

Feedback loops and competitive advantage: data-enabled learning vs. traditional network effects

Andrei Hagiu

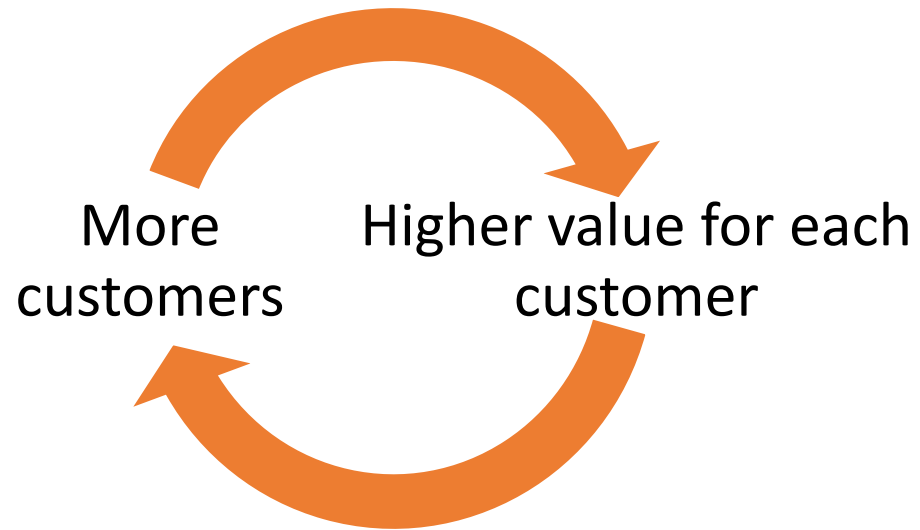
Boston University Questrom School of Business

Toulouse, January 12th, 2024

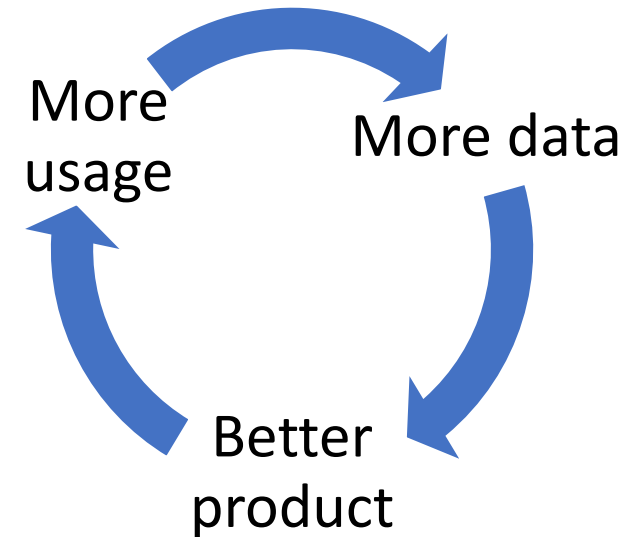
Plan

- Data-enabled learning (AI) vs. traditional network effects along dimensions relevant to defensibility, competitive advantage and market power

