Diffusion Process and Community Design of the Online Platform

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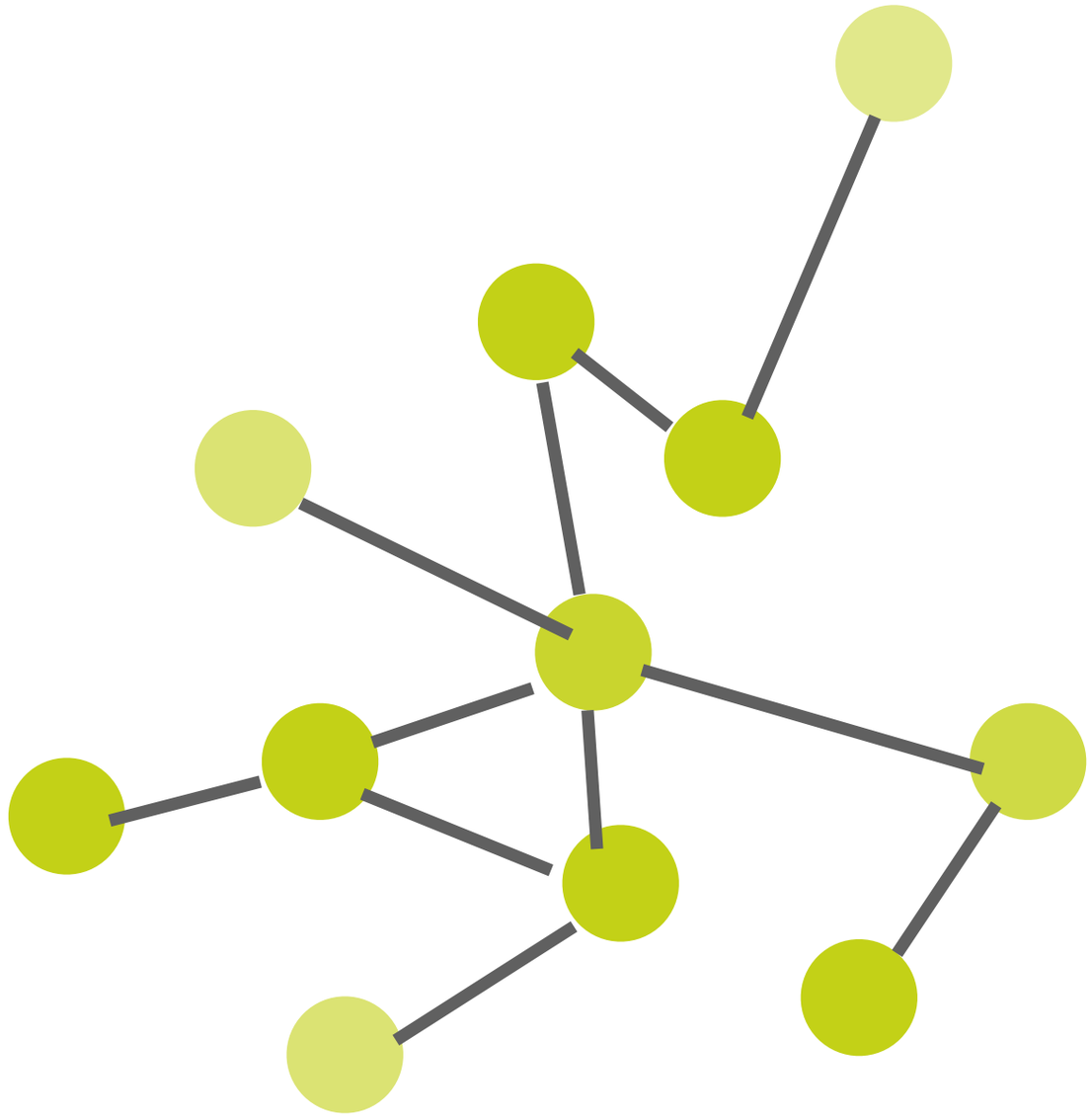
Outline

1. Motivation
   - Two Research Question
   - Literature
2. The Model
   - Model Setting
   - Analysis
3. Conclusion
4. Discussion
   - Incentive
   - Experiment and Data



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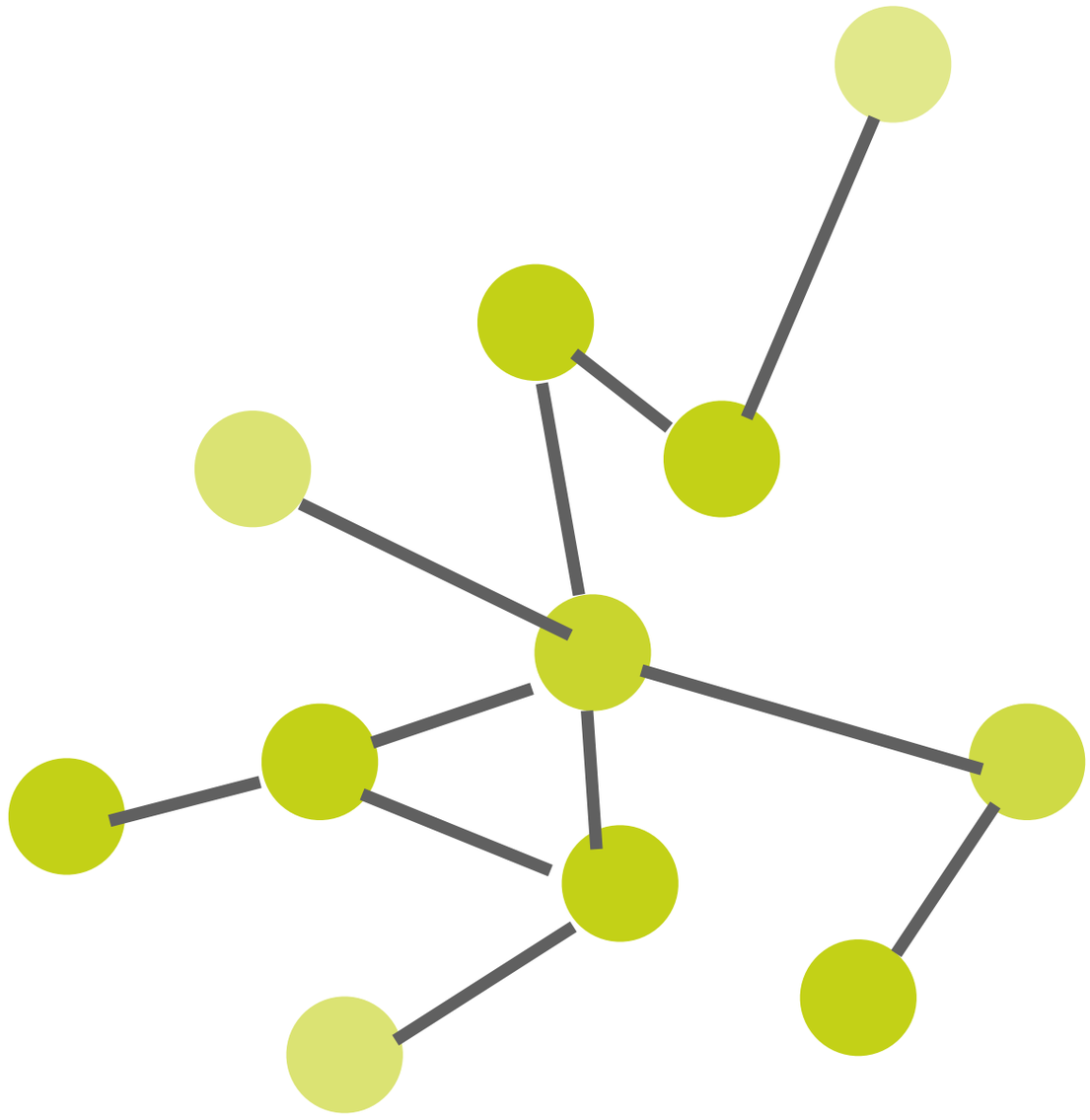


