ID430B: Data Analytics for Designers 디자인 특강V <디자이너를 위한 데이터 분석>

Lecture 12-14

Tracking User Behaviors from Log Data

Journey Mapping

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Things to Learn

1. Basic concept of graph data
2. Customer/User Journey Map
3. Related techniques
    1. Cohort, Funnel, Sankey diagrams

Graph Theory

In 1735, graph theory and the idea of topology was first described by the Swiss mathematician **Leonard Euler** as applied to the problem of the seven bridges of Königsberg. Königsberg consisted of four islands connected by seven bridges. No one had ever found a path that visited all four islands and crossed each of the seven bridges only once. Naturally, people assumed that no such path existed, but there was no mathematical proof of this.

Two common representations of the above graph

1. Node and Edge List

NODE_ID
1
2
3
4

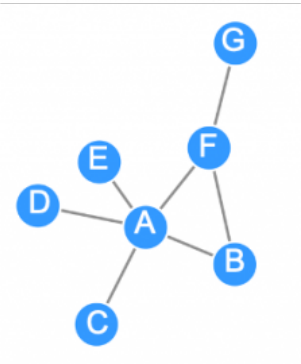
EDGE_ID	FROM	TO
1	1	2
2	1	2
3	1	3
4	2	4
5	3	4
6	2	4