Feedback loops and competitive advantage



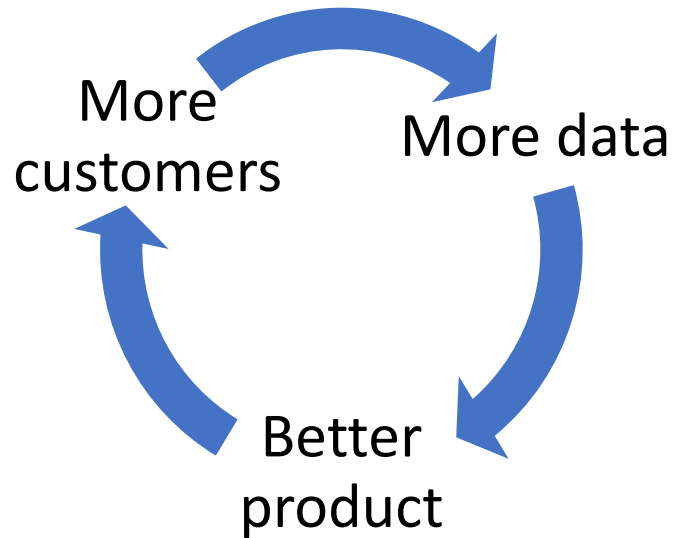
Regular network effects



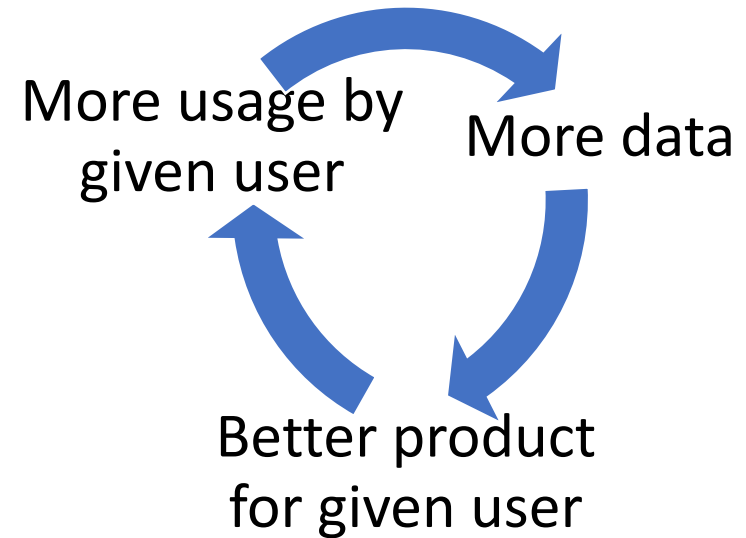
Data-enabled learning

Feedback loops => compounding competitive advantage

Two types of data-enabled learning



Across-user learning



Within-user learning

Data-enabled learning, network effects, and competitive advantage

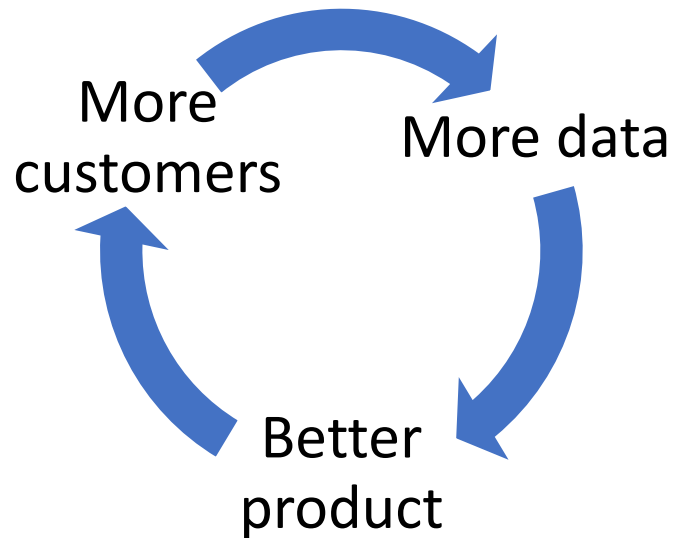
Andrei Hagiu*

and

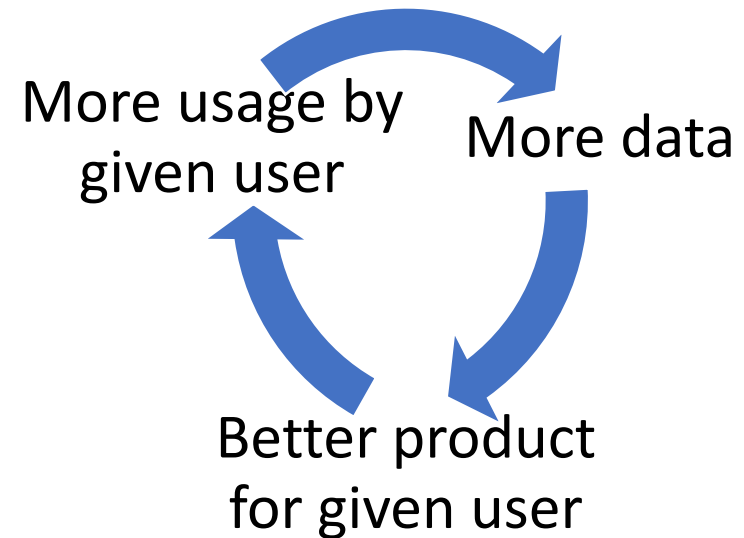
Julian Wright**

We model dynamic competition between firms which improve their products through learning from customer data, either by pooling different customers' data (across-user learning) or by learning from repeated usage of the