Universität Zürich[UZH]

Department of Business Administration

Services & Operations Management

Prof. Dr. Helmut Dietl

Module Overview

1. Operations strategy
2. Process analytics
3. Quality management: SPC
4. **Platform management**
5. Sports management

Learning Goals (1/3)

After this lecture you should know

- the economic importance of platforms and how they work
- the economics of direct and indirect network effects
- the economics of same-side and cross-side effects
- the importance of network mobilization in platform competition
- the possibilities of network mobilization
- the characteristics of winner-take-all markets
- the competitive advantages in battles for winner-take-all markets
- the roles that platform owners or operators and the supply- and demand-side play

Learning Goals (2/3)

- the degrees of openness that a platform organization may have
- the advantages and disadvantages of a closed/proprietary platform compared to an open platform
- the advantages and disadvantages of an open licensing policy vs. a restrictive licensing policy
- the advantages and disadvantages of horizontal and vertical compatibility
- what is a bundling strategy and how an established platform can be attacked with such a strategy
- how a platform can defend itself against bundling attacks
- how the market power and hold-up problems of proprietary platforms can be reduced through a cooperative platform organization and platform disintermediation

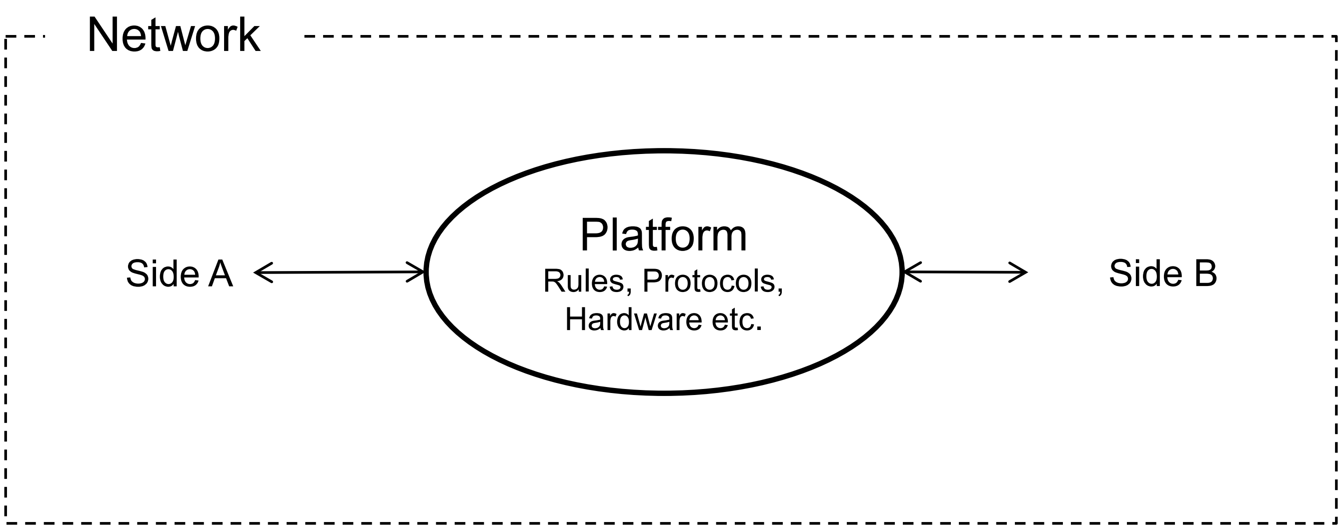
Learning Goals (3/3)

- how a disintermediation attack works
- the basic principles of blockchain
- the differences between public and private blockchains
- how Bitcoin works and why Bitcoin does not need a trusted third party
- how Satoshi Nakamoto solved the Byzantine Generals' Problem
- the potential of smart contracts
- the opportunities that new generation blockchains like Ethereum generate for decentralized service platforms and decentralized applications (dApps)
- the Oracle problem and how to solve it

What Do These Companies Have in Common?

What is a Platform?

A platform is an infrastructure which enables two or more market sides to interact with each other



