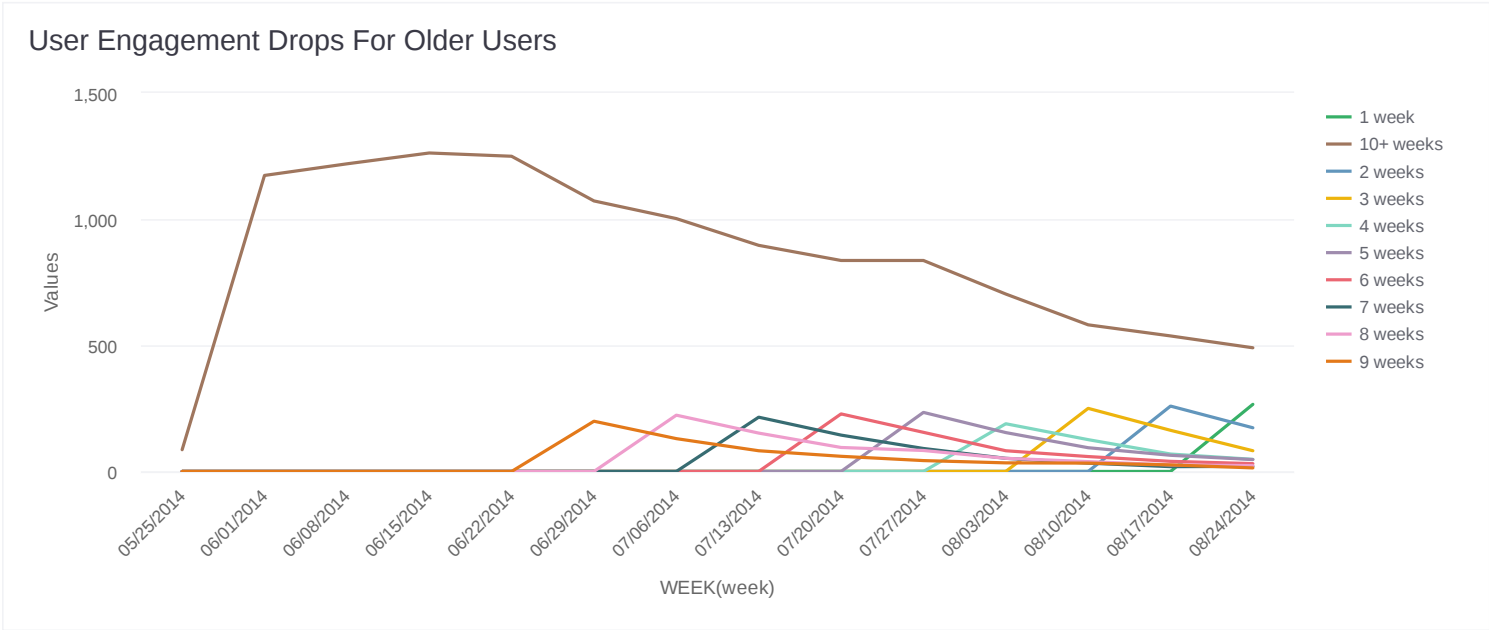
```
 LEFT JOIN tutorial.yammer_users u ON e.user_id = u.user_id
 WHERE e.event_type = 'engagement'
  AND e.event_name = 'login'
  AND e.occurred_at >= '2014-06-01'
  AND e.occurred_at < '2014-09-01'
 GROUP BY 1
 ORDER BY 1
```



User engagement drops after the first week and only a part of the users keep using the service in the long run. It's apparent that user engagement is dropping quite fast for users who have been using the service for a longer period. Especially one can see a drop in user engagement for users who have been using the service for over 10 weeks on the week of 08/03/2014. The temporary drop in new users is also visible here at the same point.