same customers (within-user learning). We show how a firm's competitive advantage is affected by the shape of firms' learning functions, asymmetries between their learning functions, the extent of data accumulation, and customer beliefs. We also explore how public policies toward data sharing, user privacy, and killer data acquisitions affect competitive dynamics and efficiency. Finally, we show conditions under which a consumer coordination problem arises endogenously from data-enabled learning.

Two types of data-enabled learning



Across-user learning

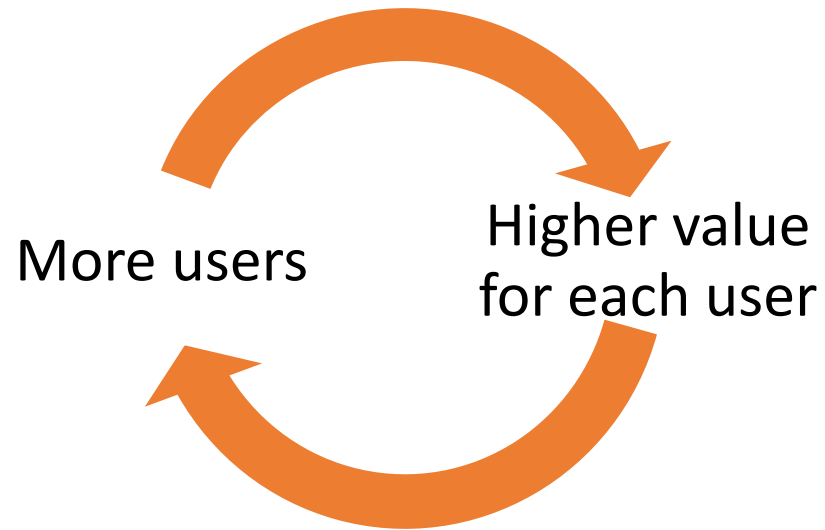


Within-user learning

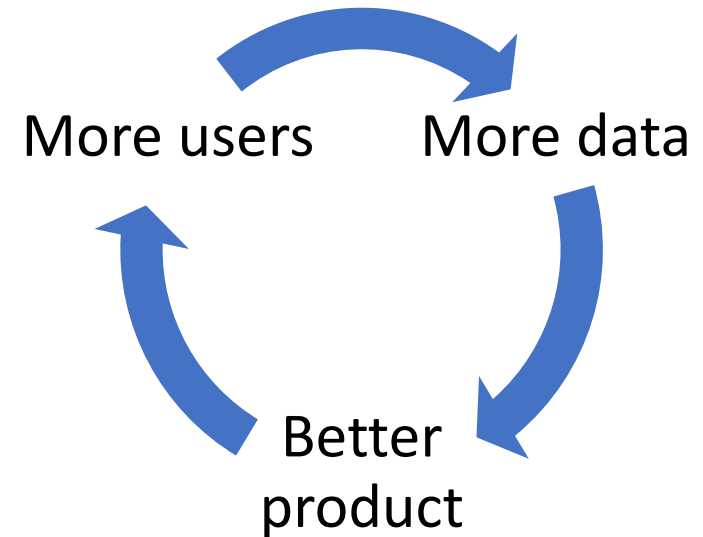
Across-user learning => data network effects