2. Adjacency Matrix

	1	2	3	4
1	0	1	1	0
2	1	0	1	1
3	1	1	0	1
4	0	1	1	0

Types of Edges

Undirected

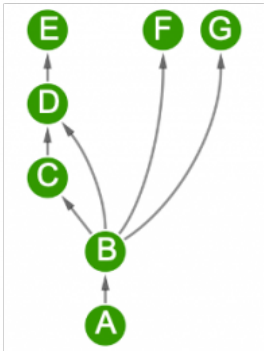


FROM	TO
A	B
A	C
A	D
A	E
A	F
…	

← same as →

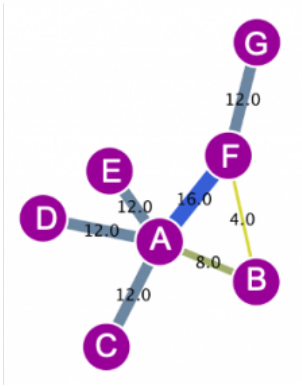
B	A

Directed



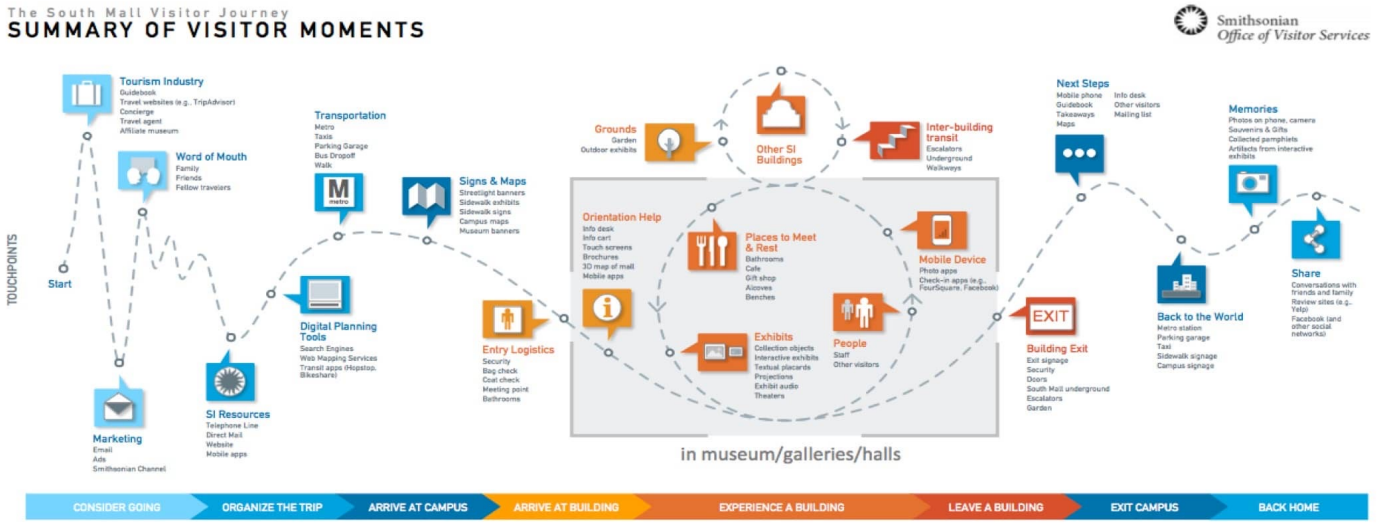
FROM	TO
A	B
B	C
B	D
B	F
B	G
…	

Weighted



FROM	TO	WEIGHT
A	B	8.0
A	C	12.0
A	D	12.0
A	E	12.0
A	F	16.0
…		

Customer / User Journey Map



- **Nodes** represent **key states** of a customer / user
  - **Touchpoints** like Kiosk, Website, Store,…
  - **Web pages** like landing page, sign-up, cart, purchase,…
  - **Member states** like guest, member, leader, …
  - **Product states** like off, on, working, idle, …

- **A customer/user must be at a specific node** (i.e. cannot be on multiple nodes at the same time)
- **Edges** represent possible transition between states
  - E.g. Visiting touch points, Opening URL, Clicking button,…

Four steps of Journey Map Analysis

1. Getting a holistic overview of user experience

2. Defining user segments based on their previous / current states

3. Causal analysis of phenomenon

4. Planning intervention on follow-up experience

Getting a holistic overview of user experience

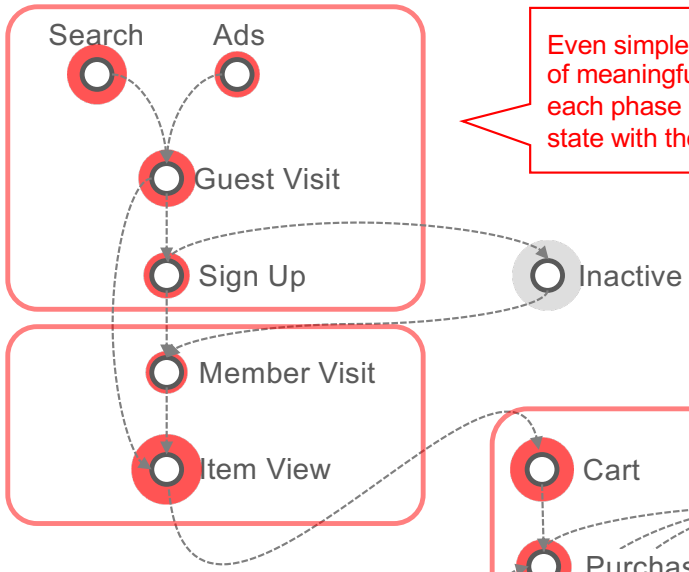
Phase 1

- 36k potential members are in the phase 1
- Potential members go either ***Inactive*** state or **Phase 2**

Phase 2

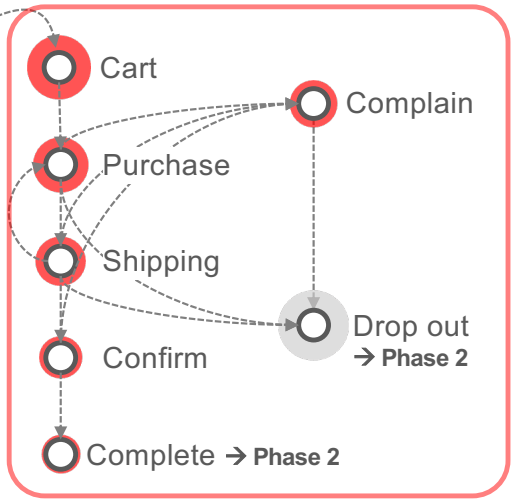
- 72k people are in Phase 2
- People in Phase 2 are mostly viewing (i.e. not in the payment process yet)

Both in-bound / out-bound paths are worth defining. For example, Phase 2 has five in-bound paths (Guest Visit, Sign up, Inactive, Drop out, Complete)



Even simple systems might have large # of states. Define smaller # of meaningful groups (i.e., phases). Aggregate total # people in each phase as well. Here we visualized current # people in each state with the radius

