



Service Science

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Engine of Growth

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Recap Previous Lesson(s)

- Driving Question(s): how do you know that ...
 - you are making your product/service/... better?
 - you are growing/progressing?
 - you are **gaining knowledge**?
- Validated Learning
 - Effective learning supported by data
- Actionable vs Vanity Metrics
 - Look for data highlighting cause-effect relationships

Engine of Growth

- **Engine of growth: the mechanism providing sustainable growth to organizations (long term sustainability)**
 - One of the **most important assumptions** to be checked by validated learning
 - Growth is usually related to **customer acquisition**
 - (Very general concept of) customers: e.g., also the final users of a new service/technology within an organization
- New customers come from the **actions of past customers**
- 4 drivers can be identified
 1. Word of mouth
 2. Product usage side effect e.g., (fashion), people buy clothes that other people wear)
 3. Repeat purchase/use (i.e., customers buying again)
 4. Advertisement

Engine of Growth

- 3 Engines of Growth can be identified considering the possible 4 driver combinations
 1. **Viral** engine
 2. **Paid growth** engine
 3. **Sticky** engine
- Engines are not mutually exclusive
 - There are scenarios where **more engines might coexist**
 - Each engine
 - has specific features
 - requires an independent **analysis perspective**

Engine of Growth

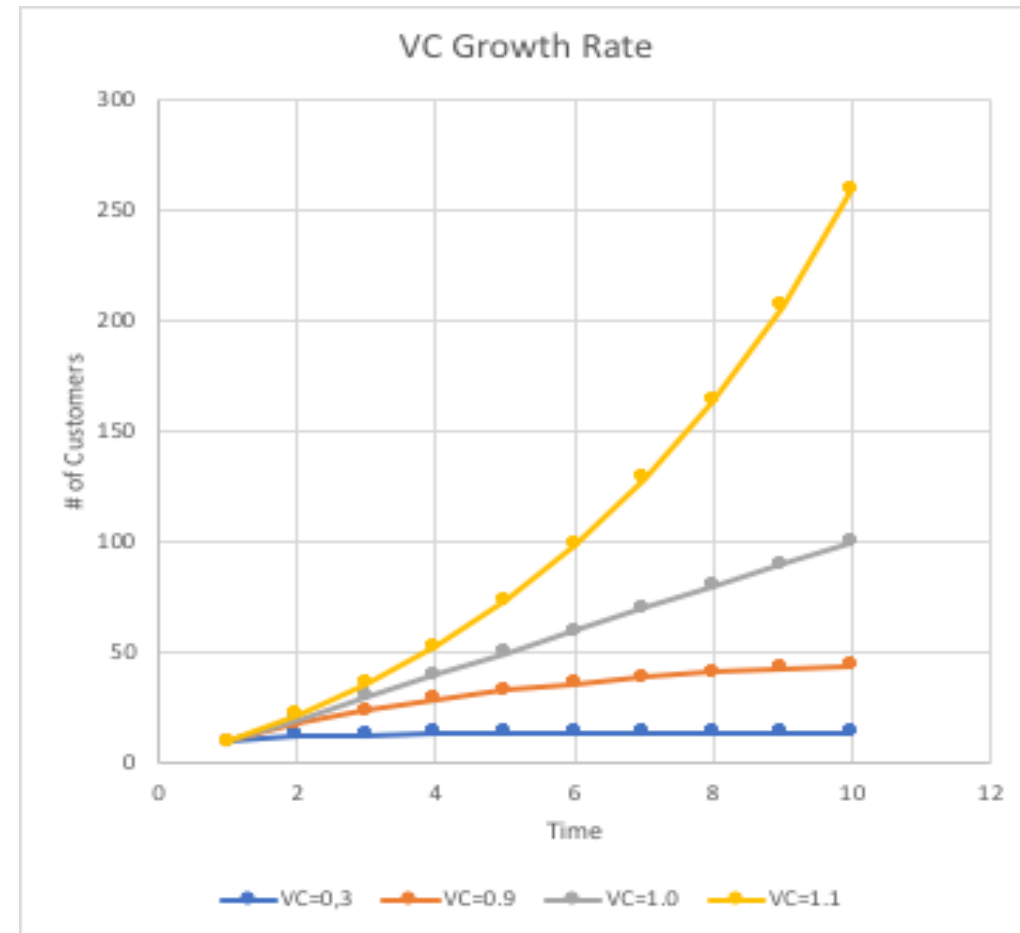
1. **Viral engine**
2. Paid growth engine
3. Sticky engine

The Viral Engine of Growth

- In some scenarios, product **awareness spreads** rapidly among people, similarly as **viruses**
 - Online social networks
 - Customers as marketing staff
- Customers intentionally or unintentionally acting as "Evangelist"
 - **Intentionally**
 - E.g., Tupperware house parties, where customers sell to friends/neighbors earning a commission
 - Customers encouraged "to be evangelist"
 - **Unintentionally**
 - E.g., Hotmail (1st free email service). Diffusion sky-rocketed after it was added to the email bottom the message "P.S. Get your free e-mail at Hotmail"
 - Growth as a side effect of product usage