Within-user learning => compounding switching costs

Feedback loops and competitive advantage



Regular network effects



Across-user learning

Regular network effects (current users) vs. across-user learning (current and past users)


Plan

- Data-enabled learning (AI) vs. traditional network effects along dimensions relevant to defensibility, competitive advantage and market power:
 1. Coordination and switching costs
 2. Engineering feedback loops
 3. Cost side
 4. Hold-up of users
 5. Market power and substitutes

1. Coordination and/or switching costs

- Fundamental source of defensibility for traditional network effects (platforms)?
 - High coordination costs and/or switching costs
- Example: Craigslist (high coordination costs, low switching costs)

Craigslist home page January 2024



[post an ad](#)

event calendar

S	M	T	W	T	F	S
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31	1	2	3

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boston [gbs](#) [nwb](#) [bmw](#) [nos](#) [sob](#)

[post](#) [acct](#)

english ▾

nearby cl

- [albany](#)
- [allentown](#)
- [binghamton](#)
- [cape cod](#)
- [catskills](#)
- [central nj](#)
- [eastern ct](#)
- [glens falls](#)
- [hartford](#)
- [HUDSON VALLEY](#)
- [jersey shore](#)
- [long island](#)
- [maine](#)
- [new hampshire](#)
- [new haven](#)
- [new york](#)
- [north jersey](#)
- [northwest ct](#)
- [oneonta](#)
- [plattsburgh](#)
- [poconos](#)
- [POTSDAM-MASSENA](#)
- [rhode island](#)
- [scranton](#)
- [south coast](#)
- [syracuse](#)
- [utica](#)
- [vermont](#)
- [western mass](#)
- [worchester](#)

us cities

us states

canada

community

- [activities](#)
- [artists](#)
- [childcare](#)
- [classes](#)
- [events](#)
- [general](#)
- [groups](#)
- [local news](#)
- [lost+found](#)
- [missed](#)
- [connections](#)
- [musicians](#)
- [pets](#)
- [politics](#)
- [rants & raves](#)
- [rideshare](#)
- [volunteers](#)

services

- [automotive](#)
- [beauty](#)
- [cell/mobile](#)
- [computer](#)
- [creative](#)
- [cycle](#)
- [event](#)
- [farm+garden](#)
- [financial](#)
- [health/well](#)
- [household](#)
- [labor/move](#)
- [legal](#)
- [lessons](#)
- [marine](#)
- [pet](#)
- [real estate](#)
- [skilled trade](#)
- [sm biz ads](#)
- [travel/vac](#)
- [write/ed/tran](#)

discussion forums

- [apple](#)
- [arts](#)
- [atheist](#)
- [autos](#)
- [beauty](#)
- [frugal](#)
- [gaming](#)
- [garden](#)
- [haiku](#)
- [help](#)
- [philos](#)
- [photo](#)
- [politics](#)
- [psych](#)
- [recover](#)

housing

- [apts / housing](#)
- [housing swap](#)
- [housing wanted](#)
- [office / commercial](#)
- [parking / storage](#)
- [real estate for sale](#)
- [rooms / shared](#)
- [rooms wanted](#)
- [sublets / temporary](#)
- [vacation rentals](#)


for sale

- [antiques](#)
- [appliances](#)
- [arts+crafts](#)
- [atv/utv/sno](#)
- [auto parts](#)
- [aviation](#)
- [baby+kid](#)
- [barter](#)
- [beauty+hlt](#)
- [bike parts](#)
- [bikes](#)
- [boat parts](#)
- [boats](#)
- [books](#)
- [business](#)
- [cars+trucks](#)
- [farm+garden](#)
- [free](#)
- [furniture](#)
- [garage sale](#)
- [general](#)
- [heavy equip](#)
- [household](#)
- [jewelry](#)
- [materials](#)
- [motorcycle parts](#)
- [motorcycles](#)
- [music instr](#)
- [photo+video](#)
- [rvs+camp](#)
- [sporting](#)
- [tickets](#)