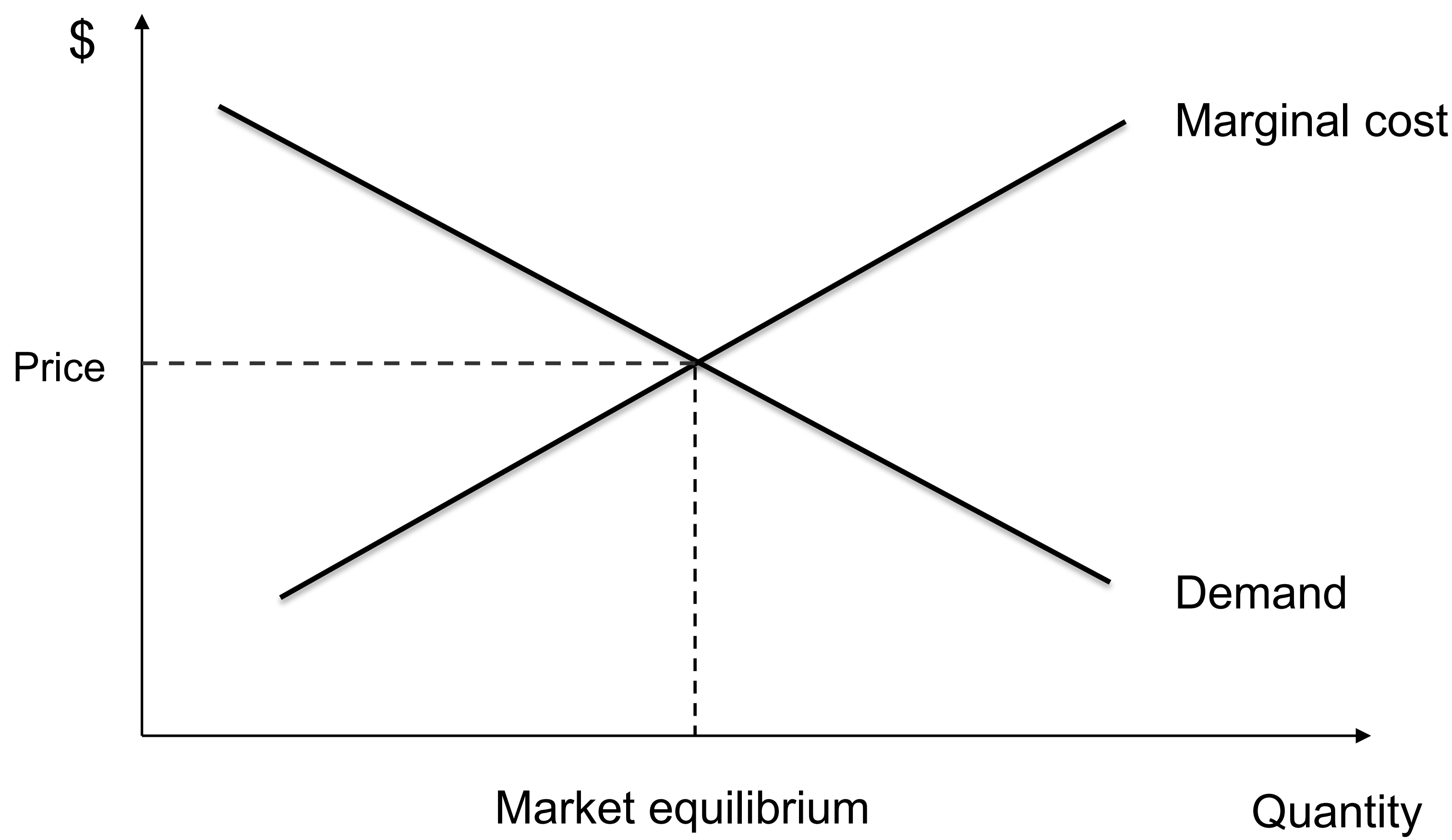
Examples

Side A	Platform	Side B
Sellers	eBay	Buyers
Game developers	Xbox	Players
Merchants	Visa	Card holders
Advertisers	20minuten	Readers
Software developers	Mac OSX	Users
Senders	Mail	Receivers
Drivers	Uber	Riders
App providers	iPhone	Users
Senders	Bitcoin	Receivers
Musicians	Spotify	Consumers

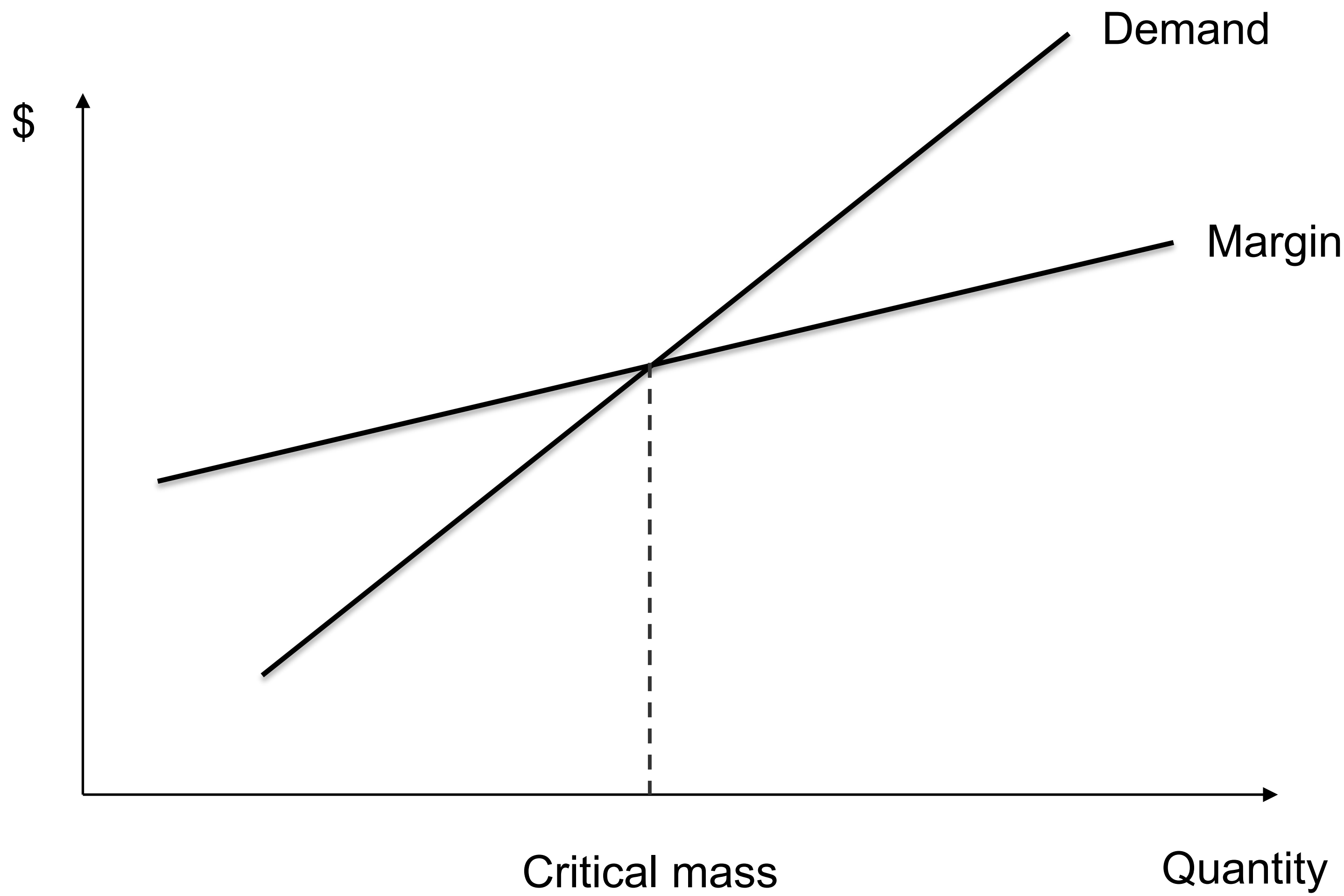
Platform Functions

- Connection
  - e.g., telephone, fax, post, railways, airlines
- Pricing
  - e.g., auction and stock exchange platform
- Diversity
  - e.g., video game, DVD, and HDTV platforms
- Matching
  - e.g., job exchanges, B2B, and dating platforms

Law of Demand



Network Effects



What are Network Effects?

Network effects exist whenever new users increase the value of a product or service for all existing users.