Viral Coefficient

- **Viral coefficient (VC):**
 - how many new customers brought by each new person
 - i.e., **how many friends** each new customer bring with her/him
- $VC > 1.0$ leads to **exponential growth**
- VC close to 0 means **unsustainable growth**
- $0 < VC < 1.0$ might be ok (or might be not)
 - Better closer to 1.0 than to 0
 - The VC effect should be carefully assessed in each specific scenario
- Some more considerations on next slide



Geometric Series Considerations

- Terminology

- IC: (cohort) **initial customer** number
- TC: **total customer** number (brought by IC)
- VC: viral coefficient

Geometric Series

- After n times

- $TC = IC + IC * VC + IC * (VC)^2 + \dots + IC * (VC)^n =$
 $= IC * \sum_{i=0}^n VC^i = IC * \frac{1-VC^{n+1}}{1-VC}$

- If $0 < VC < 1$, with $n \rightarrow \infty$, then $VC^n \rightarrow 0$ and $TC \approx IC * \frac{1}{1-VC}$

- E.g.,

- $VC=0.1$, $IC=100$, $TC = 100/(1-0.1) = 111.11 \approx \mathbf{111}$
- $VC=0.8$, $IC=100$, $TC = 100/(1-0.8) = \mathbf{500}$

100 (1st wave)+
100*0.1 (2nd wave) +
10*0.1 (3rd wave) = 111

- Summary: if $VC < 1$, TC won't grow more than a **maximum (plateau)**

VC Considerations

- ... (If $0 < VC < 1$)
 - A cohort of customers will **stop** growing
 - A new initial set of customers should be added using other ways (e.g., see next engines)
- If $VC > 1$, with $n \rightarrow \infty$, $TC \rightarrow \infty$, but ...
- For the sake of simplicity, In the previous example we assumed **VC constant** over the time,
 - Sooner or later **VC** is going to **decrease**
 - Every **population** has a **limited size**
 - **Competitors** will erode the customer base
 - More on this topic later

Inside the VC, Examples

- If user **invitations** and **conversion rates** can be **monitored**
 - User invitation: an existing users invites someone else to join
 - $VC = (\# \text{ invitations sent per existing-user}) * (\% \text{ conversion rate})$
- If ... cannot be monitored
 - Beware of biases e.g., a new customer came by **word-of-mouth** or by **advertisements**?
 - Surveys or referral-reward-programs can be used
 - Survey:
 - Explicitly asking “how do you heard about ...”
 - It’s enough to ask a **sample** and not to the whole customer population
 - Referral-reward-programs
 - Incentive for existing customers to bring new people in
 - Some programs’ primary goal is **data collection** (to test product virality) rather than marketing

Model Considerations

- Why to dig/explore inside the VC?
 - e.g., # invitations * % conversion rate
- At the first attempt
 - **Lucky** situations: $VC > 1$. Maybe in **5%** of **cases**
 - The remaining 95% of cases ...
 - call for **changes**
 - how to figure out the corrective actions?
- VC exploration goal: to identify the **cause-effect relationships**
 - To understand how to **improve**
 - To verify (long term) sustainability (even in lucky situations)
- “All models are wrong, but some are useful” George Box

Engine of Growth

1. Viral engine
2. **Paid growth engine**
3. Sticky engine

The Paid Engine of Growth

- How to find new customers?
 - Advertisement
 - Sales-people
- Summary
 - We are **spending** money to get customers
 - ... it is like “buying customers”!
- Customer acquisition **costs** should be **paid by revenues** to achieve (long-term) sustainability
- Questions?
 - What is the price for 1 new customer?
 - What is the revenue for 1 new customer?

Paid Engine: Costs and Revenues

- Important concepts
 - (CPA) **Cost per Acquisition** of a new Customer (advertisement costs, sales agent costs,...)
 - (LTV) **Customer Lifetime Value** = $(R - CGS) * NLP$
 - (R) Customer **Revenue** (of 1 item sold)
 - (CGS) **Cost** of Goods Sold (of 1 item sold)
 - (NLP) Customer **Lifetime # of Purchases**
 - How many products will the customer buy in its life
 - For a prudential evaluation, the time frame might be narrowed to a shorter period e.g., the product/service expected life (e.g., 3 years)
- If $LTV \gg CPA$ (much greater than) the company will run
- If $LTV < CPA$, the company's growth will slow down (not sustainable)

Acquisition Example: Google Ads

- Search engine (paid) results appearance are purchased. Price depending on

- (Search) Keywords
- Geographic zone
- ...