jobs

- [accounting+finance](#)
- [admin / office](#)
- [arch / engineering](#)
- [art / media / design](#)
- [biotech / science](#)
- [business / mgmt](#)
- [customer service](#)
- [education](#)
- [etc / misc](#)
- [food / bev / hosp](#)
- [general labor](#)
- [government](#)
- [human resources](#)
- [legal / paralegal](#)
- [marketing / pr / ad](#)
- [medical / health](#)
- [nonprofit sector](#)
- [real estate](#)
- [retail / wholesale](#)
- [sales / biz dev](#)
- [salon / spa / fitness](#)
- [security](#)
- [skilled trade / craft](#)
- [software / qa / dba](#)
- [systems / network](#)
- [technical support](#)
- [transport](#)

Craigslist vs. OfferUp



[post an ad](#)

search craigslist

event calendar

S	M	T	W	T	F	S
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help, faq, abuse, legal
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what's new
system status

<https://search/lbs>

boston [gbs](#) [nwb](#) [bmw](#) [nos](#) [sob](#)

[post](#) [acct](#)

english

community

- activities
- artists
- childcare
- classes
- events
- general
- groups
- local news
- lost+found
- missed
- connections
- musicians
- pets
- politics
- rants & raves
- rideshare
- volunteers

housing

- apts / housing
- housing swap
- housing wanted
- office / commercial
- parking / storage
- real estate for sale
- rooms / shared
- rooms wanted
- sublets / temporary
- vacation rentals

jobs

- accounting+finance
- admin / office
- arch / engineering
- art / media / design
- biotech / s
- business /
- customer
- education
- etc / misc
- food / bev
- general la
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- retail / wh
- sales / biz
- salon / sp
- security
- skilled tra
- software /
- systems /
- technical
- transport

services

- automotive
- beauty
- cell/mobile
- computer
- creative
- cycle
- event
- farm+garden
- financial
- health/well
- household
- labor/move
- legal
- lessons
- marine
- pet
- real estate
- skilled trade
- sm biz ads
- travel/vac
- write/ed/tran

discussion forums

- apple
- arts
- atheist
- autos
- beauty
- frugal
- gaming
- garden
- haiku
- help
- philos
- photo
- politics
- psych
- recover

for sale

- antiques
- appliances
- arts+crafts
- atv/utv/sno
- auto parts
- aviation
- baby+kid
- barter
- beauty+hilth
- bike parts
- bikes
- boat parts
- boats
- books
- business
- cars+trucks
- farm+garden
- free
- furniture
- garage sale
- general
- heavy equip
- household
- jewelry
- materials
- motorcycle parts
- motorcycles
- music instr
- photo+video
- rvs+camp
- sporting
- tickets

nearby cl

- albany
- allentown
- binghamton
- cape cod
- catskills
- central nj

Buy & Sell Locally - OfferUp - Bu... x

offerup.com


Apps IS474 Class present... Office hours IS827 class present... BUworks Joint Investments Investitii Andrei +... AH.com/Admin Economics of Platfo...

OfferUp Search OfferUp Nearby GO Sell About Log in Sign up


Shipping NEW

Categories


- Antiques
- Appliances
- Arts & crafts
- Audio equipment
- Auto parts
- Baby & kids
- Beauty & health
- Bicycles
- Boats & marine



End/Bedside table
\$60.00
Boston, MA




Cooper bbs
\$30.00
Everett, MA

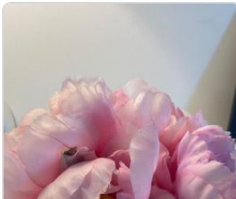



promoted

2004 Ford Ranger XLT
\$3,600.00
Everett, MA



Amazing 2003 Toyota Tacoma 4WD
\$1,200.00
Boston, MA





<https://offerup.com/item/detail/937491767/>

Craigslist vs. Facebook Marketplace

The image displays two web pages side-by-side. On the left is the Craigslist website for Boston, and on the right is the Facebook Marketplace website for Boston, Massachusetts.

