Strategy in digital industries

Part III. AI-driven firms

Business and Project Management

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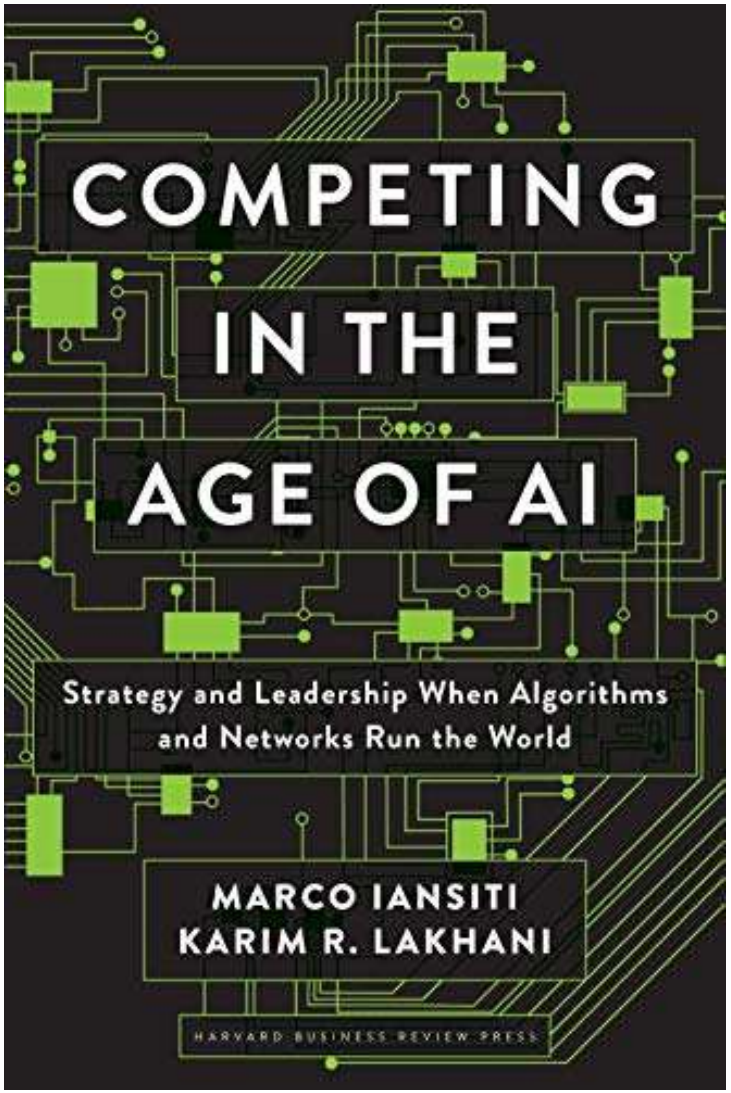


How does Artificial Intelligence (AI) change the way strategy is done?

Disruption of traditional industries

Digital camera invented by Steven Sasson at Kodak (1975) but ignored by the company.

Disruption
- not only better or cheaper way of doing photos
- but a complete redefinition of the meaning of photos and the creation of radically new business models

Digital representation
- infinitely scalable
- limitless connectivity
- zero marginal cost

Massive amount of photos (>10 trillion each year)
New wave of companies using photos (and movies) as key elements + emergence of smartphone
- Facebook, Tencent, Snapchat, Line, Instagram, Tik Tok

AI applications
- Automatic identification of subjects (from facial recognition techniques)
- Clustering and photo sorting
- Image enhancement
- Recommendation system

AI is changing the way in which strategies are done- changing the business model and the operating model

Business model

Value creation
- compelling reason for the customers choosing the company, or particular problem addressed

Also called Value proposition
Strategy (cost leadership, differentiation, Blue ocean, focus/niche)

Value capture
- Share of total value to the customers appropriated by the company

Operating model

Detailed plan on how to deliver the value promised by the business model

Key elements
- Scale (volume, complexity)
- Scope (variety, range)
- Learning

(R&D, innovation, continuous improvement, Intellectual property, intangible assets)

Scaling in digital firms

When traditional manufacturing and service companies grow in size they meet limits given by organizational factors

- internal communication needs increase
- the usual organizational reaction to increase in size is «adding a new layer» of hierarchy
    - decision making becomes slower
    - more bureaucracy (norms, incentives, rewards)
    - inertia
- deterioration of service to customers
    - lack of accountability

Maximum efficient scale places limits to the growth of firms.

