Network Thresholds and Multiple Equilibria in the Diffusion of Content-Based Platforms.

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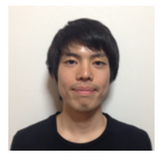

Introduction

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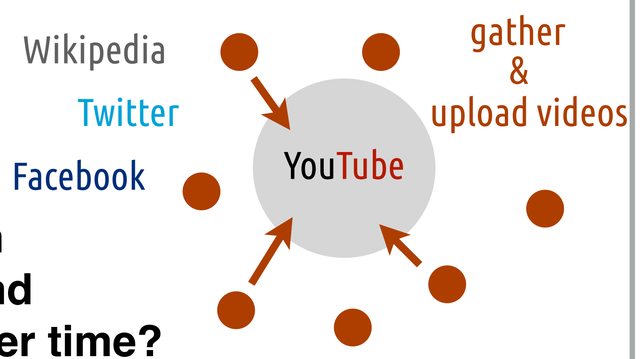
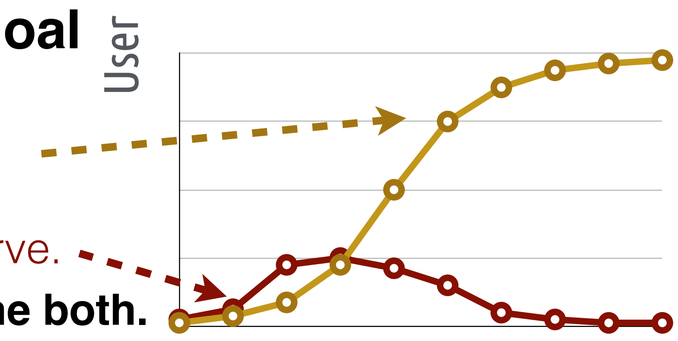
We examine the diffusion of online platforms:
How does a online platform form its user community and accumulate its contents over time?



The Problem and Goal

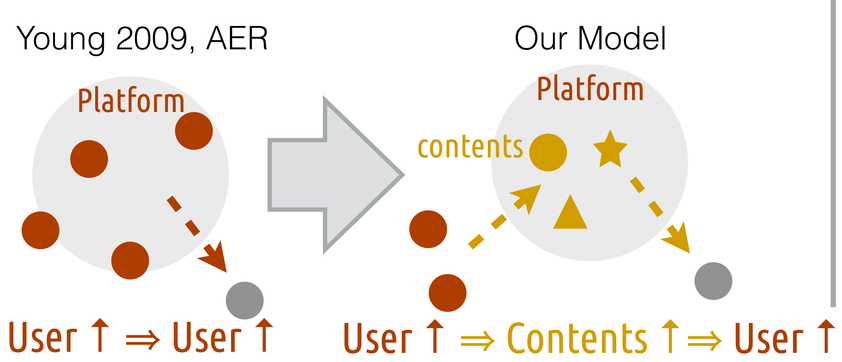
There is no model that explains both successful S-shaped curve and unsuccessful flopped curve.

Our goal is to explain the both.



Our Approach

We assume **user-content network effects** in our model.
This determines the dynamics of diffusion process.