Craigslist (Left):

- Logo: craigslist
- Buttons: [post an ad](#)
- Search:
- Event Calendar: A calendar grid showing dates from 7 to 27.
- Navigation: [help, faq, abuse, legal](#), [avoid scams & fraud](#), [personal safety tips](#)
- Categories:
 - community**: activities, artists, childcare, classes, events, general, groups, local news, lost+found, missed, connections, musicians, pets, politics, rants & raves, rideshare, volunteers
 - housing**: apts / housing, housing swap, housing wanted, office / commercial, parking / storage, real estate for sale, rooms / shared, rooms wanted, sublets / temporary, vacation rentals
 - jobs**: accounting+finance, admin / office, arch / engineering, art / media / design, biotech / science, business / mgmt, customer service, education, etc / misc, food / bev / hos, general labor, government, human resource, legal / paralegal, manufacturing, marketing / pr / medical / health, nonprofit sector, real estate, retail / wholesale, sales / biz dev, salon / spa / fit, security, skilled trade / construction, software / qa / it, systems / network, technical support, transport
 - services**: automotive, beauty, cell/mobile, computer, creative, cycle, event, farm+garden, financial, health/well, household, labor/move, legal, lessons, marine, pet, real estate, skilled trade, sm biz ads, travel/vac, write/ed/tran
 - discussion forums**: apple, arts, atheist, autos, beauty, frugal, gaming, garden, haiku, help, philos, photo, politics, psych, recover
 - for sale**: antiques, appliances, arts+crafts, atv/utv/sno, auto parts, aviation, baby+kid, barter, beauty+hlth, bike parts, bikes, boat parts, boats, books, business, cars+trucks, farm+garden, free, furniture, garage sale, general, heavy equip, household, jewelry, materials, motorcycle parts, motorcycles, music instr, photo+video, rvs+camp, sporting, tickets

Facebook Marketplace (Right):

- Browser: Facebook Marketplace: Buy and sell locally or have something new shipped from stores.
- URL: facebook.com/marketplace/
- Search:
- Filters: Boston, Massachusetts · Within 40 miles
- Categories:
 - Vehicles
 - Property Rentals
 - Apparel
 - Classifieds
 - Electronics
 - Entertainment
- Today's Picks for You (Boston · 40 mi):
 - Item 1: \$250
 - Item 2: FREE
 - Item 3: \$60
 - Item 4: FREE

Craigslist home page January 2024

The screenshot shows the Craigslist home page for Boston. The header includes the Craigslist logo, a search bar, and a 'post an ad' button. Below the header, there are several categorized lists of services and items for sale. The categories include community, housing, jobs, services, and discussion forums. A sidebar on the right lists nearby cities.

community

- activities
- artists
- childcare
- classes
- events
- general
- groups
- local news
- lost+found
- missed
- connections
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- customer service
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- food / bev / hosp
- general labor
- government
- human resources
- legal / paralegal
- manufacturing
- marketing / pr / ad
- medical / health
- nonprofit sector
- real estate
- retail / wholesale
- sales / biz dev
- salon / spa / fitness
- security
- skilled trade / craft
- software / qa / dba
- systems / network
- technical support
- transport

services

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nearby cl

- albany
- allentown
- binghamton
- cape cod
- catskills
- central nj
- eastern ct
- glens falls
- hartford
- HUDSON VALLEY
- jersey shore
- long island
- maine
- new hampshire
- new haven
- new york
- north jersey
- northwest ct
- oneonta
- plattsburgh
- poconos
- potsdam-massena
- rhode island
- scranton
- south coast
- syracuse
- utica
- vermont
- western mass
- worcester

us cities

us states

canada

<https://www.cnbc.com/2019/01/24/craigslist-posts-annual-revenue-of-1-billion-study.html>
<https://www.prnewswire.com/news-releases/craigslist-revenue-rebounds-traffic-slide-continues-301477660.html>