AI-driven companies are not subject to diseconomies of scale
They scale «spectacularly well».

By deploying a fundamentally new kind of operating model, this new type of firm (digital firm) is reaching new levels of scalability, achieving a vastly broader scope, and learning and adapting at a much faster rate than does a traditional firm (p. 32)

Tencent

- Founded 1998 Shenzhen. https://www.tencent.com/en-us/about.html#about-con-1
- Initial product Pc-based internet instant messaging service (ICQ)
- 1999 New version Open ICQ portable across all devices (customer needs in China for people not having the PC at home)- viral growth, huge success.

Engagement strategy (Chen, 2022): building scale, monetization, introduction of new services and complementary goods

- advertising
- premium offerings (e.g. special icons)
- avatars
- games
- virtual goods

WeChat launched 2011, mobile messaging application

- voice messages
- video sharing
- picture sharing
- GPS location
- sending and receiving money

Tencent/2

Open architecture
- open platform
- aasily accessible application programming interfaces (APIs)
- plug in of external services

Data platform
- Data analytics
- AI applications on consumer data

Together with rival Alipay world largest
- payment services (WeChat Pay) launched 2013
- money market fund
- small business loan network

Tencent 腾讯

Ant Financial

Hangzhou, China
2014 spinout fom Alibaba
2018 150 billion $ capitalization

- 700 million consumer users
- 10 million SMEs
- Less than 10,000 employees

Facilitate payments for e-commerce shoppers and merchants.
Escrow system to create trust (=third party holds payment until a contractual agreement is fulfilled)
Alibaba invented Alipay as third party

- Alipay is connected to a bank
- Alipay acceps payment from a buyer
- it does not deliver the payment to the seller until the buyer confirms receipt of the good
- after receipt it delivers immediately the payment to the seller.

Fee charged to merchants 0.6% of transaction.

In 2004 Alipay made its services available to all individuals and businesses in China, not necessarily associated to Alibaba e-commerce. In 2006 33 million users, in 2009 150 million users, 4 million transactions a day.
Strong **network effect**.

Ant Financial/2

In 2011 Alipay app launched.
QR code system
- retailers subscribe to the service
- retailers display QR code in the store
- customers open Alipay app and scan the code

to make a purchase

Alipay spunout in a new company called Ant Financial, that started to introduce new services:
- Yu'e Bao- investment platform to earn money on accounts (4%), with no minimum deposit required and mobile phone access- 81 billion$ collected in nine months
- Ant Fortune- one-stop personal investment and wealth investment platform
- Xhima Credit- social credit score system
- MyBank- internet banking services provider
- insurance platform
- education services
- medical services
- transportation
- games
- reservation system
- food delivery

Ant Financial/3

In 2019 Ant Financial controlled 54% mobile payment in China (38% WeChat Pay by Tencent).
Starting from 2015 Ant Financial started an international expansion in Asia (South Korea, India, Thailand) and Europe (mainly for Chinese travelers).

Digital operating model at MyBank

Loan processing: 3-1-0 system
- three minutes to apply for a loan
- one second for approval
- zero human interaction

AI-driven loan authorization
- credit score modeling
- >3,000 risk control strategies
- frequency, lenght, type of communications (instant messaging, e-mail etc.) examined in order to assess relationship quality

Peak workload 120,000 transactions every second, disaster recovery up to 99,99% in place.
Cost of loan processing 2 renmimbi (vs. 2,000 renmimbi traditional banks).

Ant Financial/4

AI-driven applications at MyBank, using data from Alipay app
- recommendation
- personalization
- revenue optimization

Trust building at Alipay
- each time a user initiates a transaction, the information is passed through five layers of real-time digital checks to ensure transactions and the parties are legitimate
- check buyer and seller account information for suspicious activities
- probabilistic prediction models produced by data scientists are updated in real time on the basis of the transaction data

Credit scoring at Zhima
- data from 4 sources: (a) consumer behavior at Alibaba; (b) transaction data from sellers on Alibaba's platforms; (c) public data; (4) data from Ant Financial's partners
- data scientists produce credit scoring
- scores are updated in real time
- fraud prevention monitoring system: any anomalous behavor is channeled through a separate risk model, which returns a decision.