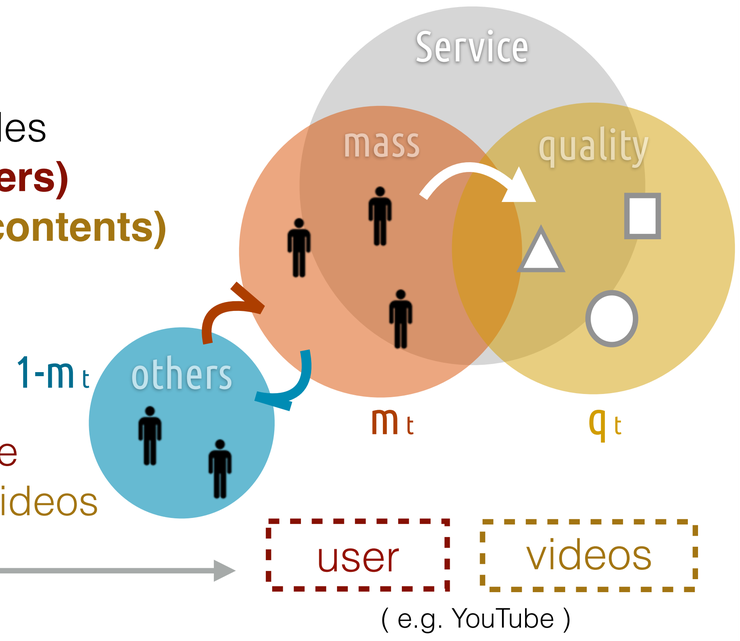


Model

Model Settings

There are two key variables
m: Mass (number of users)
q: Quality (number of contents)
m, q ∈ [0, 1]

e.g.) YouTube
m: active user of YouTube
q: number of uploaded videos



Dynamic Equations

Dynamics

$$\dot{m}_t = \lambda(F(m_t|q_t) - m_t)$$

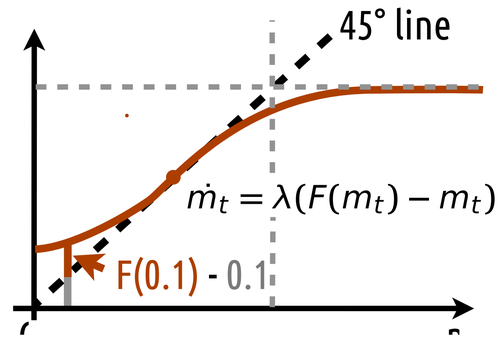
$$\dot{q}_t = cm_t - \beta q_t$$

Contents provided by users

Contents reduced over time

Diffusion of a platform

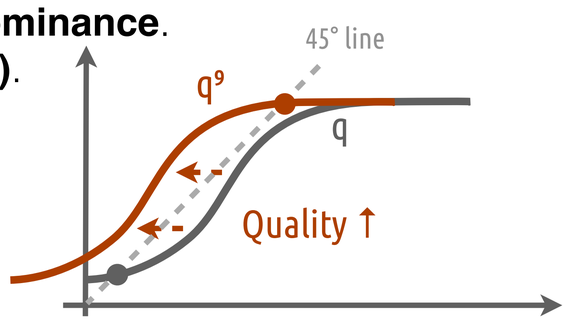
F(·) is adoption distribution
e.g.) F(0.3) = 0.5 means if 30% of population use a platform, then 50% will adopt.



Assumption

F(·|q) is a **fist order stochastic dominance**.
if **q' > q**, then ∀**m, F(mlq') > F(mlq)**.

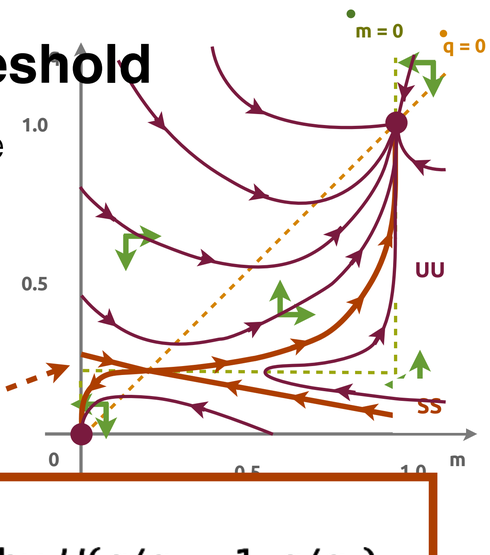
e.g.) If q=0.1, q'=0.5, and m=0.3
F(0.3|0.1) = 0.4 ⇒ **40%** will adopt
F(0.3|0.5) = 0.6 ⇒ **60%** will adopt



Results

Multiple Equilibria and Threshold

If F(·) is first order stochastic dominance i.e. ∀m, q' > q, F(m|q') > F(m|q) , then (m, q) will converge **multiple equilibria** depending on the initial point, and there exists a **threshold** that determines the growth of the platform.