Motivation - Introduction

How can we form a community and spread it ?

- How to diffuse the popularity : Diffusion Process

- How to form sustainable community : Community Design

- How to evaluate the model : Online Platform

Motivation - Literature : Diffusion Process

- Bass (1969)

  Classical model which explain how innovative devices spread (e.g. refrigerators, air conditioner, and etc.)

- Ellison and Fudenberg (1995)

  Theoretical paper which analyze which technology diffuse among players given quality of technology

- Young (2009)

  Present the model : contagion, social influence and social learning

- Xie, etal (2011)

  Simulate the network model and find that 10% is the tipping point where the situation completely change

Motivation - The Problem : Online Platform

There are a lot of online platform services

Wikipedia

YouTube

Twitter

GitHub

Flickr

Facebook

Its value depends on users[9] upload contents
(eg. YouTube = video, Twitter = tweet)

=> The key point is how to form a community

Motivation - Literature : Community Design

- Lerner and Tirole (2002)

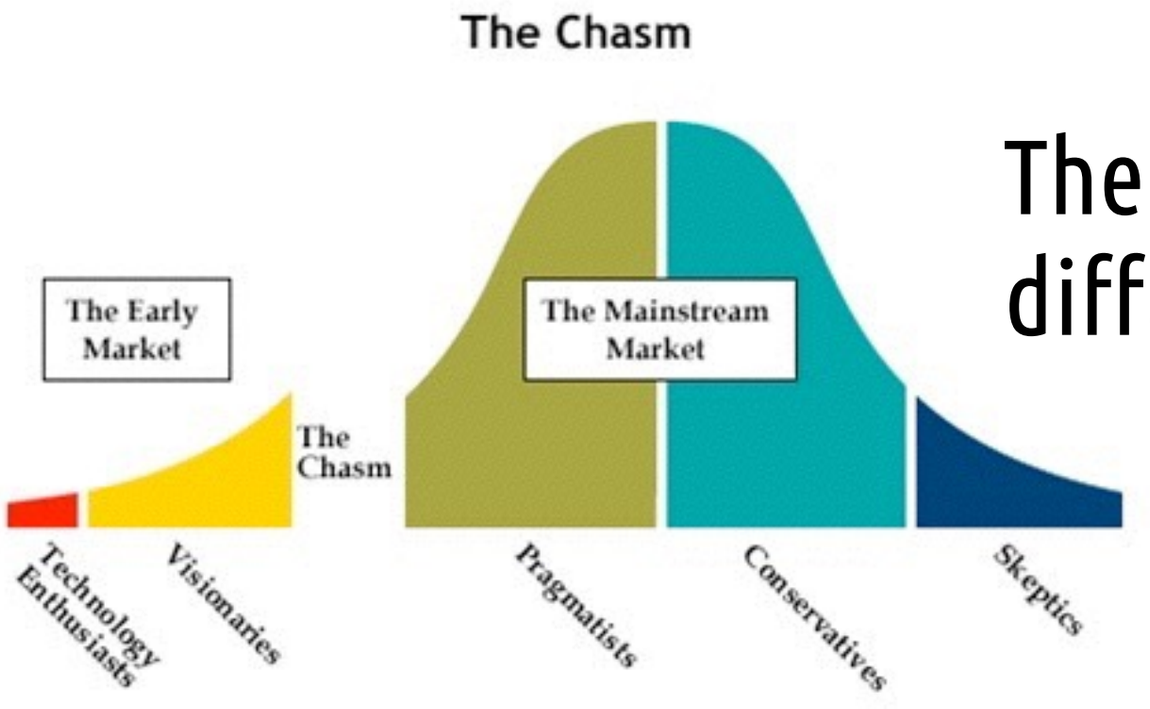
  Analyze open source software in the approach of economics

- Anthey and Ellison (2012)

  Theoretical paper analyze how to form open source community and focus not only on the number of users (programmers) but also on the quality (code of the software)

Motivation - The Problem : Critical Mass

[8]Critical Mass[9]



There is a gap between diffuse and not diffuse

=> The model must explain the stylized facts

Motivation - Two Research Question

On the Online Platform

1. Where is the difference between success and failure ?

Where is a critical mass ?

2. In very early stage, what do we should do ?

How to achieve a critical mass ?