There are two kinds of network effects

- Direct network effects
- Indirect network effects

Direct Network Effects

Direct network effects are based on complementarities in physical networks

Examples

- Telephone
- Internet
- Railroads
- ATM

Indirect Network Effects

Indirect network effects are based on complementarities in virtual networks

What are virtual networks?

Virtual networks are a collection of compatible products/services on a common technological platform

Examples of Virtual Networks

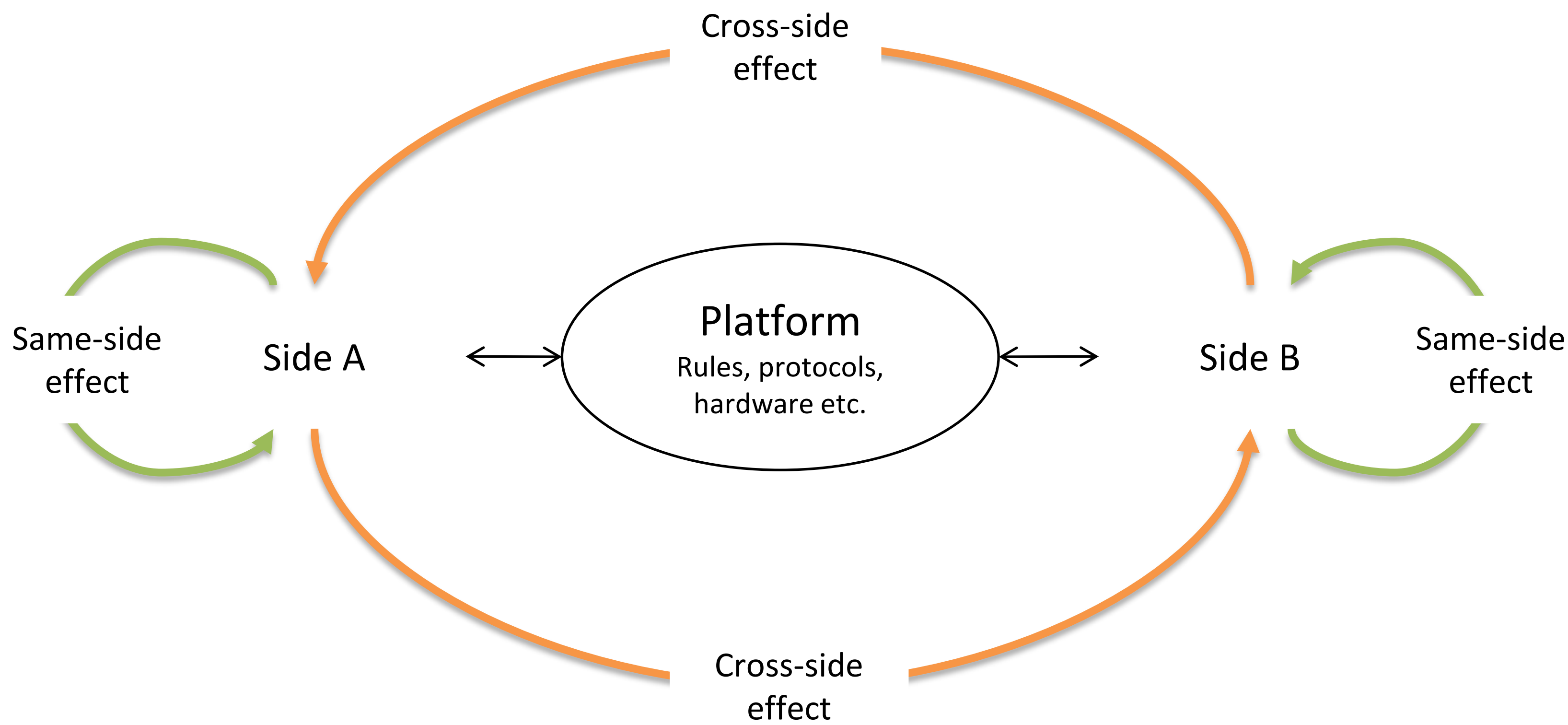
- Computer hard- and software
- DVD players and DVDs
- Video consoles and video games
- Smartphones and applications
- Cryptocurrencies and wallet services
- Razors and razor blades

Indirect Network Effects: Definition

Virtual networks are characterized by indirect network effects because every additional buyer/user of one system component (e.g., hardware) increases the market for the other system component (e.g., software).

This increase leads to more variety and/or lower average costs of the other system component (due to economies of scale). As a result, the value of the entire virtual network increases which, in turn, results in a higher demand for both system components.

Categories of Network Effects



Positive and Negative Same-Side Effects

- Positive same-side effects
  - Every additional member of one side increases the value of the network for all other users on the same side
    - Example: Smartphone users