- More info <https://ads.google.com/home/how-it-works/>

- Billing method: pay per user click

- Funnel example

- | | |
|------------------------|------|
| • Google Ad. click | 100% |
| • Landing Page | 98% |
| • Information Page | 70% |
| • Free Service Regist. | 40% |
| • Paid Service Regist. | 5% |

- If the cost per click is 2\$, one Paid Service User costs 40\$

Paid Results

Organic Results

The screenshot shows a Google search for "Cheap Flights". The search bar is at the top with the Google logo. Below the search bar, there are navigation tabs for "All", "Flights", "News", "Images", "Videos", "More", "Settings", and "Tools". The search results are displayed below, starting with "About 171,000,000 results (0.58 seconds)".

The first section of results is labeled "Paid Results" and includes several advertisements from various travel agencies like CheapOair.com, Skyscanner.it, CheapTickets.com, and Alitalia. Each ad includes a title, a URL, and a brief description of the offer.

The second section is labeled "Organic Results" and features a sponsored search box for "Cheap flights from Milan (all airports)". This box includes a search bar with "Milan (all airports)" entered, a destination input field, and a "Search flights" button. Below the search box, there are "Your recent flight searches" for Milan-Vienna, Milan-San Francisco, and Milan-Los Angeles. Below the search box, there are several organic search results from travel websites like Cheapflights.com, Cheapflights.com.au, and eDreams.

Engine of Growth

1. Viral engine
2. Paid growth engine
3. **Sticky engine**

The Sticky Engine of Growth

- The 2 previous engines focus on **customer acquisition**
- The Sticky Engine shifts focus to **customer retention**
- Some businesses allows to **lock-in** customers e.g.,
 - Chat technologies (e.g., Whatsapp)
 - Mobile phone subscribers
 - Of course, users can change mobile phone provider ...
 - ... but changing is not so easy as
 - Exploring different grocery shopping
 - Changing gas station for the car

Strategies and Assumptions

- Possible sticky **strategies**:
 - **Technology locking** e.g., once an organization built a product on top of an IT technology, the organization is locked to the IT technology vendor
 - A company/web site has a “**Dominant Position**” and customers keep doing business with (e.g., search engines, ...)
- **Assumption** to test: **retention**
i.e., % customers remaining engaged
- Even the **stickiest** business won't succeed in retaining 100% of customers

Evaluating the Sticky Engine

- How to evaluate the growth of sticky businesses?
 - **New customer acquisition rate**: the fraction of new customers over all the customer base
 - **Churn rate**: the fraction of customers in any period who fail to remain engaged with the company's product/service, over all the customer base
 - (Dual metric) **Retention rate** = 100% - Churn rate
 - **Compounding growth rate** = rate of new customer acquisition – churn rate
- The product will grow if
 - Compounding growth rate > 0 (i.e., the rate of new customer acquisition exceeds the churn rate)
 - The higher is the compounding growth rate, the higher is the speed of growth
- Beware
 - In some scenario churn is explicit (e.g., mobile phone subscriptions)
 - In others ... an idle customer (i.e., not engaged) is a lost customer

Sticky Growth Example

- Company ...
 - We invested a lot in advertising!
 - Why don't we grow?
- Some numbers after careful investigation
 - **Retention rate: 61%** (i.e., **39% churn rate**)
 - **New customer** acquisition rate: **39%**
 - Compound growth rate: 0%
- Considerations
 - Advertisement worked well (new customer acquisition rate is very good)
 - ... maybe the "*new customer acquisition rate*" can't be further improved
 - Now better focus on reducing the churn rate, ...
 - This is against the standard intuition that if a company lacks growth, it should invest more in sales and marketing
- Churn rate reduction strategies: by making the product/service more engaging for existing customers (e.g., special offers, ...)

Engine Running out of Fuel

- Sooner or later every successful engine will **run out of fuel** (market saturation)
 - The customer **population is limited**.
E.g., TLC Vendors selling Mobile Phone Base Stations
 - Had a huge business in Europe from 1995 to 2010
 - When they covered all Europe ... their business slew down (in Europe)
 - **Technological innovations** will change strategy or even the whole businesses
 - E.g., Telephone Public Call Box, Fax, ...
- Every organization will have to change strategy or even business in the future
 - Those who didn't manage to adapt are likely to die
 - Even established organizations will have to face uncertain scenarios



Several Engines at the same Time?

- Technically, **more** than one **engine of growth** can work at the same time. E.g.,
 - Some service/products have
 - extremely fast viral growth and
 - low customer churn rates
 - A viral coefficient between 0 and 1 may be supported/strengthened by paid growth at the very beginning
- Trade-off among engines e.g.,
 - Increasing a service price may fuel Paid Growth but may reduce the Viral Coefficient

Focus

- The growth engine is one of the riskiest assumption in a business
- Since a start-up has limited resources, **better to focus on a single engine**
 - Every engine requires specific expertise, in depth testing ...
 - Tuning more than one engine is very difficult (because trade-off)
 - Building indicators including all 3 engines will cause a lot of confusion in the team
- In the 1st MVP
 - Test a single engine of growth
 - Tune it with the Build-Measure-Learn feed-back Loop
- If the engine is working, some more engines/strategies can be added later
- If the initial engine is not working, it will be changed in the subsequent MVPs