- 50k registered members have not logged in once



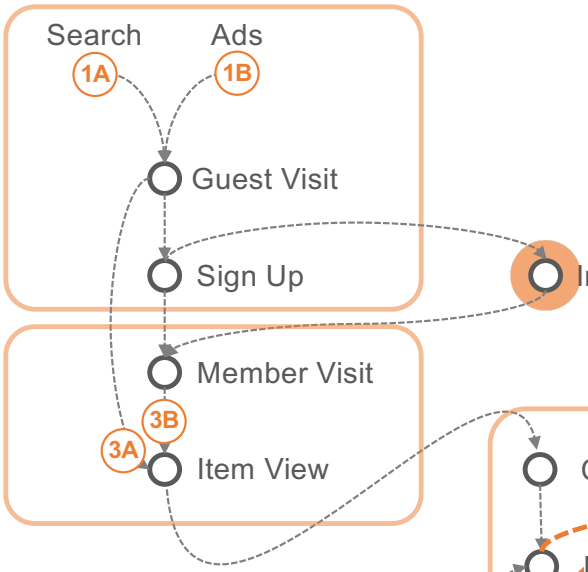
Phase 3

- 2k people are currently in Phase 3
- All the people are from Phase 2
- People in Phase 3 are in the middle of the payment process
- After completing / dropping out people automatically go back to Phase 2

Defining user segments based on their previous / current states

Segment 1A and 1B

- There are two in-bound paths of guest visitors (Search and Ads). We can put them into two segments 1A and 1B.
- We can examine many things with segment 1A and 1B such as
  - Who they are
  - How long they stay here
  - How to motivate them to move on to Phase 2
  - and so on…

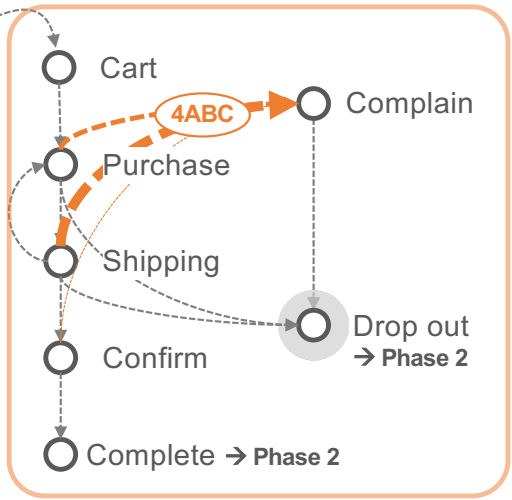


Segment 2

- How many inactive members do exist? Inactive members are a good target of causal analysis (e.g. why they didn't visit after sign-up) and interventions (e.g. follow-up marketing email).

Segment 3A and 3B

- There are two groups of people (guest and member) who are viewing item, and our website should treat them differently.
- E.g. Nudge guests to sign-up as soon as they add an item to cart
- E.g. If we recommend items based on member profile, we can ask guests a few questions to give accurate recommendations.



Segment 4A, 4B, 4C

- Let's say our payment process is poorly designed, and a lot of people complained. We can put them into three segments based on which state (purchase, shipping, confirm) they were at.
- By analyzing the three segments we can better understand problems of the current payment process.