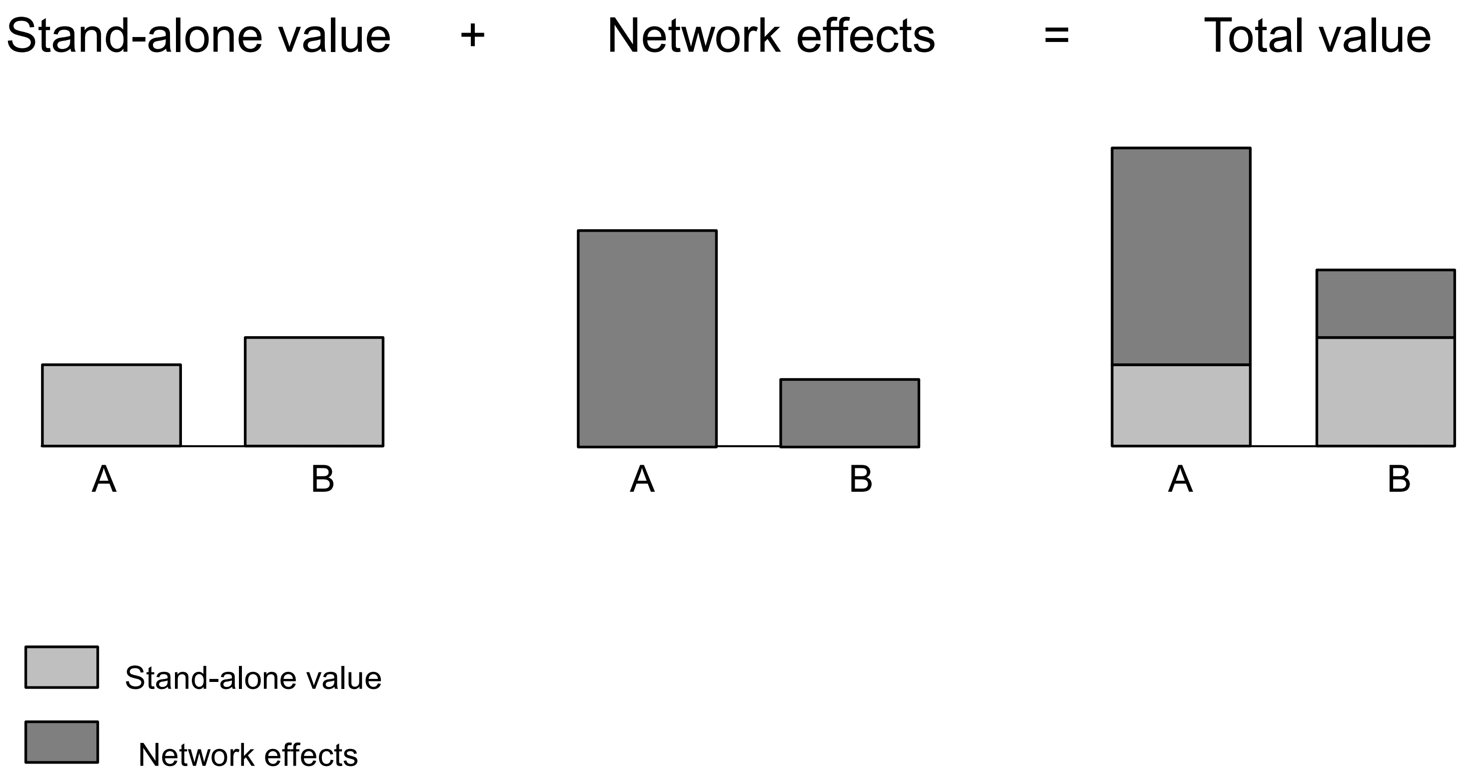
- Negative same-side effects
  - Every additional member of one side decreases the value of the network for all other users on the same side
    - Example: Job seekers on Monster.com

Positive and Negative Cross-Side Effects

- Positive cross-side effects
  - Every additional member of one side increases the value of the network for all other users on another side
    - Example: Merchants accepting credit cards

- Negative cross-side effects
  - Every additional member of one side decreases the value of the network for all other users on another side
    - Example: Advertisers on 20minuten

Platform Value



Management Problems

- Network mobilization
- Platform organization
- Competitive strategy

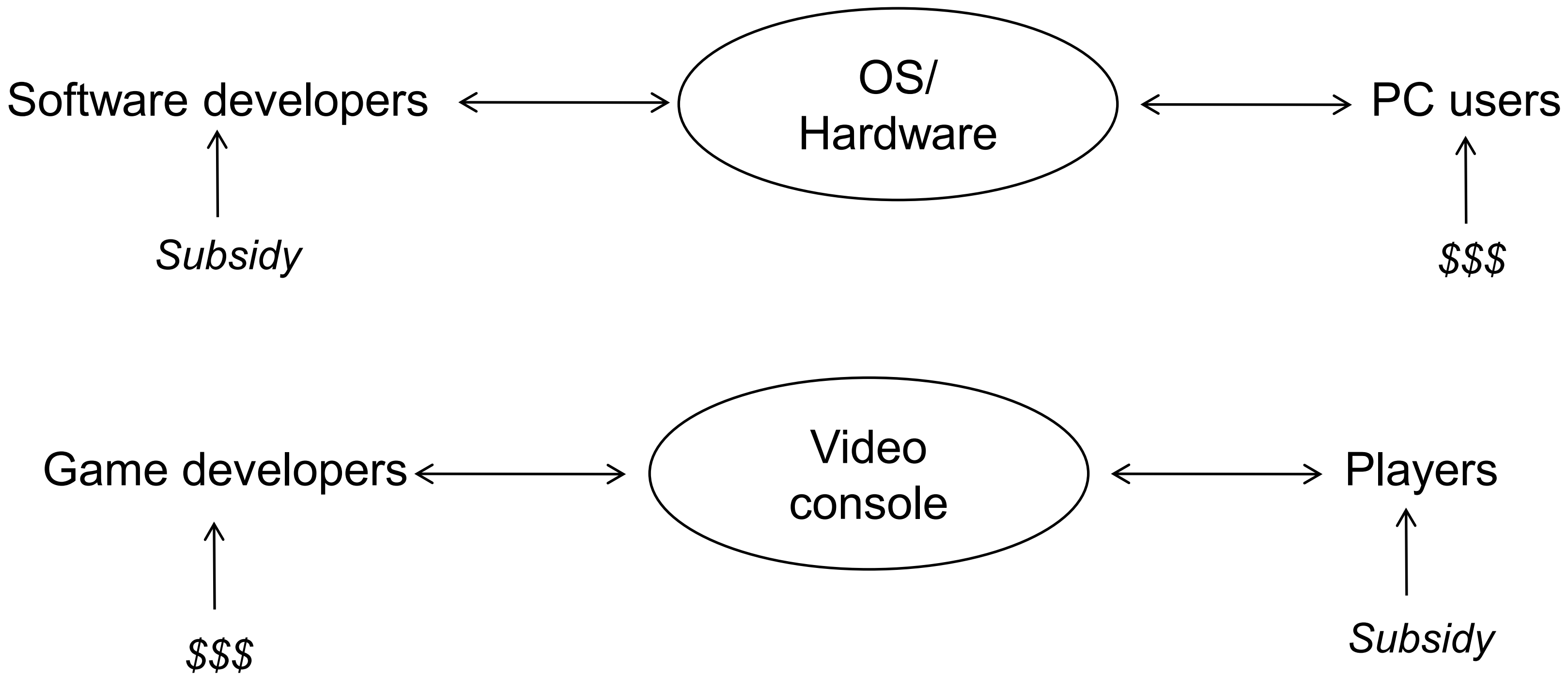
Network Mobilization (1/2)

