Meta-Platform Theory: Cooperative Network of Networks Effects Scaling Laws for Trans-contextual Value Transfer

Why decentralized platforms will eat centralized platforms

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IIW 2019/04/30 Session 5
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https://github.com/SmithSamuelM/Papers

https://medium.com/selfrule/meta-platforms-and-cooperative-network-of-networks-effects-6e61eb15c586

GitHub

SmithSamuelM

Papers

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Promise of Decentralization

Decentralized control has the potential to cause a leveling effect that more fairly distributes value to users, limits exploitation, removes barriers to entry, and increases opportunities for disruptive innovation and value creation.

A concern comes from the fact that other leveling technologies, such as communication networks, first started as decentralized but then become more centralized over time with the associated value capture eventually becoming concentrated into a few very large business entities with higher rates of value extraction.

One can argue that the internet which started as a great leveler due to decentralized networking has now resulted in most of its value being concentrated in a handful of companies.

Once centralization occurs innovation and value creation decrease and value extraction increases to the detriment of the average user.

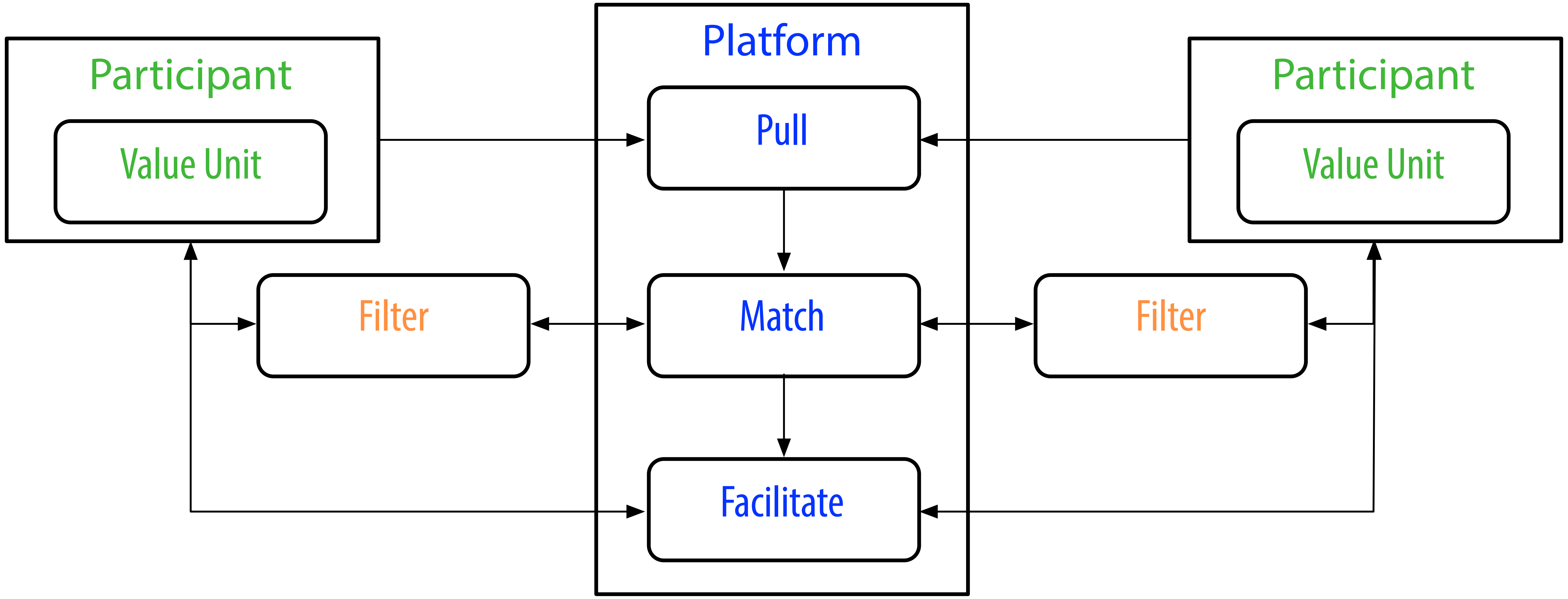
Platform Business Models

Multi-Sided Platform (MSB), Two-sided Networks, N-sided Networks, Network Markets.