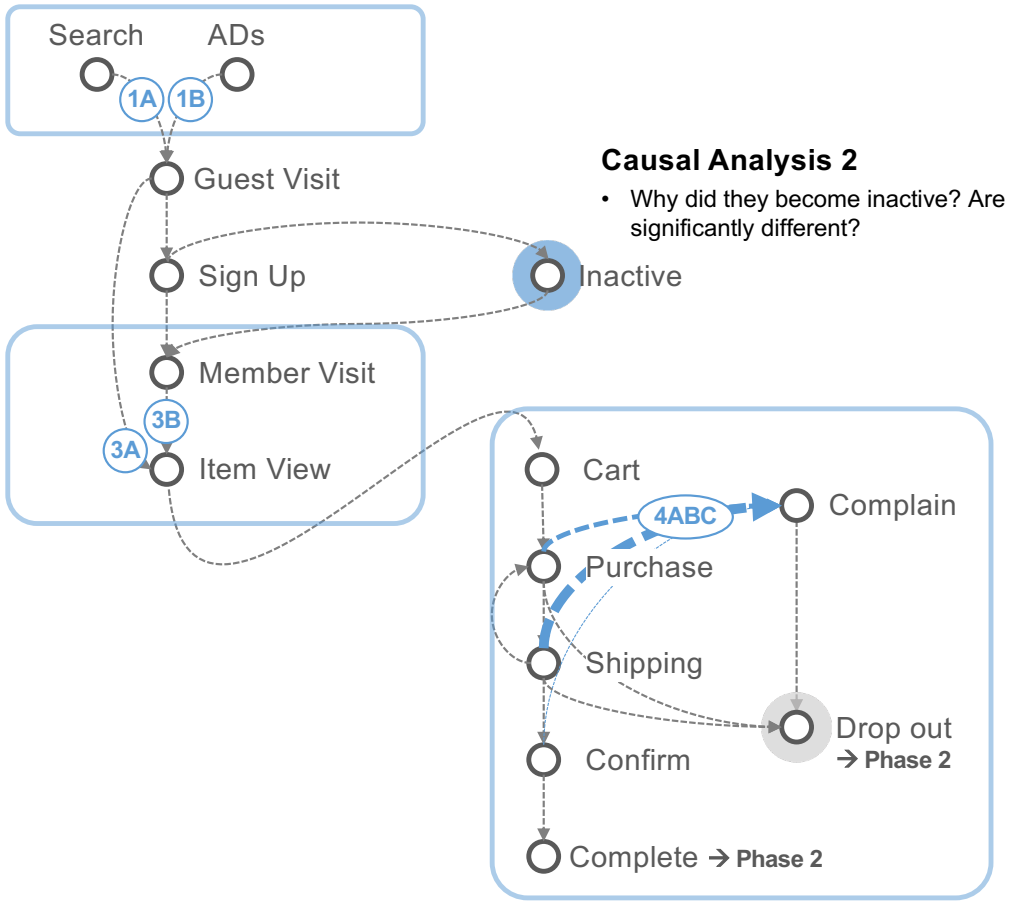
Causal analysis of phenomenon

Causal Analysis 1

- Among 1A(Search) and 1B(online ads) which channel was more efficient?

Causal Analysis 3A and 3B

- Is there any association between inbound channel (3A / 3B) and people's behavior in Phase 2?
- Do registered members view more items / move to Cart more frequently than guest visitors?



Causal Analysis 2

- Why did they become inactive? Are the ratios of 1A and 1B significantly different?