- Chicken-egg problem
  - Platform is only attractive for side A if there are many participants on side B and vice versa
- Increasing platform value
  - Create stand alone value
    - Example: video recorder
  - Integration of one market side
    - Example: Microsoft/Bungie Studios (Halo)
  - Simulate users
    - Examples: Reddit (fake users), Airbnb (Bots)
  - Attract marquee users
    - Example: Visa (“they don‘t take American Express”)
  - Start in local market
    - Example: Facebook (Harvard), Uber (San Francisco)

Network Mobilization (2/2)

- Decreasing user adoption costs
  - Tools and training
    - ➢ Examples: Microsoft/Intel (Intel Developer Forum), Uber (help in navigating the driver licensing process)
  - Integrating with other platforms
    - ➢ Example: Paypal (eBay)
- Penetration Pricing
  - Low prices in the beginning
  - Then price increases or increasing margins via volume (learning curve, economies of scale)
- Subsidizing one side
  - Subsidizing the more price elastic side
  - Subsidizing the side with larger (cross-side) network effects
    - ➢ Examples: Adobe, 20minuten

Subsidizing: Examples



Characteristics of Winner-Take-All Markets

- Large network effects
- High multi-homing costs
- Small differentiation potential at the level of the platform
- Large differentiation potential at the level of the commercial market side
- Large economies of scale

Competitive Advantages in the Battle for WTA Markets

- Existing relationships to potential customers
  - Example: Monster (TMP)
- Reputation from previous battles
  - Example: Microsoft
- Deep pockets
  - Examples: Alphabet, Amazon, Facebook, Alibaba, Softbank
- First-Mover-Advantages
  - Examples: eBay, Amazon
- Late-Mover-Advantages
  - Avoiding (market) positioning errors
  - Newest technology
  - Reverse engineering

Platform Organization: Roles

- Platform Owner/Sponsor
  - Holds property rights of the platform, can change the platform and decides who acts as platform provider. Does not interact with platform users
- Platform Provider
  - Is licensed by the platform owner and interacts with users
- Side A
  - (Supply side) Users
- Side B
  - (Demand side) Users

Platform Organization

		Platform provider	
		Single firm	Multiple firms
Platform owner/sponsor	Single firm	**Proprietary** • eBay • iPhone • Monster.com • OurCrowd	**Licensed** • Windows • Engel & Völkers • VHS
	Multiple firms	**Joint Venture** • mozaig operations • Orbitz • Covisint • R3/Corda	**Open/Shared** • Linux • Bitcoin • Ethereum

Source: Eisenmann, Parker, and Van Alstyne (2008, p.5)

Platform Organization: Degrees of Openness

	Linux	Windows	Macintosh	iPhone
Platform owner/sponsor (Design- and IP-rights)	open	**closed**	**closed**	**closed**
Platform provider (Hardware/OS-bundle)	open	open	**closed**	**closed**
Side A (Commercial/Application developers)	open	open	open	**closed**
Side B (Consumers)	open	open	open	open

Source: Eisenmann, Parker, and Van Alstyne (2008, p.2)

Open vs. Closed Platforms: Basic Trade Offs

- Open platforms
  - Enhanced value creation
    - Fixed costs are shouldered by more participants
    - More diversity
    - Anti hold up signal
    - Lower stranding risk
    - Access to distribution channels
  - Complicated value appropriation
    - Internal competition
  - Complicated platform coordination

- Closed platforms
  - Vice versa

Hold up (Williamson)

Transaction characteristic		Behavioral assumption
Uncertainty	↔	Bounded rationality
Specificity	↔	Opportunism

Competitive Strategies

- Licensing
- Compatibility
- Bundling
- Disintermediation

Licensing

- Increases variety
  - Example: Windows vs. Macintosh

- Customer preference for second source
  - Fewer bottlenecks
  - Reduced hold up

- Access to established distribution channels
  - Example: American Express/MBNA (Maryland Bank National Association)

Historical Example: VHS (JVC) vs. Betamax (Sony) 1/2

- Sony had larger installed base, but pursued a more restrictive licensing policy
- JVC had a more generous licensing policy
- Customers favored VHS because the generous licensing policy assured them against hold up (charging locked-in customers high prices for complements)
- Sony lost its First-Mover-Advantage

Historical Example: VHS (JVC) vs. Betamax (Sony) 2/2

- 1975 Sony Betamax in Japan and USA
- 1976 JVC VHS in Japan
- 1977 JVC VHS in USA
- 1978 VHS and Betamax in Europe
- 1979 Philips and Grundig introduce Video 2000
- 1981 VHS has 80% market share in USA
- 1983 Philips produces VHS
- 1984 Grundig produces VHS
- 1987 VHS has 100% market share in Germany
- 1988 Sony produces VHS

Compatibility Strategies

- Horizontal compatibility
  - Compatibility between different platforms
    - Example: Swisscom and Sunrise
  - Transmission of information and value between different blockchains
    - Based on cross chain technology
    - Examples: Ripple, The Fusion Platform, Lightening Network, Polkadot

- Vertical compatibility/interoperability
  - Compatibility between different versions of the same platform
    - Example: iOS 12 and iOS 13
  - Soft forks do not result in vertical incompatibility
  - Hard forks result in vertical incompatibility
    - Example: Bitcoin, BitcoinCash, BitcoinGold