Experimentation platform- hundreds of experiments daily.

Google

May 17, 2017 talk «AI first» by Sundar Pichai, Google's CEO.

AI at the core of Google services
- Conversational (speech, text
- Ambient (all types of devices)
- Contextual

Predictive analytics
- dynamic prediction of the full search term (autosuggest box)
- organic search results + automated auctin for the most relevant ads to match the user's intent
- personalized advertising

Experimentation protocols
- Causal identification
- Statistical validity of experiments
- 100,00 experiments each year

Netflix

Early days movie reviews + daily DVD shipping
Developmemt of a recommendation engine based on movie ratings.
8 million subscribers.

Data available under the DVD delivery model
- titles requested
- lenght of time DVD rental
- rating of titles

2007 launch of the streaming service
- full user experience
- pause, rewind, skip
- device use
- movie thumbnail image

Based on data available, predictive analytics on genres, actors, even individual titles + customer loyalty.
Automatic queue of next episodes and recommendation of similar movies.

Predictive analytics on which content to create on its own.

Amazon

Digital operating model
Jeff Bezos e-mail to All development (Bezos Mandate, 2002).

Componentization of software.
Siloed information systems at Amazon
- unpredictable connections between silos
- immediate needs and «fighting fires»

Re-architecting the firm
- Brian Valentine, software executive at Microsoft (MS Exchange, Windows 2000, Windows XP)
- complete redesign of all e-commerce services

Remove all bottlenecks created by human intervention
Remove human interaction from the critical path

Amazon Echo

Smart speaker and microphone
Alexa, voice interface to Amazon AI platform

- Started from simple command
- Accumulated data on human interaction, types of commands, languages
- Trained itself based on data

Alexa > 50,000 skills
Developed by a large ecosystem of third-party developers.

Digital operating model
Removing all bottlenecks created by human intervention

Microsoft

2011 Satya Nadella head of Server and Tools group (15bn $ from SQL and Windows Server)
2014 Satya Nadella CEO: «the cloud is our future, and we have fundamentally no choice. We will make it work»
2018 *Embracing our future: Intelligent cloud and Intelligent edge*

Complete redesign of Microsoft organization

Previous poor performance
- Windows Vista (delay in shipping)
- Zune music player (commercial failure)
- Windows 8 (disappointment on sales)
- acquisition of Nokia (disaster)
- lost confidence by the software development community