Motivation - Research Theme and Results

This research will show 2 things

1. Where is a critical mass ?

- We show there exists a critical mass and the result depends on the initial point

2. How to achieve a critical mass ?

- Can achieve a critical mass even when there are a few users at the initial point

- To achieve a critical mass, focus not on large amount of users but on a small community (still conjecture)

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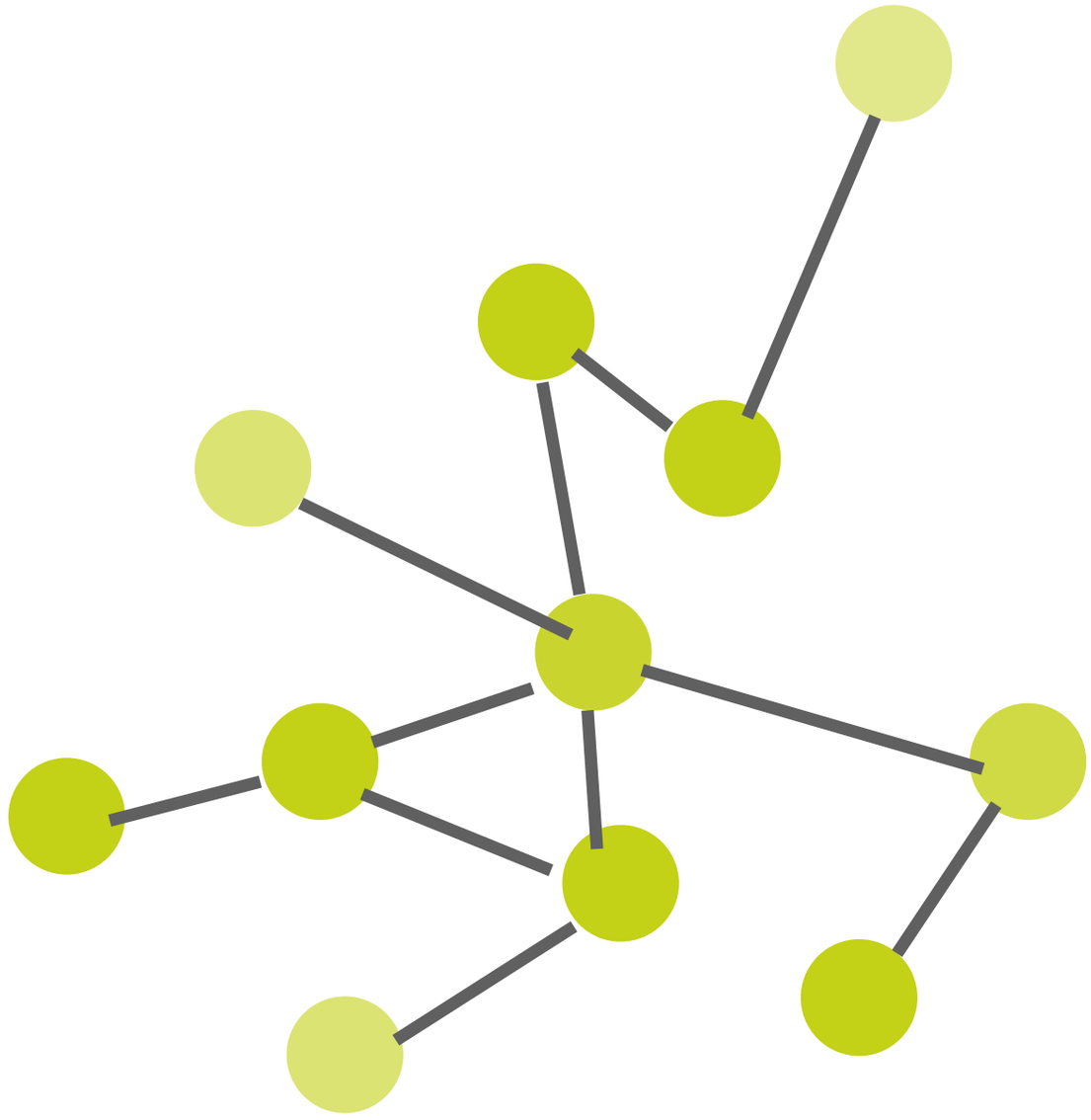
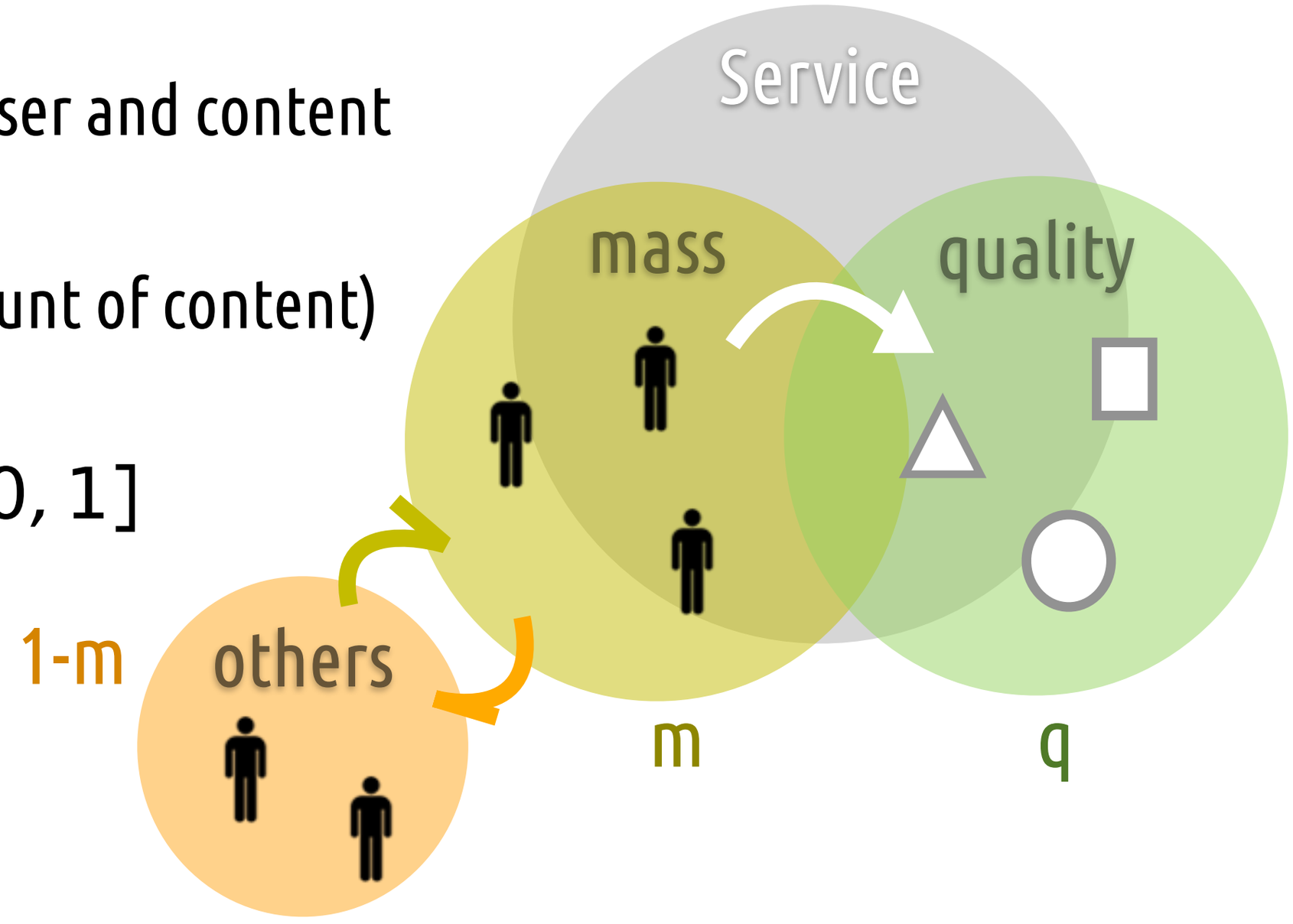