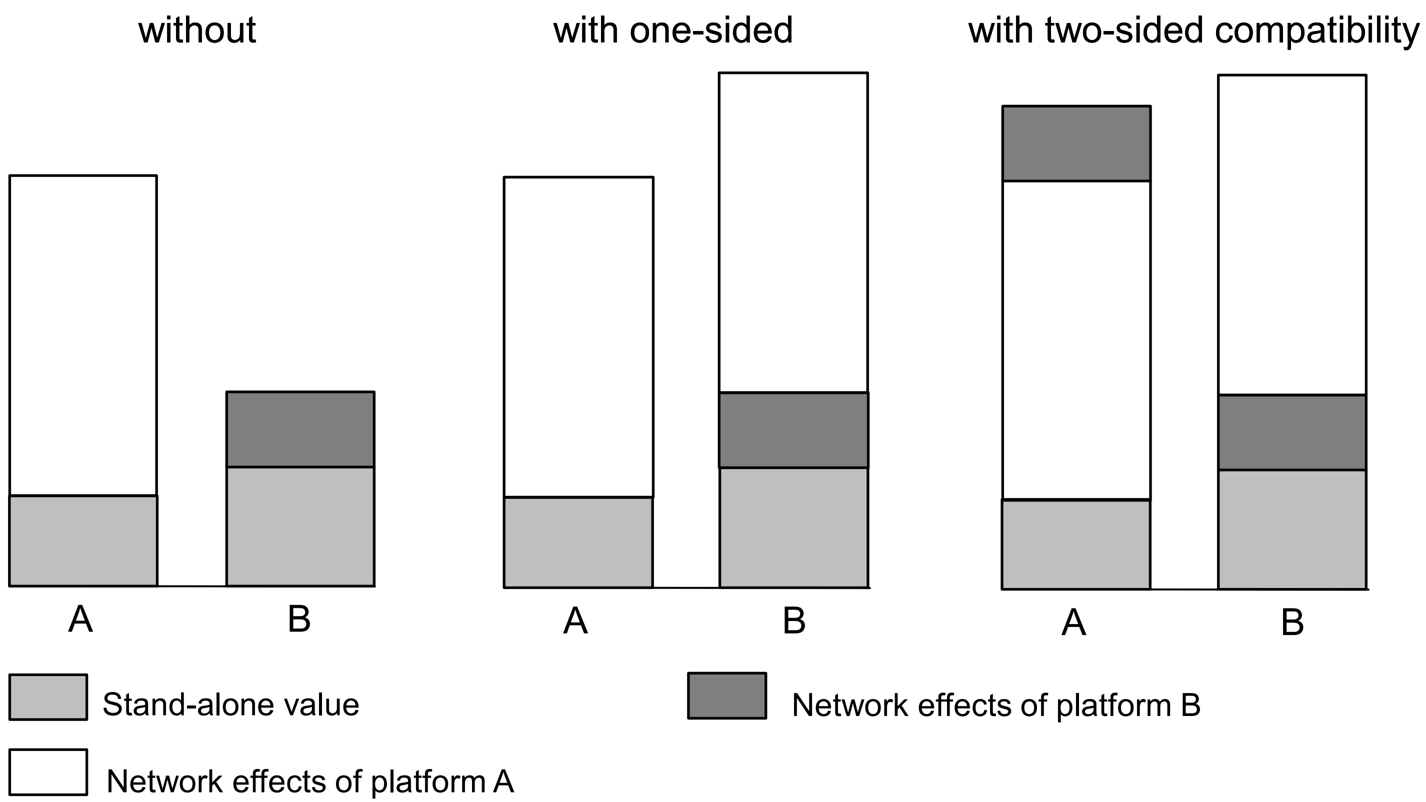
Horizontal Compatibility/Interoperability

- Profit = Market size x market share x margin

- Market size
  - Compatibility results in larger network effects
  - → participants' willingness to pay increases
- Market share
  - Compatibility eliminates network effects as determinant of market share
  - Market shares are determined solely by stand alone value, switching costs, multi-homing costs and conversion costs
  - Incompatibility creates entry barriers
- Margin
  - Compatibility increases willingness to pay, but reduces the ability to differentiate
  - → competition intensifies

Competitive Effects of Horizontal Compatibility

Competitive position



Vertical Compatibility

- Compatibility of different platform generations / versions
  - Problem arises with the introduction of every new platform generation

- Backward compatibility
  - Existing customers will change to the new generation if price < stand-alone value

- Backward incompatibility
  - Existing customers will change to the new generation if price < (stand-alone value + network effects)

Bundling Strategies

- Integration of additional services/functions into an existing platform
  - Examples: Windows OS (web browser, streaming media, fax, etc.)
- Efficiency gains
  - For customers
    - Lower transaction costs
  - For providers
    - Economies of scope in marketing
    - Integrated design
- Price discrimination (see next slide)
- Export of market power
  - Example: Microsoft/Netscape
- Bundling attack
  - Example: Real Networks vs. Microsoft

Price Discrimination: Example

	Willingness-to-pay	
	Service A	Service B
Anna	10	7
Bernd	6	11

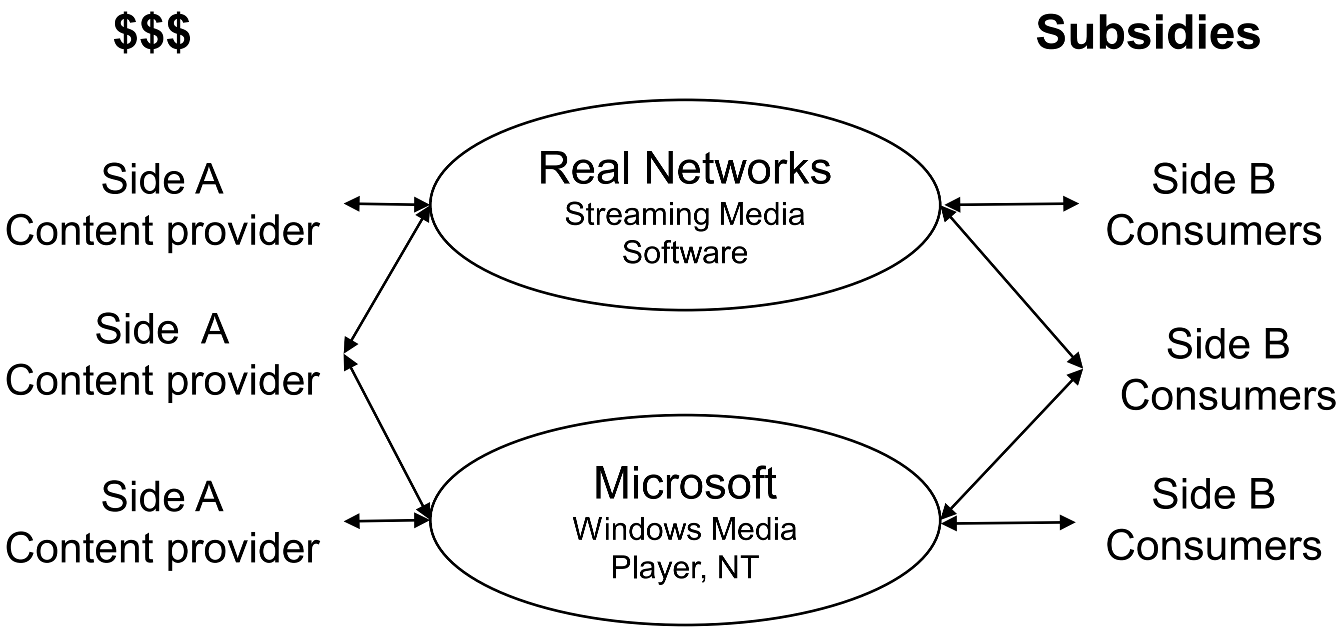
- Maximize revenues by
  - selling each service separately
  - bundling both services