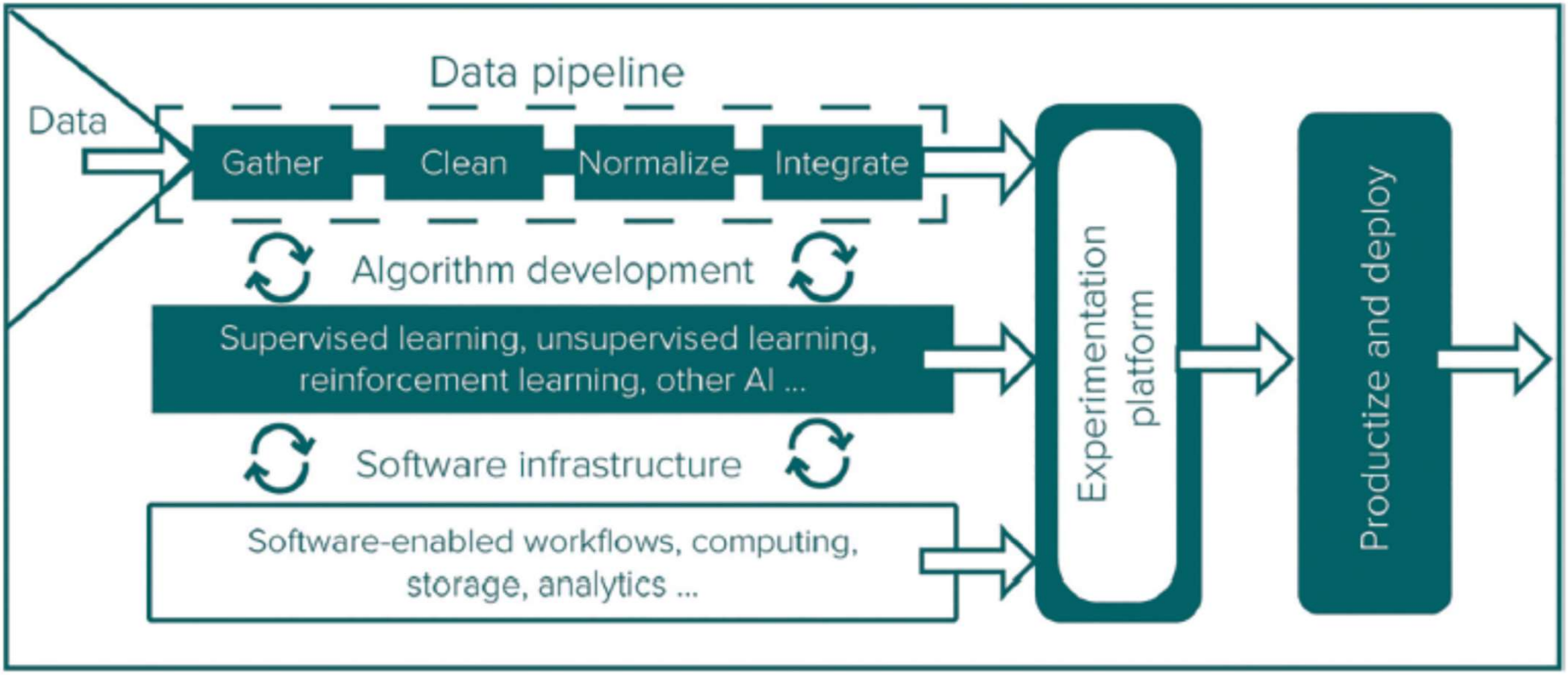
Microsoft/2

Complete redesign of Microsoft organization

- AI-based architecture underlying all product lines
    - Office 365
    - Microsoft Dynamics (ERP, CRM)
    - Azure
- all product lines asked to identify and address specific customer pains and use cases
- «our product is the process» (Kurt DelBene, 2015)
    - Identification of data within customer processes
    - Data > data catalog > data lake > Machine learning «on top of everything»
- strategic move of opening to Open source software («Microsoft (heart) Linux»)
- acquisition of GitHub (2018)

Cloud-based business model

- completely different from the delivery of software CDs
- need for Capex investment
- decision to place Azure at the center of Microsoft strategy (Azure previously disconnected)
- Azure redesigned to run Windows and Linux workloads
- Azure introduce AI-driven services: search, knowledge, vision, language and speech APIs
- introduction of Azure Data Factory (2018)



Source: Marco Iansiti and Karim Lakhani, *Competing in the Age of AI: When Algorithms and Networks Run the World* (Harvard Business Review Press, 2020)

Data pipeline

The process gathers, inputs, cleans, integrates, processes, and safeguards data in a systematic, sustainable, and scalable way.

Netflix data
- ratings from Netflix subscribers
- popularity (several metrics)
- plays (time of day, duration, device)
- queues
- metadata (actors, directors, genre, parental rating, reviews)
- presentations on Netflix screen (scrolls, mouse-overs, clicks, time spent on a given page)
- social data
- search terms in Netflix service
- external data (box office performance, movie reviews, critics)
- customer data (demographics, location, language)

Personalization of the screen each time a customer opens the application.
Datification.
Microclusters of user preferences (>2,000)- much more sophisticated than traditional segments.

Algorithm development

Set of rules a machine follows to use data to make a decision, generate a prediction, or solve a particular problem.
AI algorithms generate predictions about future states or actions of the business, driving critical operating activities

Three types of models

1. **Supervised learning**

Expert-labeled dataset. Training set + validation set.
E.g. spam, image identification, payment authorization, recommendation (collaborative filtering algorithm), health care system, diagnostics, insurance.

2. **Unsupervised learning**

Pattern recognition in data without previous modeling.
(a) Clustering
(b) Association rule mining
(c) Anomaly detection

3. **Reinforcement learning**

Performance function + starting point. Alpha Go.

Experimentation platform

Systematic testing of hypotheses regarding new prediction and decision algorithms in order to ensure the suggested changes have the desired (causal) effect.