The Model - Setting

- A service has active user and content
- m : mass (active user)
- q : quality (total amount of content)

$$m, q \in [0, 1]$$



How do m(t) and q(t) evolve over time ?

The Model - Dynamics I

Dynamics of m (mass)

$$\Delta m = \text{increasing} - \text{decreasing}$$

$$= (1-m)\ \Pr(\text{begin using}) - m\ \underbrace{\Pr(\text{stop using})}_{\delta}$$

Dynamics of q (quality)

$$\Delta q = \text{increasing} - \text{decreasing}$$

$$= (\text{content per capita})\ m - \beta\, q$$

The Model - Dynamics II

$$\Delta m_t = (1 - m_t)\Pr(m_t, q_t) - \delta m_t$$

$$\frac{\partial \Pr(m_t, q_t)}{\partial m_t} \geq 0, \frac{\partial \Pr(m_t, q_t)}{\partial q_t} \geq 0$$

$$\begin{aligned} \Delta q_t &= \int_{i=0}^{m_t} c_i(m_t, q_t)di - \beta q_t \\ &= \overline{c}(m_t, q_t)m_t - \beta q_t \end{aligned}$$

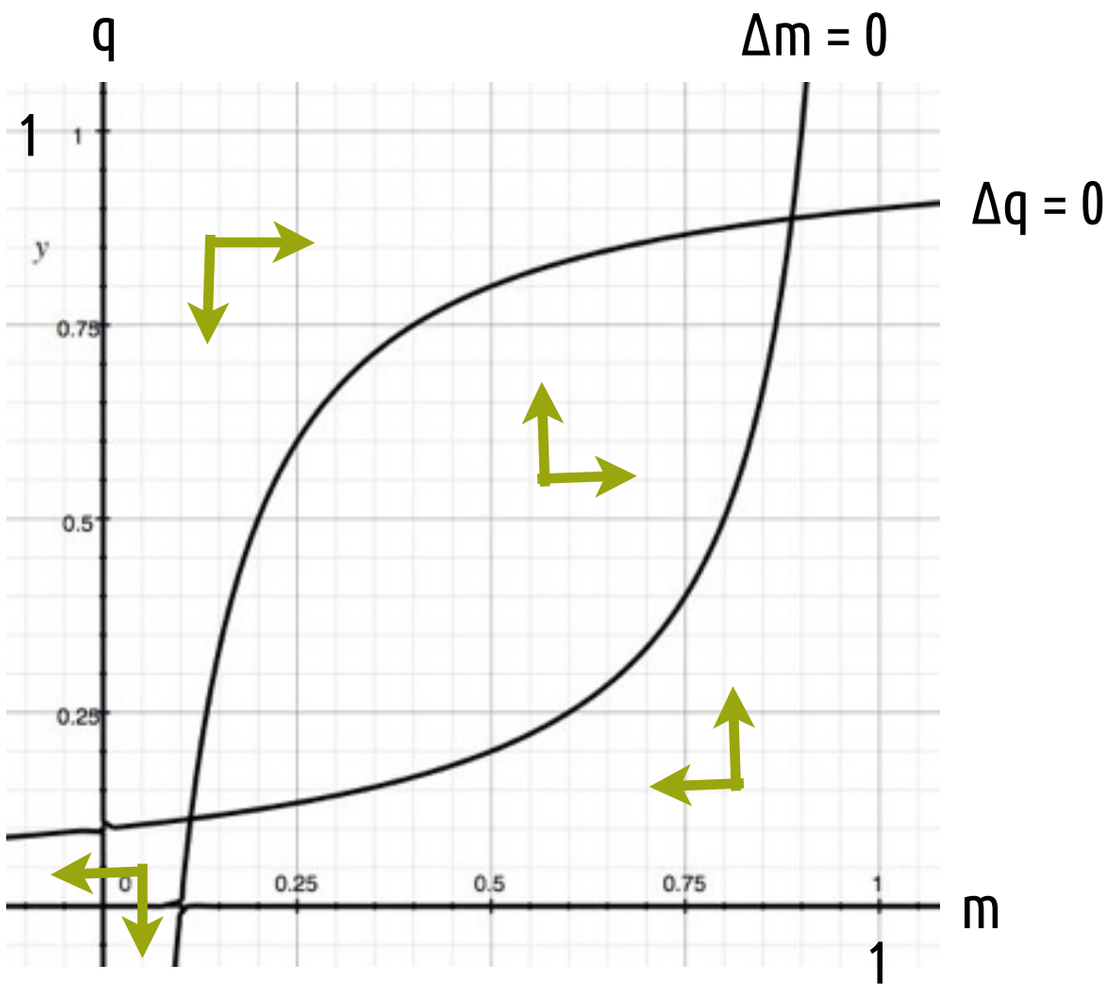
Assumption

$$\Pr(m_t, q_t) = m_t q_t,\ \overline{c}(m_t, q_t) = (1 - q_t)q_t$$

The Model - Analysis I

$$\Delta m_t = (1 - m_t) m_t q_t - \delta m_t$$

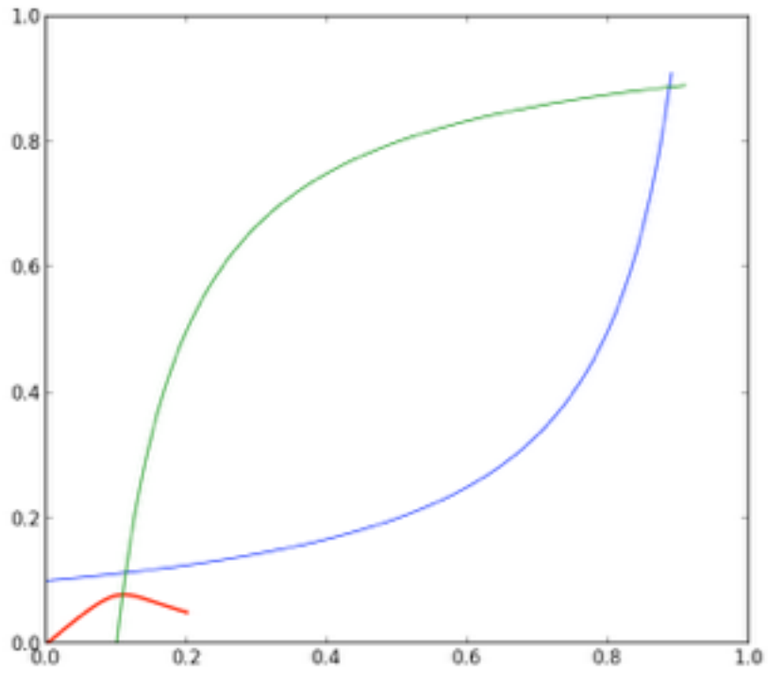
$$\Delta q_t = (1 - q_t) q_t m_t - \beta q_t$$