Price Discrimination: New Example

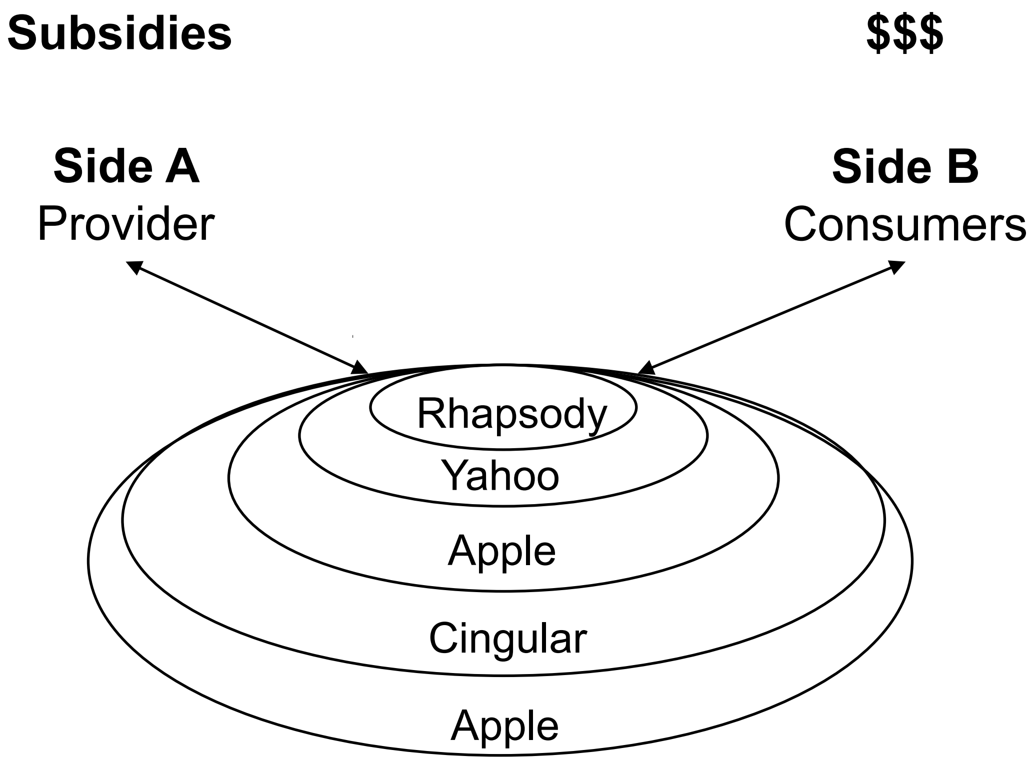
	Willingness-to-pay	
	Service A	Service B
Anna	10	11
Bernd	6	7

Result: Price discrimination via product bundling only works with opposite preferences!

Platform Envelopment: Example



Platform Envelopment: Example (Continued)



Envelopment Strategies

- Horizontal Bundling
  - Bundling of complementary services
    - Example: Google bundles search function with email, instant messaging, news, storage and software services

- Vertical Bundling
  - Bundling services with essential upstream services
    - Example: eBay takes over PayPal

- Conglomerate Bundling
  - Bundling unrelated services
    - Example: Cablecom offers telephone services

Envelopment: Counterstrategies

- Counterattack
  - Example: UPS/FedEx and Swisscom/Cablecom
- Change business model
  - Example: Real networks/Microsoft
- Opening the platform
  - Example: Eclipse (IBM transfers intellectual property rights for its Eclipse software development tools to an independent foundation responsible for stewardship of an open-source community), Android (Linux)
- Merger/Alliances
  - Example: Lotus/IBM
- Anti-trust suit
  - Example: Netscape/Microsoft

Potential Problems of (Proprietary) Closed Platforms

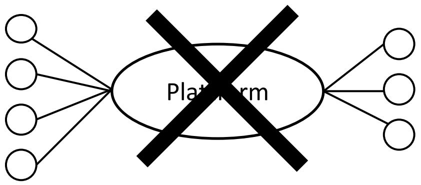
- Market power
  - Monopoly or oligopoly
    - Monopoly pricing
    - => Appropriation of consumer rents
    - Examples: Credit cards (2-5% fees), Western Union (8.5% fees), Apple (30% of revenues through App Store)
- Hold up
  - Specific investments of platform participants (high multi-homing costs)
  - Hold up by charging excessive prices on the dependent market side
  - Hold up by charging excessive prices on the other market side
    - Example: Academic journals, authors hold up (Side A) due to high future subscription prices => fewer readers (Side B) => disadvantage for authors (McCabe & Snyder, 2016)
  - These problems even exists in platforms with user generated content

Solution 1: Cooperative platform organization

- Transaction cost theory
  - Reduction of the hold up risk through vertical integration
- Platforms
  - Integrating many supply-side companies with the platform owner is often impossible
  - Integrating the demand side (end customer) is impossible
- Platforms with user generated content
  - Value is created primarily through platform participants
- Cooperative platform organization as a transaction cost theoretical solution
  - Analogy to cooperatives in other industries
    - ➢ Example: Agriculture
    - ➢ Platform example: Twitter

Solution 2: Disintermediation of Closed Platforms

- Elimination of intermediary



- New problems
  - Larger coordination costs
    - (n x m) instead of (n + m) relations
  - Verification
    - Who verifies interactions?
    - Who acts as “trusted third party”?