Huge number of experiments per year
- Netflix > 40,000 experiments
- Google > 100,000 experiments

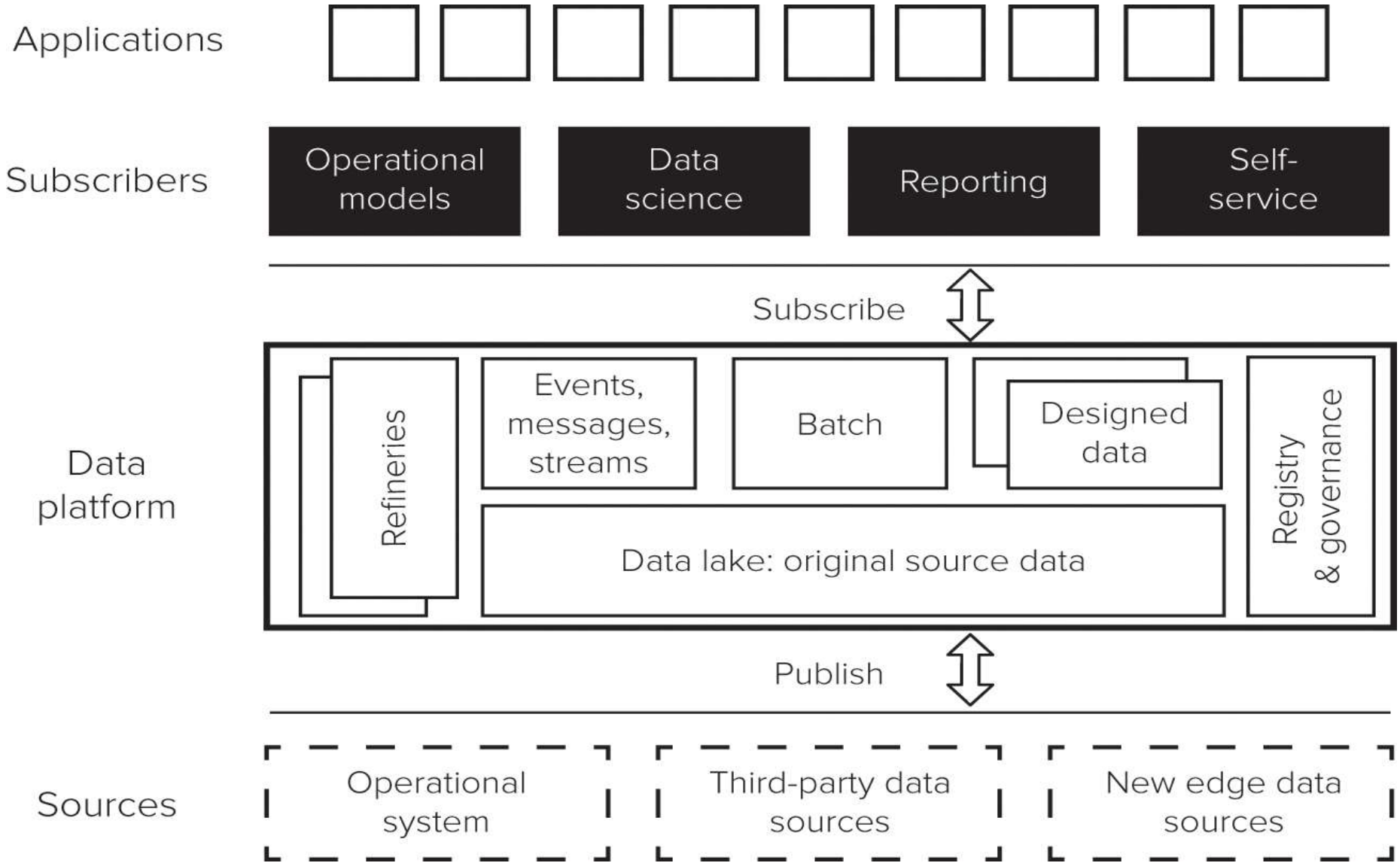
Formalization of hypotheses
Randomized Control Trial (RCT) or A/B testing
- Random sample of users exposed to a change or treatment («treated»)
- Random sample of users as a non-treated group («control»)
- Statistical techniques to examine the differences and to establish causality

Software infrastructure

AI Factory
- publish-subscribe methodology for APIs
- data are aggregated, cleaned, refined and processed
- data made available through consistent interfaces (APIs)
- data subscribed in order to implement applications