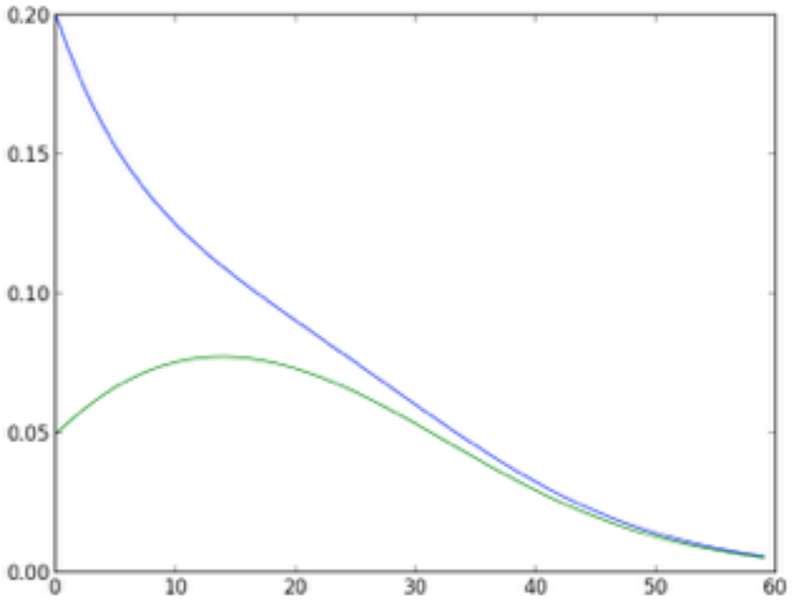


$\delta = 0.1,\ \beta = 0.1$

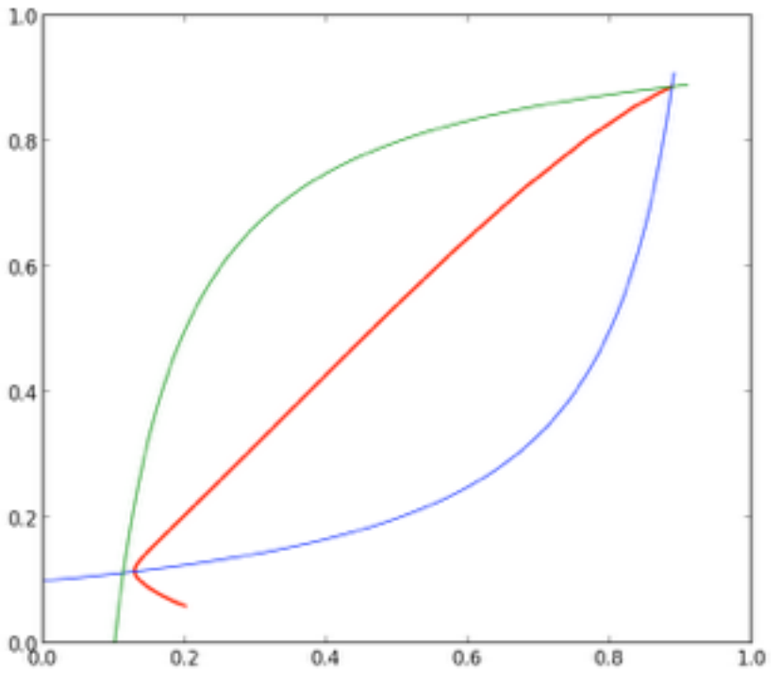
The Model - Analysis II

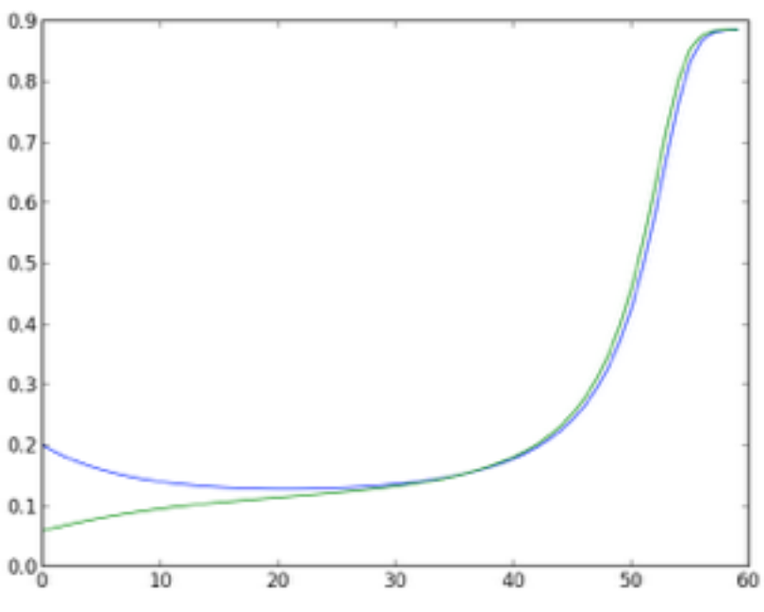