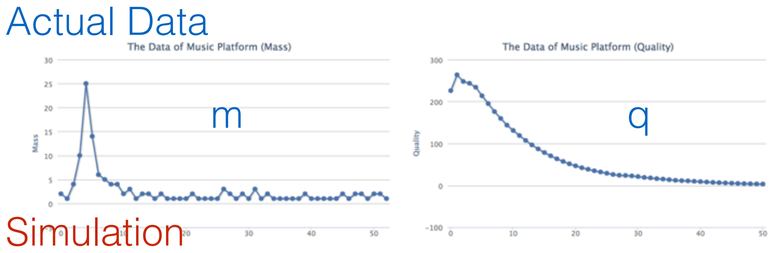


Proposition

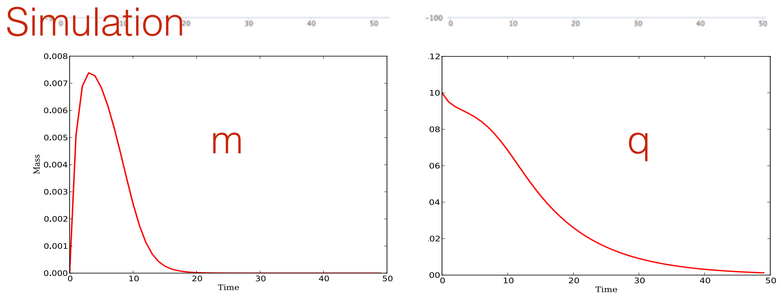
Distribution of $F(m_t|q_t)$ is given by $U(a/q_t - 1, a/q_t)$.
If $c/\beta > a$ and $\lambda(c/\beta - a)^2 \geq ca$ hold,
then there exists a threshold in $q \in [a, c/\beta]$.

Data and Simulation

Actual Data



Simulation

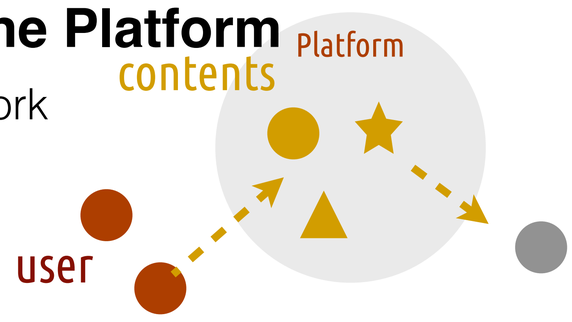


We developed iPhone application to gather user and content data.
We estimate that **β ≈ 0.1, c ≈ 1.0, F(·|q) ≈ N(0.1/q, 0.2)**
We also show that the result is robust to the actual data.

Conclusion

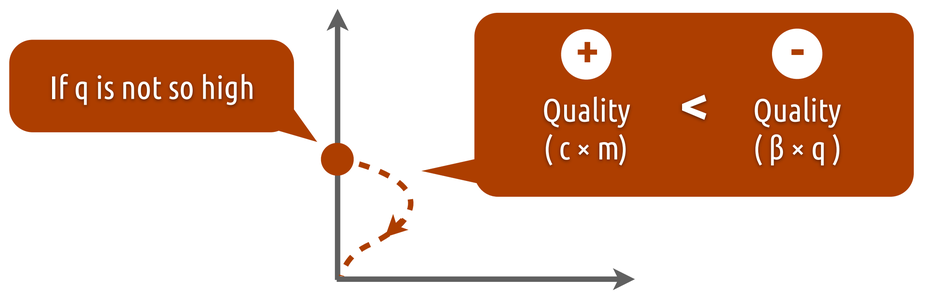
Network Effects in Online Platform

We find that user-content network effect results in **stronger positive/negative feedback** than previous models.



Intuitions

Although q_0 is not high, some user starts using.
However, increasing of quality is smaller than declining.



Discussion

We show that **β** and **c** play a crucial role in determining the equilibrium. In order to build successful community, one must design **small diminished rate of content (β)** or give a strong incentive to **increase content per user (c).**

Intuitions

	low c ↓	high c ↑
low β ↓	Wikipedia, Medium, StackOverflow	failed :(
high β ↑	failed :(	Twitter, Reddit