Modularity of interfaces.
Consistent design of APIs
- data security and governance
- development of internal systems
- plug-in of third party software

The AI Factory model is radically different from traditional IT approach
- siloed information systems
- fragmented data (scattered data assets, often embedded in Excel spreadsheets)
- expensive custom software development
- long delays for software development


Applications
Subscribers
Operational models
Data science
Reporting
Self-service
Subscribe
Data platform
Refineries
Events, messages, streams
Batch
Designed data
Registry & governance
Data lake: original source data
Publish
Sources
Operational system
Third-party data sources
New edge data sources

Principles of digital transformation

After Microsoft experience five principles can be identified

1. One strategy (strategic clarity and commitment)

«Data knows no functional boundaries, and refocusing the cmpany on a foundation of analytics and Ai requires close, multifunctional collaboration» (p. 111).

2. Architectural clarity

- Centralization
- Consistency

3. Agile organization

4. Capability foundations

5. Multidisciplinary governance

Principles of strategic management in the AI era: (1) value creation dynamics

Network effects

From industry analysis to network analysis

Network effects

- **Direct network effects**
    - Users value the presence of other users (social networks, telecommunications, fax, messaging etc.)
- **Indirect network effects**
    - Users in one category value the presence of users from another category (e-commerce, reservation systems, Uber, Airbnb, videogames, You Tube etc.)

Multi-network effects

Leverage the properties of existing networks to generate value in other networks
E.g. massively multiplayer videogames: from two-sided networks (one player- several providers of videogames) to multiple-sided networks (communities of players- providers of videogames)

Principles of strategic management in the AI era: (1) value creation dynamics

Learning effects

The growth of the network of users generates significant learning effects driven by algorithms used in AI applications

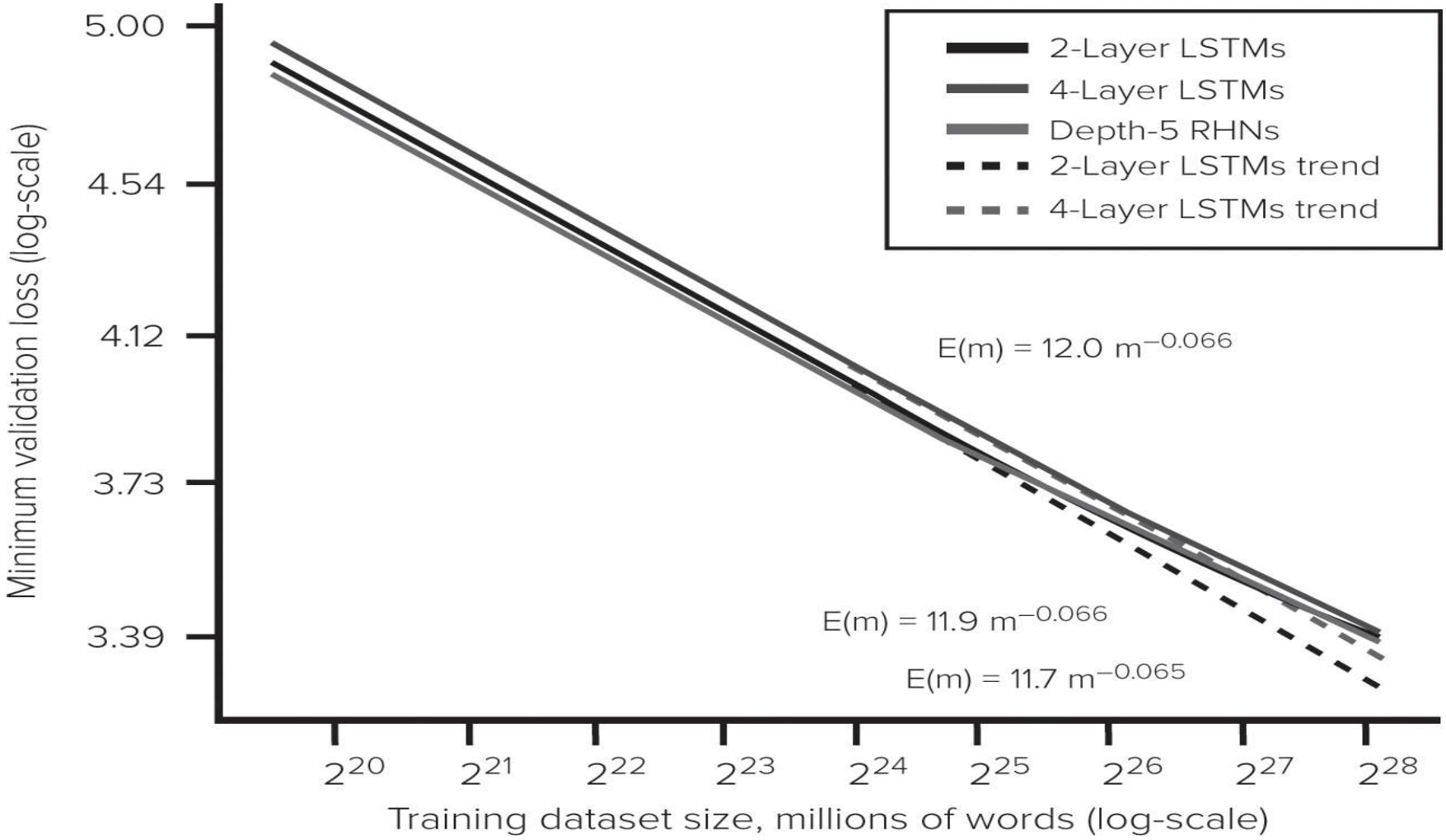
The more data used to train and optimize the algorithm, the more accurate the algorithm's output- hence the more complex the problem to be solved.