m = 0.20, q = 0.05





m = 0.20, q = 0.06





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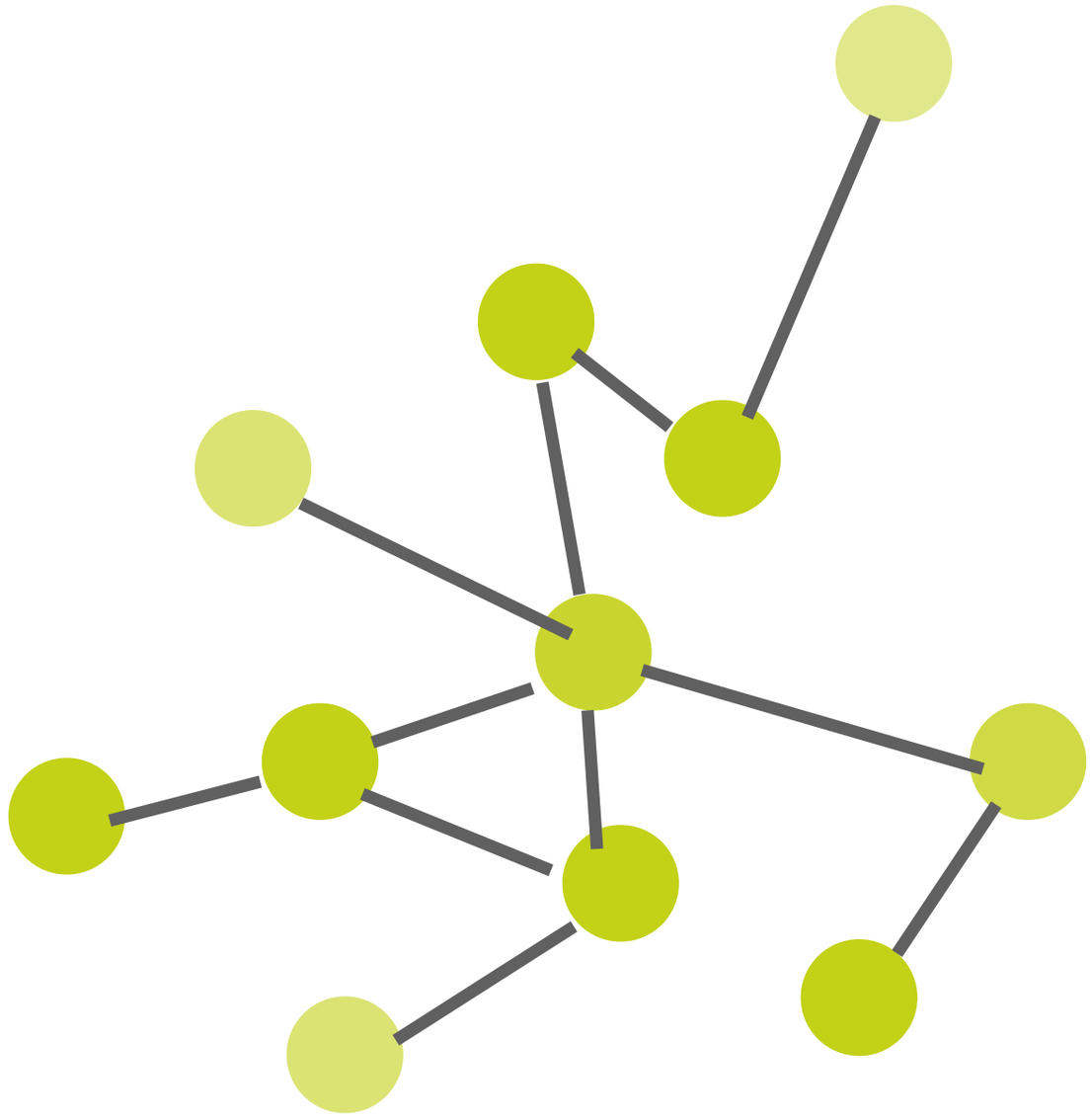