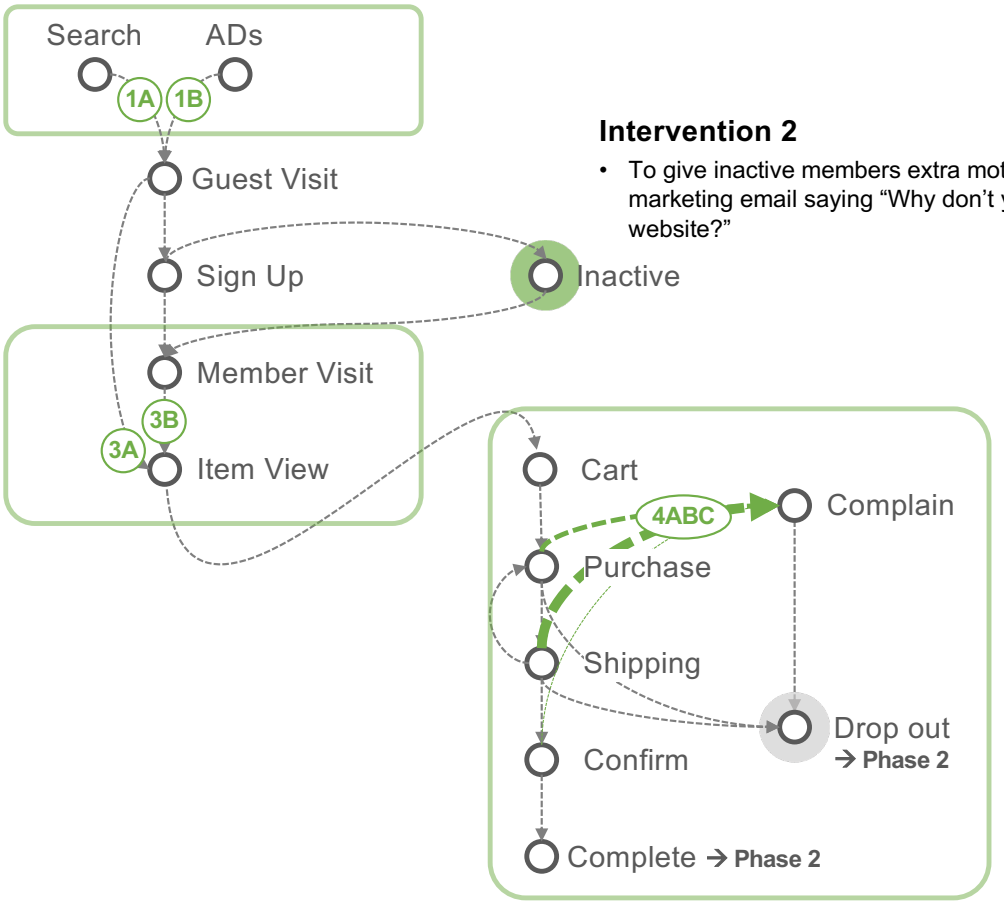
Causal Analysis 4A, 4B, 4C

- What is the biggest problem that caused people compain or even drop out? Was it due to a poorly designed UI or instruction at a specific state? Or was it caused by the lengthy three step process (like the LinkedIn case)?

Planning intervention (A/B testing) on follow-up experience

Intervention 1

- How can we improve the effectiveness and efficiency of marketing channels? We could focus on a more efficient channel or improve the other channel.



Intervention 2

- To give inactive members extra motivation, we can send a marketing email saying “Why don’t you check out ___ on our website?”

Intervention 3A and 3B

- Do we want to convert guest visitors to registered members? If so, we should design variations of when / how to nudge guests to sign up.

Intervention 4A, 4B, 4C

- Based on results from causal analysis, we can we redesign our payment process to lower the ratio of unsatisfied people.
- E.g. Simplify the payment process into a single page (like LinkedIn did)
- E.g. Fix usability issues or misunderstandings
- It is important to iterate causal analysis and intervention steps!

Additional Analysis on Journey Map

Cohort analysis

A **cohort** is a group of people sharing something in common, such as date of the **first visit**, month of the **first purchase, geographical location, version of the app, acquisition channel,** and so on. We used “segment” in the previous slides instead of “cohort”. They have almost the same (but not identical) meaning.

What do we do with cohort analysis?

Track these groups of users over time, to identify some common patterns or behaviors: ”See patterns clearly across the life-cycle of a customer (or user), rather than slicing across all customers blindly without accounting for the natural cycle that a customer undergoes.” –Alistair Croll; Benjamin Yoskovitz (15 April 2013). *Lean Analytics: Use Data to Build a Better Startup Faster*. Sebastopol, CA: O'Reilly. ISBN 978-1449335670.

Journey map focuses **understanding the current state of everyone.**
Cohort analysis focuses on **comparing long-term behaviors of groups of people**.

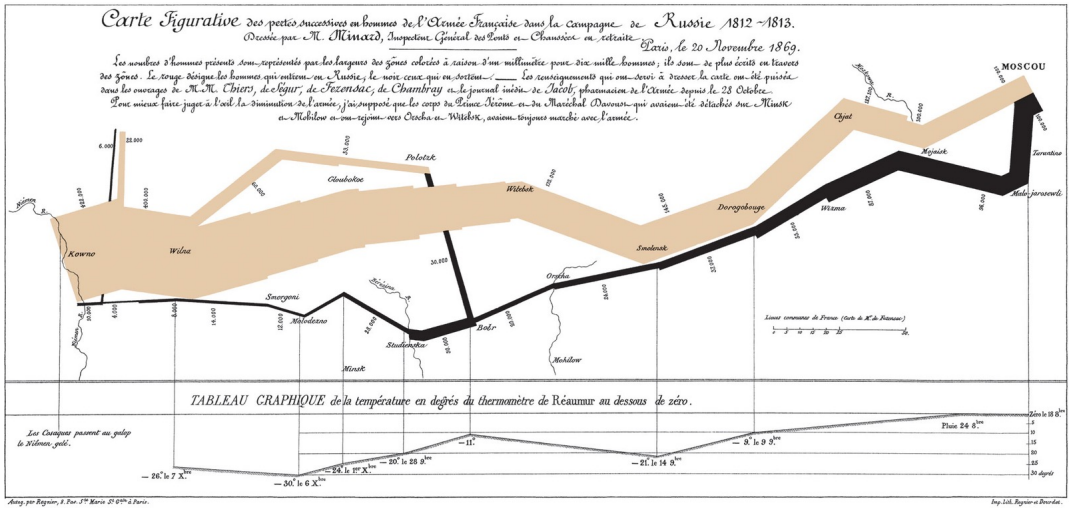
Beware of Type 1 error (e.g. If you focused on tiny little cohorts, your findings may not be meaningful)