Accuracy of the algorithm increases with the square root of the number of data points

Combined effects in the use of multiple algorithms

Examples

- Failure of Bing (Microsoft) and Yahoo to compete with Google in the advertising market- cumulated advantage of Google in improving algorithms over
- Advantage of Tesla in the accumulation of knowledge in driverless car technology- more defensible and appropriable knowledge



Source: Baidu Research

Principles of strategic management in the AI era: (1) value creation dynamics

Clustering

Structure of the network
- global
- clustered

In global networks the value users receive comes from the presence of other users in the overall (world) network
- Airbnb- users are interested in the availability of flats everywhere in the world
- huge investment at world level
- high barriers to entry and limited competition (just one competitor, HomeAway/Vrbo)

In clustered networks the value users receive depend on other users in a sub-group (cluster) of the overall network
- geographic/urban level (e.g. Uber, facing competition from Gett, Juno and Via in New York)
- service type (e.g. food delivery)
- customer need (e.g. patient communities by disease)

Global hubs do not emerge in clustered networks. Local competition may be fierce.

Principles of strategic management in the AI era: (2) value capture dynamics

Multihoming

Forming ties with multiple platforms or hub firms

Single side of the network

- iOS vs Android: smartphone app developers introduce applications for both environments (hence the platforms cannot leverage on exclusive agreements on the developer side), but consumers still use just one environment only (hence Apple and Android make large profits on the consumer side)

Two-sides of the network

- multihoming at Airbnb (home-sharing): owners may publish their availability on alternative platforms (Home Away), reducing the profits for Airbnb
- multihoming at Uber (ride-sharing): taxi drivers may use multiple local platforms, reducing the profits for Uber

Companies try to lock-in one side (or both sides) of the network.

Principles of strategic management in the AI era: (2) value capture dynamics

Disintermediation

Nodes in a network are in the position to bypass the intermediary, particularly in marketplaces (see the failure of Homejoy, Task Rabbit)

Strategies to mitigate the risk of disintermediation

Fight disintermediation
- lock customers in exclusive use of the intermediary
- avoid releasing information on the other side of the network until payment (e.g. Airbnb)

Enhance the value for users
- reduce transaction fees
- offer additional services

ZBJ, Chinese outsourcing marketplace
- 90% lost revenue due to disintermediation
- Largely used to examine logos by new companies
- Created a trademark registration service system- largest in China, 1bn$ turnover

Principles of strategic management in the AI era: (2) value capture dynamics

Network bridging

Ability to leverage on the properties and strenght of a network to build and sustain another network.