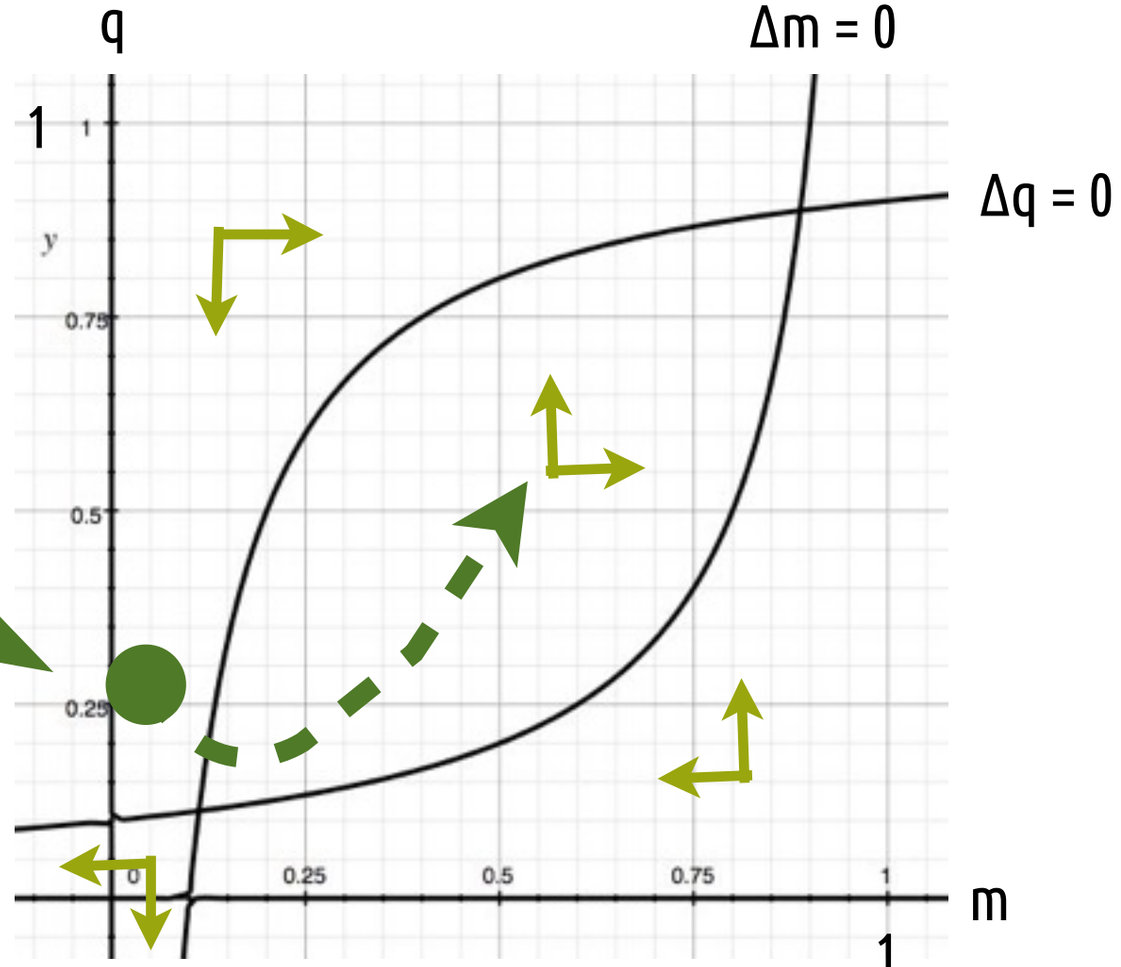
Conclusion - Proposition

Proposition

- There exists a critical mass and the result depends on the initial point

- Can achieve a critical mass even when there are a few users at the initial point

Even if initial user is small, can achieve a critical mass



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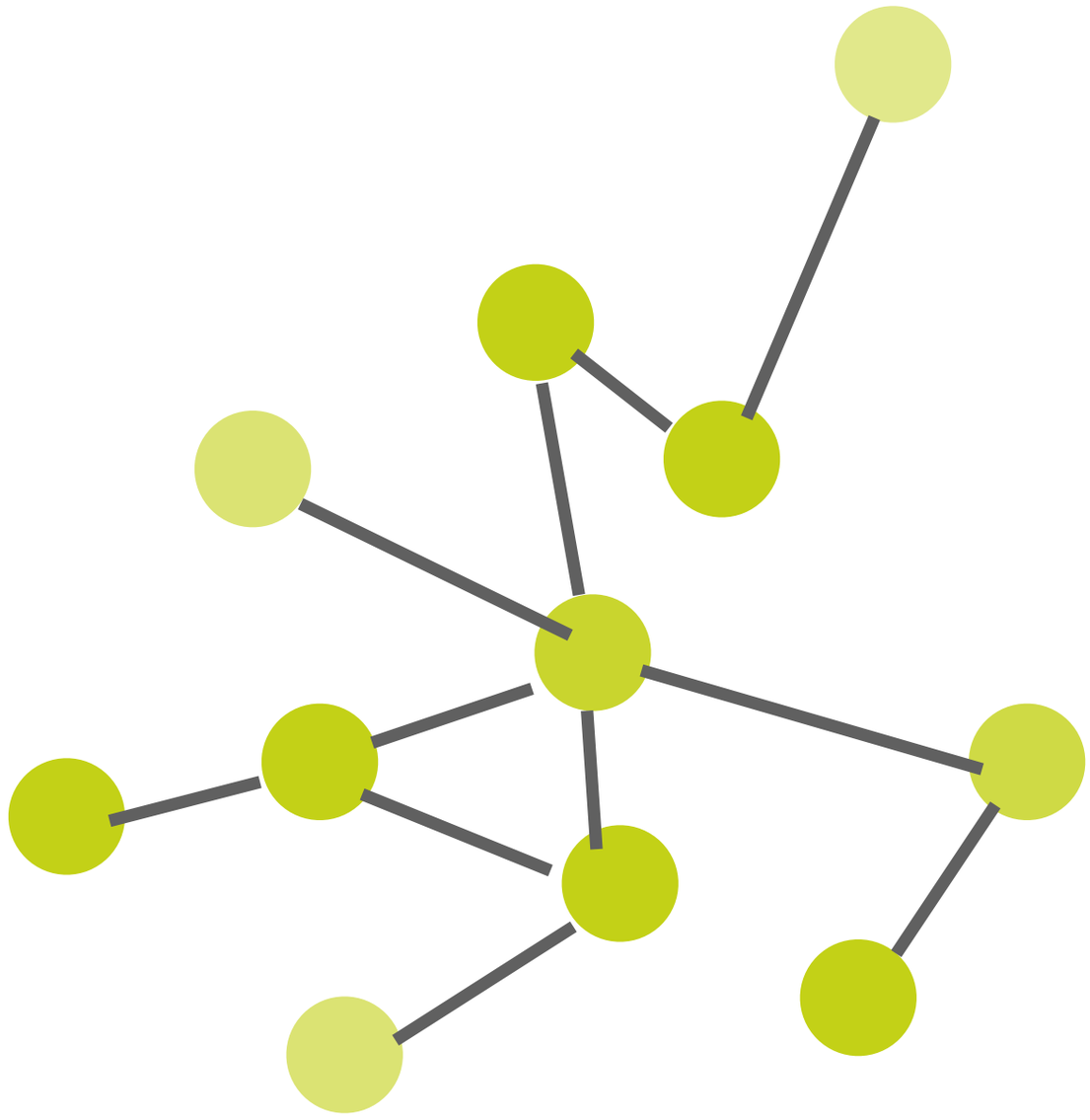