Additional Analysis on Journey Map

Funnel analysis

- Focuses on a **linear progression of behavior** (e.g. from the initial state to the goal state)
- Optimized to visually represent what **% of people proceeded** to the next stage
    - The flow of people is mostly diverging (i.e. # people decreases along the progression axis)
    - Those who getting out of the flow are simply considered as drop-offs
- Possible to compare segments (cohorts) if they share the same progression

- Funnel is a partial view of a journey map
    - The flow of people in journey map tends to be complicated (i.e. having a lot of diverging and converging paths)
    - User journey might have multiple points of interest
        - E.g. # people repeating the same steps due to usability issues
        - E.g. People coming from multiple in-bound paths



Additional Analysis on Journey Map

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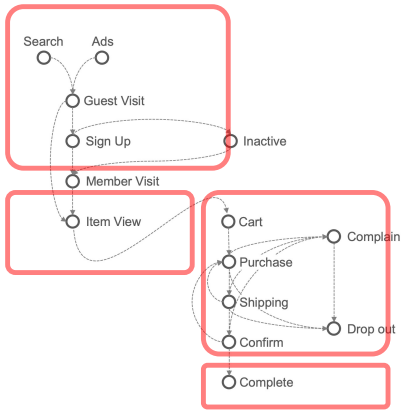
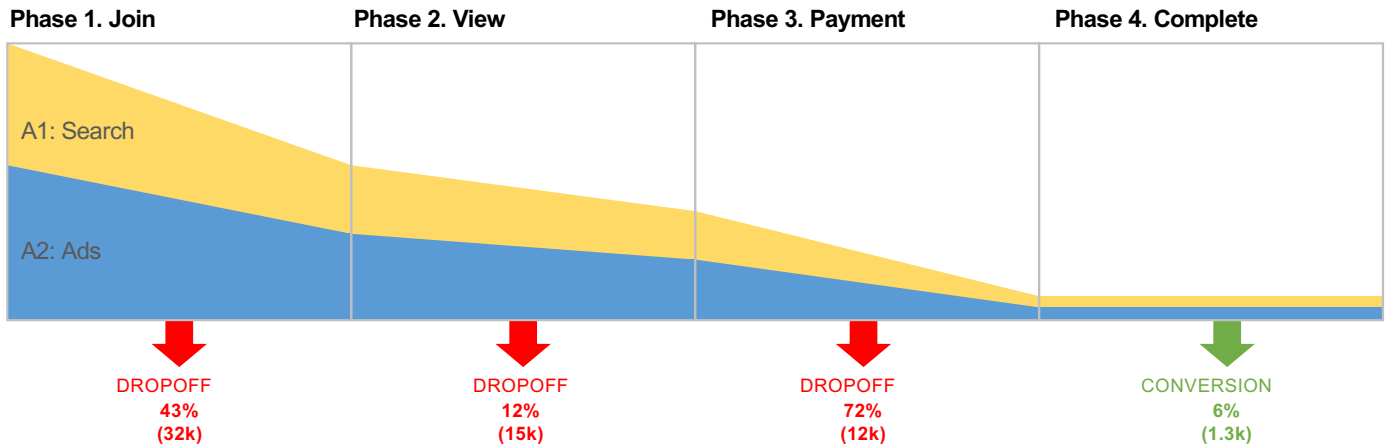
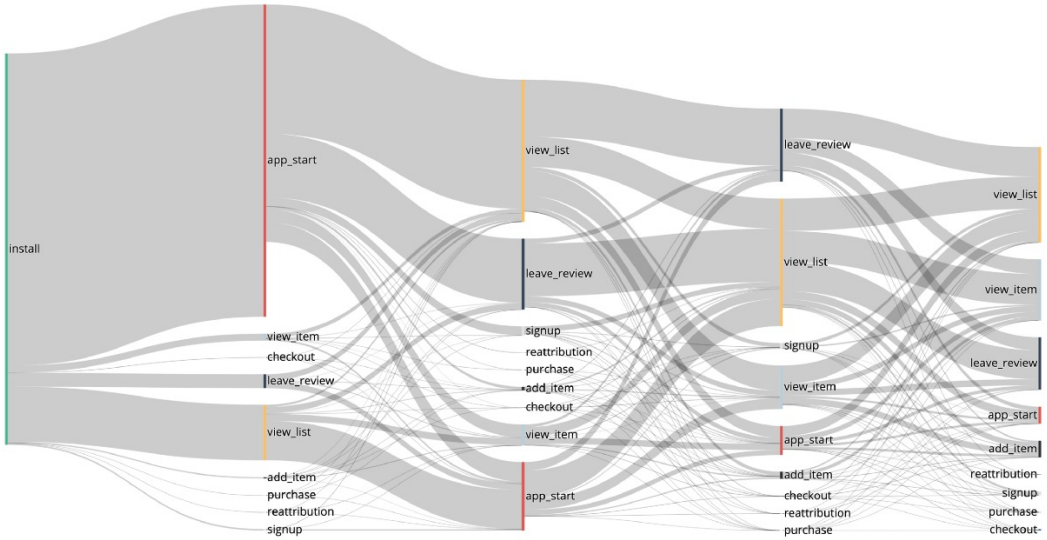