**Craigslist 2021: ~\$660 million revenues (99% US), 50 employees, >90% margin
No ratings & reviews, account not necessary => pure coordination**

1. Coordination and/or switching costs

- Fundamental source of defensibility for traditional network effects (platforms)?
 - High coordination costs and/or switching costs
- Example: Craigslist (high coordination costs, low switching costs)
 - No WhatsApp group for buyers and sellers to coordinate
- Examples with low coordination costs:
 - Zoom, Evite, etc.
 - [Honeycomb Credit](#): marketplace for small businesses to obtain crowdfunded loans, mainly from customers, locals that know the business, and family & friends
 - [Open Sea](#) vs. [Blur](#): coordination for switching via NFT-focused [Discord](#) groups

1. Coordination and/or switching costs

- For traditional network effects, coordination costs are determined by extent of discovery enabled by the platform
 - If only interact with people you already know, then lower defensibility
- Lack of coordination costs can be mitigated by switching costs
 - e.g., Zoom
- The most defensible platforms have both high coordination and switching costs
 - e.g., Airbnb, Amazon, Apple's iOS and App Store, Instagram

1. Coordination and/or switching costs

- Fundamental source of defensibility for data-enabled learning?
- Discovery is meaningless, but coordination *can* matter with across-user learning
 - If backward-looking learning or short consumption period, then coordination is irrelevant
 - e.g., Netflix, Google search
 - If learning includes current users but users are myopic, then coordination favors incumbent
 - Users may be more myopic with data-enabled learning b/c feedback loop “under the hood”
 - Users may be less likely to switch even with full coordination if learning materializes slowly
- Within-user learning creates compounding switching costs => switching costs can be higher with data-enabled learning (if WUL is present)

Generative AI and switching costs

- LLMs can create significant switching costs for enterprises using customized LLMs
 - e.g., [Chat GPT Enterprise](#)
- Customized LLM gets better the more the company and its employees use it – no leakage of data and learnings to generic LLM
- How easy would it be for enterprise to switch from Chat GPT Enterprise to [Anthropic's Claude for Enterprise](#)?
- Data portability policy?
 - Giving user activity logs to competitors, including both users' data AND provider's data?

2. Engineering feedback loops

- Strength of feedback loops and network effects can be enhanced by design and firm strategy
- Naturally strong data feedback loops (rare):
 - e.g., Google search, Google Maps, Spotify
 - usage reveals clear signals about user preferences and value, learning is fully automated
- Naturally weak data feedback loops:
 - e.g., “dumb” products (cars, furniture, clothes), credit scoring, venture investing
 - usage is hard to track, or doesn’t reveal useful information, or does so only very slowly
 - need to ask users for explicit feedback or insert humans in the loop

Competitive Strategy

To Get Better Customer Data, Build Feedback Loops into Your Products

by Andrei Hagiu and Julian Wright

July 11, 2023



[HBR online July 2023](#)

Turn Generative AI from an Existential Threat into a Competitive Advantage

How to factor the new technology into your strategy by Scott Cook, Andrei Hagiu, and Julian Wright

From the Magazine (January–February 2024)



[HBR magazine Jan-Feb 2024](#)

2. Engineering feedback loops

- Examples:
 - Wearables (e.g., Fitbit, Oura, Whoop)

Creating data feedback loops for wearables



- Data feedback loops \neq summary statistics
 - e.g., “your sleep has improved by X% over past Y months”, “readiness score for working out”
- Weak feedback loops:
 - e.g., optimize user interface over time, recommend time to sleep/workout
- More meaningful feedback loops:
 - e.g., connect to Peloton/Tonal and measure biometrics before & after standardized workout