What more could we see from the data? There's at least the device the users are using. Let's group by device type:

```
SELECT DATE_TRUNC('week', e.occurred_at) AS week,
    COUNT(DISTINCT e.user_id) AS weekly_active_users,
    COUNT(DISTINCT CASE WHEN e.device IN ('macbook pro','lenovo thinkpad','macbook air','dell inspiron notebook',
     'asus chromebook','dell inspiron desktop','acer aspire notebook','hp pavilion desktop','acer aspire desktop','mac mini')
     THEN e.user_id ELSE NULL END) AS computer,
    COUNT(DISTINCT CASE WHEN e.device IN ('iphone 5','samsung galaxy s4','nexus 5','iphone 5s','iphone 4s','nokia lumia 635',
    'htc one','samsung galaxy note','amazon fire phone') THEN e.user_id ELSE NULL END) AS phone,
    COUNT(DISTINCT CASE WHEN e.device IN ('ipad air','nexus 7','ipad mini','nexus 10','kindle fire','windows surface',
    'samsumg galaxy tablet') THEN e.user_id ELSE NULL END) AS tablet
 FROM tutorial.yammer_events e
 WHERE e.event_type = 'engagement'
  AND e.event_name = 'home_page'
  AND e.occurred_at >= '2014-06-01'
  AND e.occurred_at < '2014-09-01'
 GROUP BY 1
 ORDER BY 1
```

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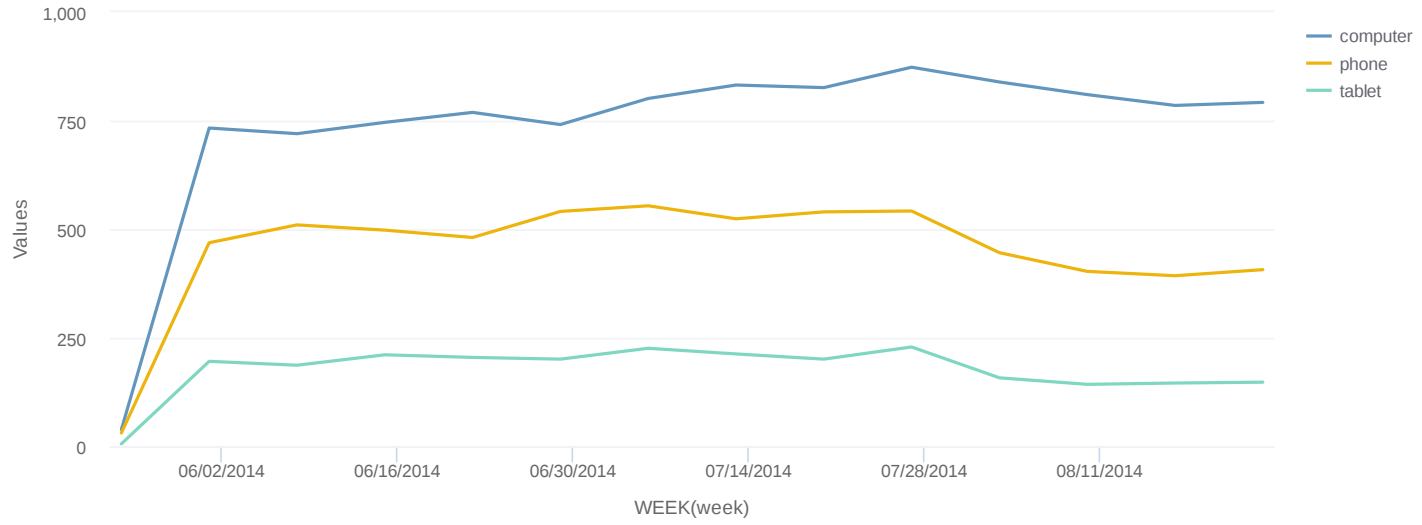
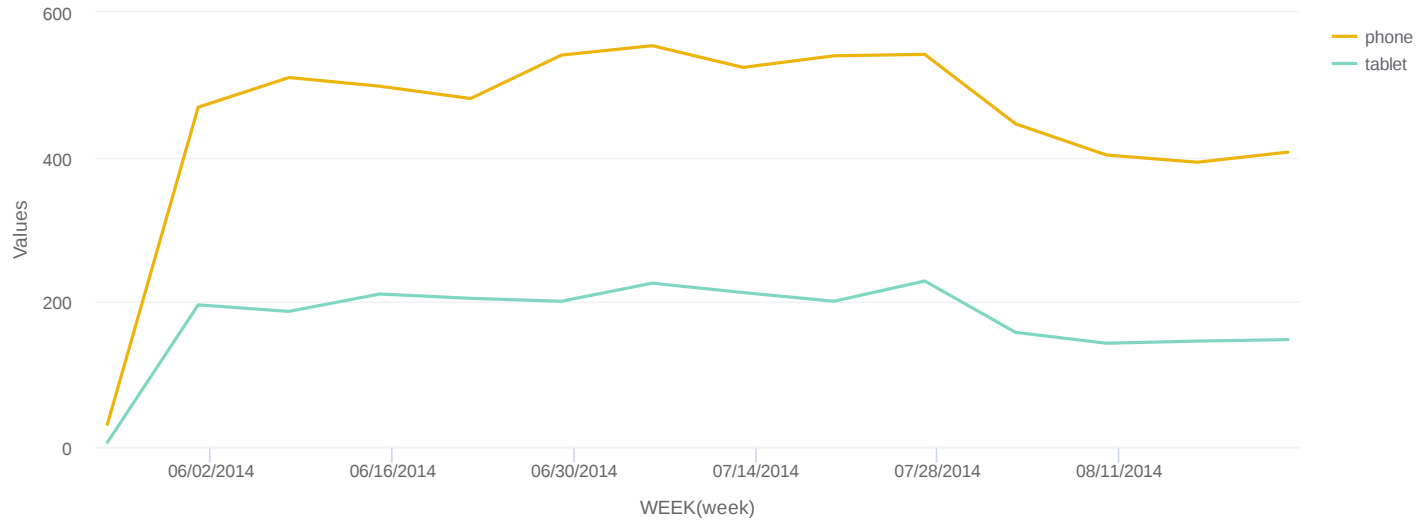
Slight Downward Trend for Desktop Devices in Engagements