Principles of Blockchains (1/3)

- Distributed network
  - Public blockchain
    - Every member of the network has access to the entire data base
    - Access is not controlled by a central authority
    - No verification monopoly
    - Examples: Bitcoin, Ethereum
  - Private (permissioned) blockchain
    - Blockchain owner grants access rights
    - Blockchain owner decides who can read and write on the blockchain
    - Blockchain owner may even change data on the blockchain
    - Private blockchains are similar to proprietary platforms
    - Examples: Corda, cardossier

Principles of Blockchains (2/3)

- (De-)Centralized verification
  - Byzantine Generals' Problem
  - Proof-of-Work
  - Proof-of-Stake
  - Blockchain scaling
- Peer-to-peer interaction
  - No intermediary contrary to traditional platforms (e.g., Visa, Uber)
  - Private vs. public P2P networks
- Transparency with pseudonymity
  - All transactions are public
  - Example: every participant In the Bitcoin network has an ID of at least 30 digits
  - In the Visa network the central authority knows the identity of all transaction partners

Principles of Blockchains (3/3)

- Irreversibility
  - Every transaction is verified and added as a new block at the end of all existing blocks (=> blockchain)
    - ➢ Blockchain represents the full history of all transactions
    - ➢ Transaction partners are only registered with their pseudonyms on the blockchain
    - ➢ After transaction has been verified and added as a new block to the blockchain all information contained in the block cannot be reversed
- Programmability
  - Due to its digital character blockchain transactions can be programmed and automatically executed
  - Accordingly, algorithms or rules can be developed which trigger transactions between pseudonyms

History of Blockchain Development

- Bitcoin
  - First successful application of blockchain technology
- Blockchain
  - Blockchain is a ledger, it functions like a register
    - Example bitcoin: blockchain registers who owns which bitcoins
  - Blockchain may be used as a register for other property rights
    - Examples: securities, art, jewelry, passports, real estate (Georgia)
- Smart contracts
  - Second generation of blockchains offers the possibility of integrating software programs into the blockchain => smart contracts
  - Smart contracts are computer protocols which control legally relevant activities depending upon digitalized if-then-conditions
    - Simple example: ATM

Applications of Smart Contracts

- Blackbox insurance
- Service-level agreements
- DeFi (Decentralized Finance)
- dApps (Decentralized Applications)
- Medical therapies
- Logistics
- Supply chains
- Industry 4.0
- Internet of things
- …

Polymarket: Introduction (1/2)

- Privately owned company
- Founded in 2017 by Shayne Coplan
- Initial funding $ 28 million
- Decentralized prediction market platform with transparent peer-to-peer trading
- Based on Polygon (PoS) (Layer 2) and Ethereum (Layer 1)
- Traders can by shares of events and win (lose) if event occurs (does not occur)
- Trades are made in USDC (stablecoin)

Polymarket: Introduction (2/2)

- Fined $ 1.4 million in January 2022 by the Commodity Futures Trading Commission (CFTC)
  - Problem: Polymarket offered off-exchange event-based binary options contracts and failed to obtain designation as a designated contact market (DCM) or registration as a swap execution facility (SEF)
- Appointed J. Christopher Giancarlo, a former Commissioner of the CFTC, as chairman of its advisory board in May 2022
- Raised $ 70 millions in 2 rounds in May 2024
- Currently plans to raise another $ 50 millions and issue its own token
- 30 employees
- Investors include Founders Fund (Peter Thiel) and Vitalik Buterin

How does Polymarket work? (1/2)

- Everybody can suggest a market (via Twitter/X) by
  - naming the market
  - giving evidence of demand for trading the market
  - showing that the market has social or news value
  - high lightening which question the market will answer
  - proposing a source of resolution for the market

- Polymarket selects markets based on 3 criteria
  - Is the demand for trading sufficiently high (target volume)?
  - Does the market create social or news value (e.g., relevant information)?
  - Can the market be resolved clearly?

How does Polymarket work? (2/2)

- Example: Presidential Election Winner 2024: Harris
  - Traders can buy “Yes” or “No” shares
  - If Harris is elected “Yes” shares will pay $ 1,-, “No” shares will pay $ 0,- and vice versa
  - Prices reflect probabilities, e.g., share price of “Yes” is 42 cents
  - => market predicts that Harris will win with 42% probability

- Idea: market price reflects probability that event occurs
  - Wisdom of the crowd
  - Economic background: von Hayek (1945)
    - ➢ Price mechanism aggregates huge amounts of knowledge scattered throughout the world

Oracle Problem (1/2)

- Cause: blockchains cannot connect with real-life data
  - Smart contracts are usually based on real-life data
  - Who connects the blockchain with the (off-chain) real world?
- Solution: oracles connect the blockchain with the physical world
  - Oracle is a middleware that connects blockchains to off-chain systems
- Problem: conflict between security, authenticity, and trust in third-party oracles for the trustless execution of smart contracts
  - Blockchains are good in finding consensus on basic binary questions
  - Blockchains are not well suited to answer questions that require external data that is not easily accessible to every node in the network
    - ➢ E.g., What is the weather in Zurich?

Oracle Problem (2/2)

- “Subjective” data gives oracles excessive power
  - Once the data is reported to the blockchain it becomes immutable
  - Smart contracts will be executed accordingly
  - => centralized oracles erase all advantages of trustless, decentralized blockchains
- How can oracles be trusted?

Polymarket's Solution: UMA's Optimistic Oracle

- UMA (Universal Market Access Protocol)
  - Decentralized Truth Machine
- Optimistic Oracle verifies data in stages
  - Stage 1: a statement is proposed as true
    - Natural-language statement is submitted along with a bond
    - Bond acts as a bounty for anyone to dispute it if they have evidence to the contrary
  - Stage 2: Statement can be disputed
    - Statements that are not disputed are accepted as true
    - If a statement is disputed => stage 3
  - Stage 3: UMA token holders vote on the dispute
    - Majority wins
    - All token holders who vote with the majority receive a reward

UMA’s Game Theory

- Everybody who proposes a market resolution has to place a bond
- If market resolution is not disputed the bond and a reward are returned to the proposer
- If market resolution is disputed, the disputer has to place a challenge bond in the same amount as the proposer bond
- UMA voters who vote with the minority are rewarded
- Proposer wins: Proposer receives bond back plus half the disputer’s bond as a bounty. Disputer loses bond
- Disputer wins: Disputer receives bond back plus half the proposer’s bond as a bounty. Proposer loses bond
- If a proposal is made too early: Disputer receives bond back plus half the proposer’s bond as a bounty. Proposer loses bond