2. Engineering feedback loops

- Examples:
 - Wearables (e.g., Fitbit, Oura, Whoop)
 - LLMs (Chat GPT, Bard, Claude) – significant progress over past year
 - choose between multiple responses, ability to bookmark/edit LLM responses, challenge games (AI vs. human answers) with user voting and leaderboards, thumbs up/down
 - [Chegg](#): generative AI personalized learning assistant for students
- Enhancing feedback loops with traditional network effects:
 - better algorithms and recommendations (more discovery)
 - escrow, dispute resolution, insurance, identity and quality verification, booking/scheduling, record keeping (more transaction value)

3. Cost side

- Traditional network effects businesses (platforms) have very low costs.
 - e.g., Craigslist, eBay, Instagram, Etsy, Airbnb
 - “[platforms] get better as I sleep”
- Data-enabled learning businesses tend to have higher cost structures:
 - Fully automated data feedback loops are very rare
 - Ongoing costs of gathering, cleaning, securing and processing data and improving algorithms
 - Oftentimes need humans in the loop (cost to the firm) or user feedback (cost on users)

4. Hold-up of users

- Traditional network effects (platforms):

4. Hold-up of users

- Traditional network effects (platforms):
 - General platform hold-up: network effects => power transfer to the platform => can extract higher fees over time
 - e.g., Amazon, Microsoft, DoorDash, [Property Guru](#)
 - Commoditization (for marketplace sellers):
 - more discovery => commoditization of sellers => less willing to participate
 - e.g., Shopify (limited discovery, including Shop.app) vs. Amazon (full discovery)
 - “Amazon is trying to build an empire, and Shopify is trying to [arm the rebels](#).”
 - See “[Optimal Discoverability on Platforms](#)” (forthcoming *Management Science*)

4. Hold-up of users

- Data enabled learning:
 - Similar general hold-up problem, both with across-user and within-user learning
 - Users keep adopting same product/service => value increases relative to outside option => can extract higher fees
 - See “[Data-enabled learning, network effects and competitive advantage](#)” (RAND 2023): consumer surplus decreases as incumbent gets better and entrant gives up subsidizing in attempt to compete
 - Still, data sharing policy can hurt consumer surplus by reducing incentives to compete
 - Commoditization problem (for business users):
 - occurs in principle via data leakage, but in practice is already being solved as OpenAI and others offer siloed customized LLMs (e.g., [Chat GPT Enterprise](#))

5. Market power and substitutes

- Traditional network effects: hard to displace incumbent platforms once coordination and switching costs are in place
 - e.g., Craigslist, Airbnb, Amazon, Etsy, X, YouTube,
- With data-enabled learning, there are usually more ways around incumbents:
 - buying data is easier than acquiring users: alternative data sources and/or better algorithms
 - existence of large publicly available data sets and open-source models => harder to build unassailable competitive positions with data-enabled learning
 - ...except when incumbents have truly unique and proprietary customer data – rare

When Data Creates Competitive Advantage

And when it doesn't by Andrei Hagiu and Julian Wright

From the Magazine (January–February 2020)



5. Market power and substitutes

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 - ...except when incumbents have truly unique and proprietary customer data – rare
- Open-source for traditional platforms: blockchain-based decentralized platforms

Concluding thoughts

- Traditional network effects (NFX) vs. data-enabled learning (DEL):
 - Similarities: coordination & switching costs drive defensibility, scope for enhancing via design and strategy, hold-up via increased market power
 - Differences: cost structure, commoditization risk for users, threat of substitutes
- Strongest competitive positions will have both NFX and DEL
 - e.g., Amazon, Instagram, YouTube, OpenAI (possibly with launch of GPT store 2 days ago)
- Some DEL (gen AI) will likely disrupt some existing NFX monopolies
 - e.g., Google search

Thank you for your attention