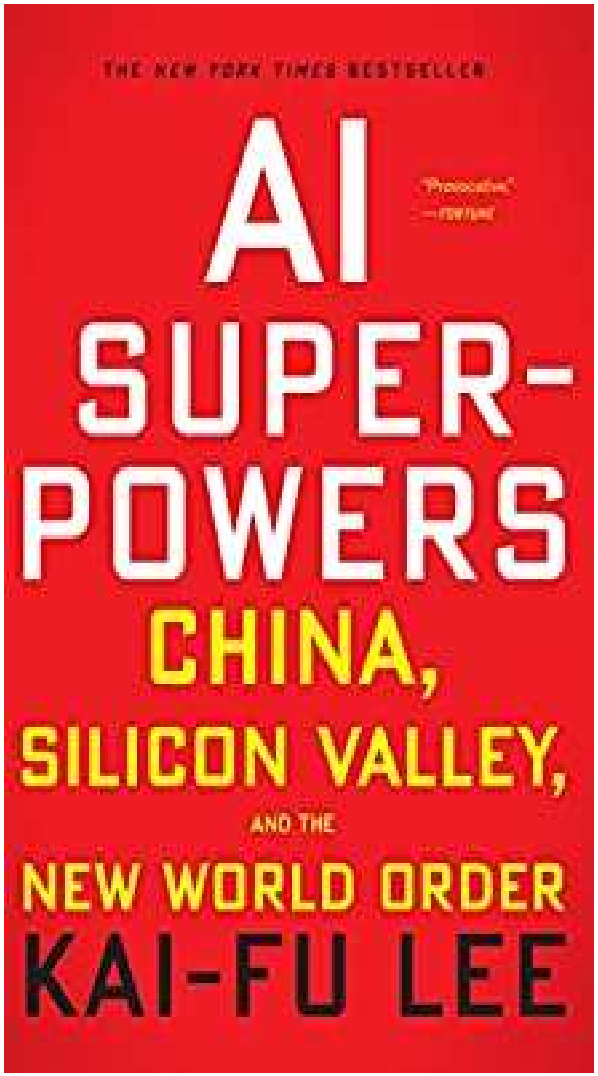
Examples

- Google (business model of free search + advertising)
- Alipay (use of data from e-commerce Alibaba to create AI applications of credit scoring)
- Airbnb entry into the business of complementary tourist services (visits, experiences, trips, local amenities, etc.)
- Uber entry into additional driver services (Uber Eats in food delivery, Uber Health in driving services for patients and impaired people) + Uber Pool in pooling several people driving to the same destination)
- applications of E-Health using secure data on patients to build up additional services

Why China?
May 2017 Ke Jie defeated by Alpha Go- «Sputnik moment» of China.

Facilitating conditions

- scientific achievements (*deep learning*: proof by Geoffrey Hinton, 2012)
    - computing power + data (vs. rule-based AI)
- new generation of aggressive entrepreneurs
    - first approach- imitation of Silicon Valley
    - cut-throat competition in China against imitators
    - emergence of skilled entrepreneurs
- large diffusion of mobile phone
    - access to Internet not through PC (too expensive)
    - large number of Android-based mobile services
    - bridging network strategies (e.g. from e-commerce to Alipay mobile payment, messaging WeChat, food delivery, transport, bike sharing)
    - O2O online-to-offline services produce huge volume of valuable data that can be used for AI applications (better than data generated by online behavior only, as in USA)
    - unique language
- government plan
    - «entrepreneurship and mass innovation» plan (2014)
    - creation of >6,600 innovation poles and incubators



Stage I. Early imitation of Silicon Valley- the case of Wang Xing «the Cloneur»
2003 Friendster
2005 Facebook (Xiaonei)
2007 Twitter (Fanfou)
2010 Groupon (Meituan)
Imitation is deeply rooted in ancient Chinese culture (e.g. mechanical watches from the West, èlite education based on memory). The social imperative is to «get rich», at any cost. Single child policy and the need to escape poverty.

Stage II. Entry of new companies
- Alibaba competition with e-Bay.
- Google China exit from the Chinese market
- Didi Chuxing competition with Uber

Stage III. Cut-throat competition
- Tencent' QQ security system vs Qihoo360
- Kaixin (a brand of Xiaoniei) vs. Renren
- *War of thousand Groupons*. Groupon alliance with Tencent vs Meituan, now Meituan-Dianping

Stage IV. Emergence of tech giants (BAT)
- Baidu on search engines
- Alibaba (e-commerce), Alipay (mobile payment), now Ant Financial (all financial services)
- Tencent on e-commerce and social media