Discussion - Background of the Assumption

$$\Delta m_t = (1 - m_t)\Pr(m_t, q_t) - \delta m_t$$

$$\begin{aligned}\Delta q_t &= \int_{i=0}^{m_t} c_i(m_t, q_t)di - \beta q_t \\ &= \bar{c}(m_t, q_t)m_t - \beta q_t\end{aligned}$$

Who posts contents ?
What is the incentive to do ?
(e.g. Wikipedia, YouTube)

Discussion - Literature : Incentive in the Internet Community

- Lackhani and von Hippel (2003)

  Empirical study - why open source community [8]forum[9] works.
  Analyze the incentive to post answers
  (help : 16, solve problems : 9.5, earn reputations : 4.8, money : 0.9)

- Chiu, Hsu and Wang (2006)

  Empirical study - what is incentive to share knowledge @BlueShop.com.tw
  - Quality <- trust : 0.18
  - Quantity <- identification : 0.26, social interaction : 0.21, etc.

- Lin and Lu (2011)

  Empirical study - why people use SNS
  Effect of the number of peers is much stronger than the number of total users

Discussion - Difficulty and Experiment

It is difficult to gather data in early stage

Making app and gathering data by myself

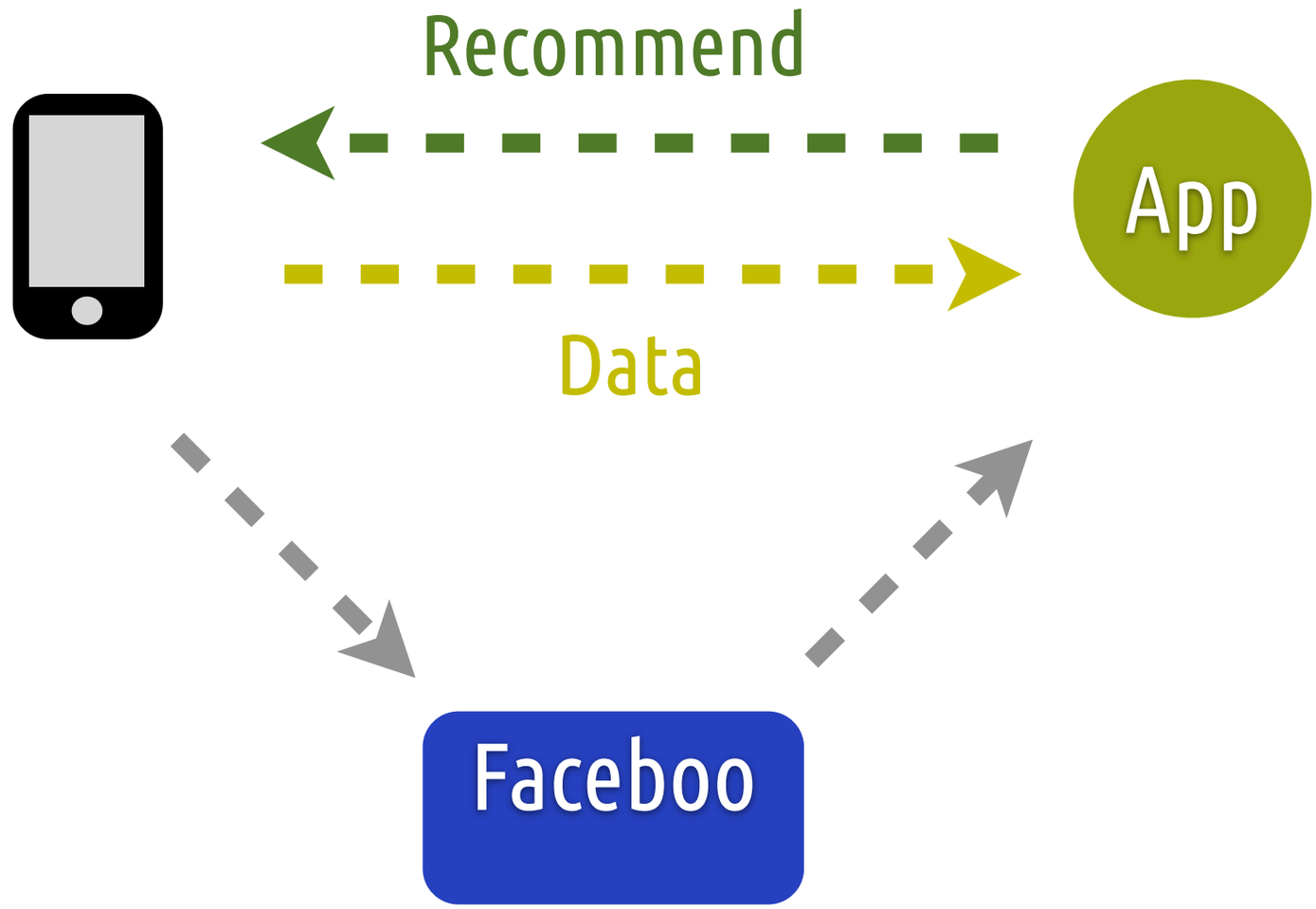
Populi

150 user

Otomagic

5,000 user

Discussion - About App



To see >>

- Who gives data ?
- Who comes in ?

Discussion - Future Work

Microeconomic foundation

$$\Delta m_t = (1 - m_t)\Pr(m_t, q_t) - \delta m_t$$

$$\begin{aligned} \Delta q_t &= \int_{i=0}^{m_t} c_i(m_t, q_t)di - \beta q_t \\ &= \bar{c}(m_t, q_t)m_t - \beta q_t \end{aligned}$$

Show that how to begin services at very early stage effectively

Thank you for your attention