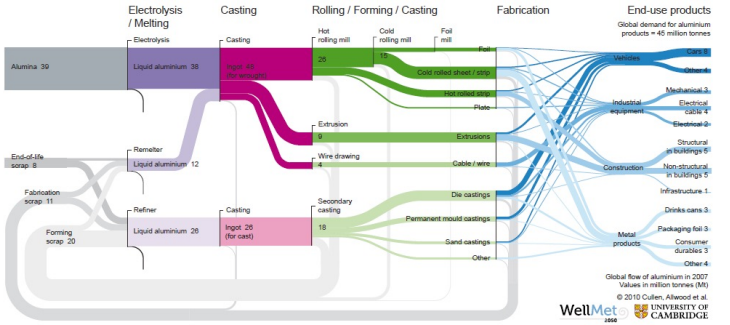


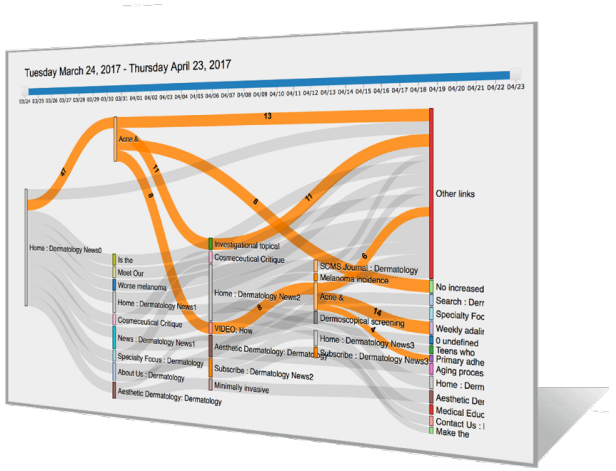
Additional Analysis on Journey Map

Sankey (Flow) Diagram

- Sankey is a little more complex than funnels – as it visualizes both diverging and converging paths
- Both funnel and sankey diagrams highlight # or % cases encoded with edge thickness - while journey maps would be hard to interpret with such visual encodings.







Summary

- **Journey map** is **mid to high-level overviews of people's behavior** within a specific system

- Journey map allows us to do the following tasks
  - **Tracking # or % of people** moving along the paths on the map
  - **Identifying segments** (or cohorts) of people having similarities
  - **Causal Analysis** of what contributes to a specific phenomenon
  - **Intervention** (e.g. A/B test) on a specific group of people

- There are many variations (partial representations) of journey map
  - **Cohort analysis** focuses on comparing groups in terms of specific measure (e.g. retention, convergion, drop-off rates)
  - **Funnels** focus on linear progressions and (# or %) of cases at each stage
  - **Sankey** is similar with funnels but also allows converging paths

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