Desktop devices hardly seem to be affected, which is interesting!

Big Drop in Phone and Tablet Engagements



Phones and tablets show a clear drop! There seems to be an issue affecting mobile and tablet users.

For spurring user engagement the users are sent weekly digests. Let's check if there is a change in those:

```
SELECT DATE_TRUNC('week', e.occurred_at) AS Week,
 e.action,
 COUNT(DISTINCT e.user_id) AS "Email events"
FROM tutorial.yammer_emails e
LEFT JOIN tutorial.yammer_users u ON e.user_id = u.user_id
WHERE e.occurred_at >= '2014-06-01'
  AND e.occurred_at < '2014-09-01'
```

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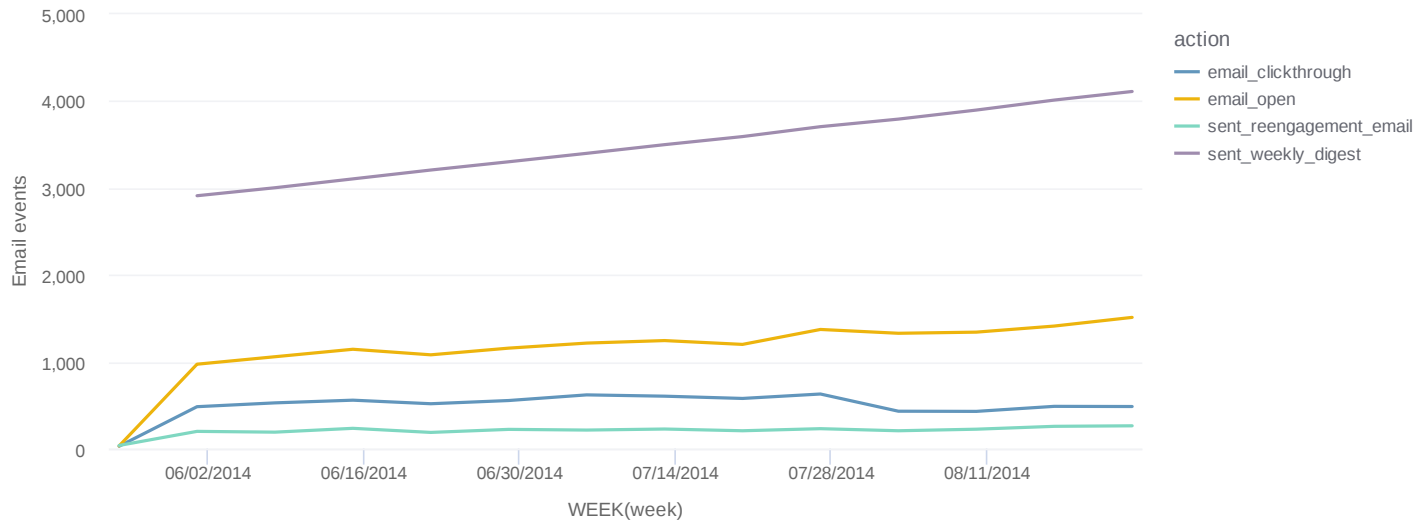
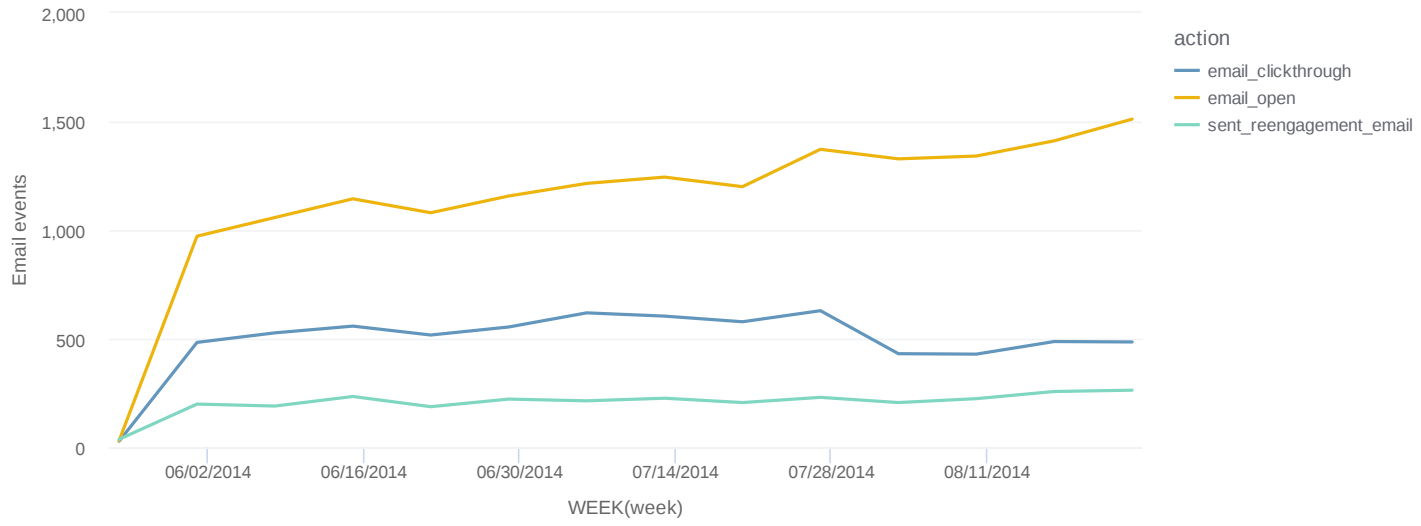
```
GROUP BY 1,2
ORDER BY 1,2
```

Steady Upward Trend for Sent Weekly Digests



We can see that weekly digest emails have been sent steadily. But if we zoom in on the chart we can see a big drop in the clickthrough numbers suggesting there is an issue related to the digest email.

Drop in Email Clickthrough



We can inform the head of product that:
There was a small drop in new user creation during one week (08/03/2014) but that bounced back up. The issue was more related to older users. Specifically, there was a clear drop in user engagement for mobile app users. Moreover, there was a significant drop in the number of clickthroughs for the weekly email digests. These should be looked more into.