Think Airbnb or Uber

The primary role of the platform is to foster value transfer by connecting (finding, filtering and matching) participants from both sides of the network and then facilitating transactions between them.

Platform Business Model



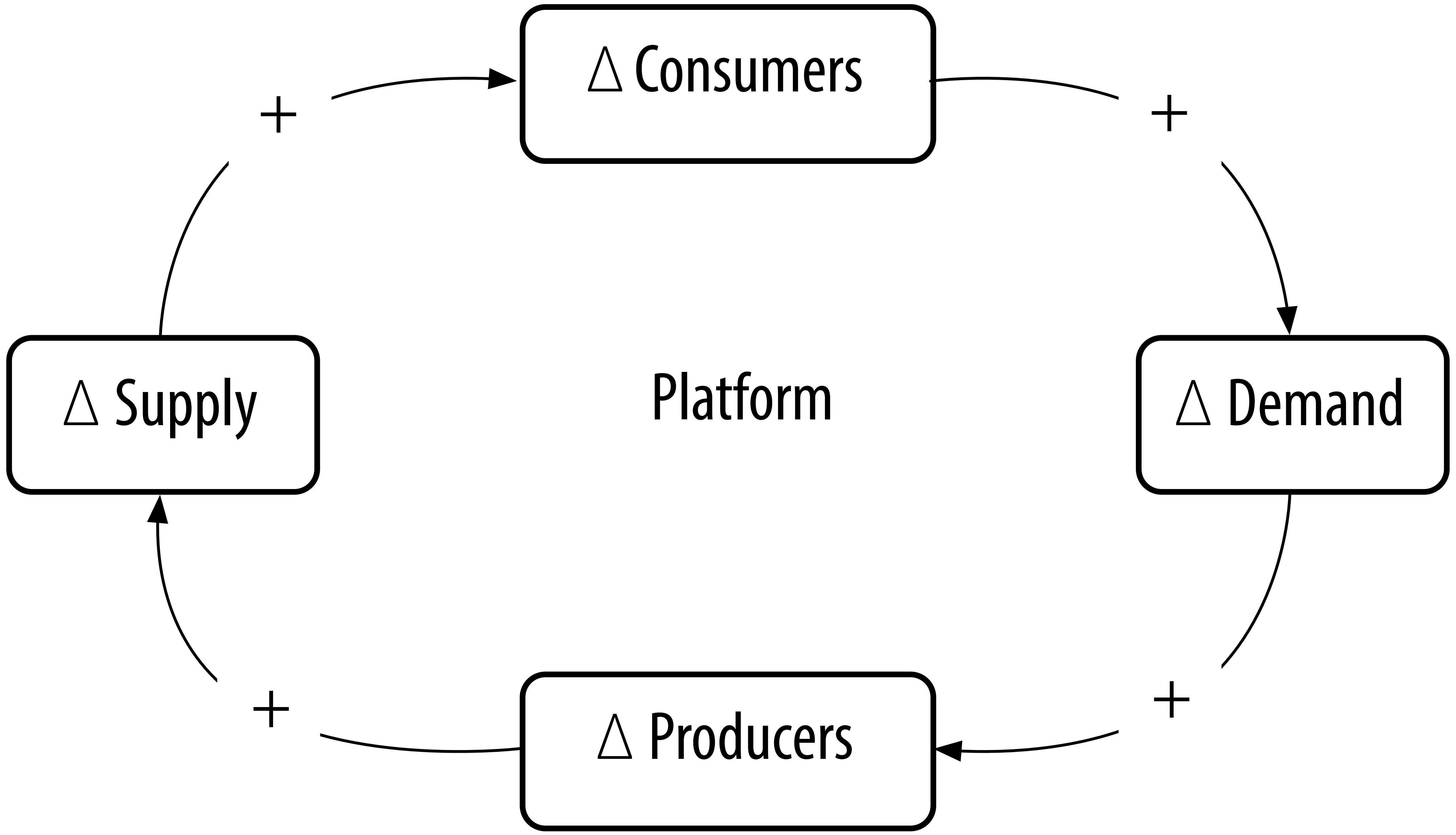
Core Interaction = *Participant/Value unit* + *Filter*

Platform = *Pull* + *Match* + *Facilitate*

Two-sided network effects

Demand economies of scale (network effect multipliers of value)
that eventually drive
Supply economies of scale (production efficiency)

Positive Feedback Loop

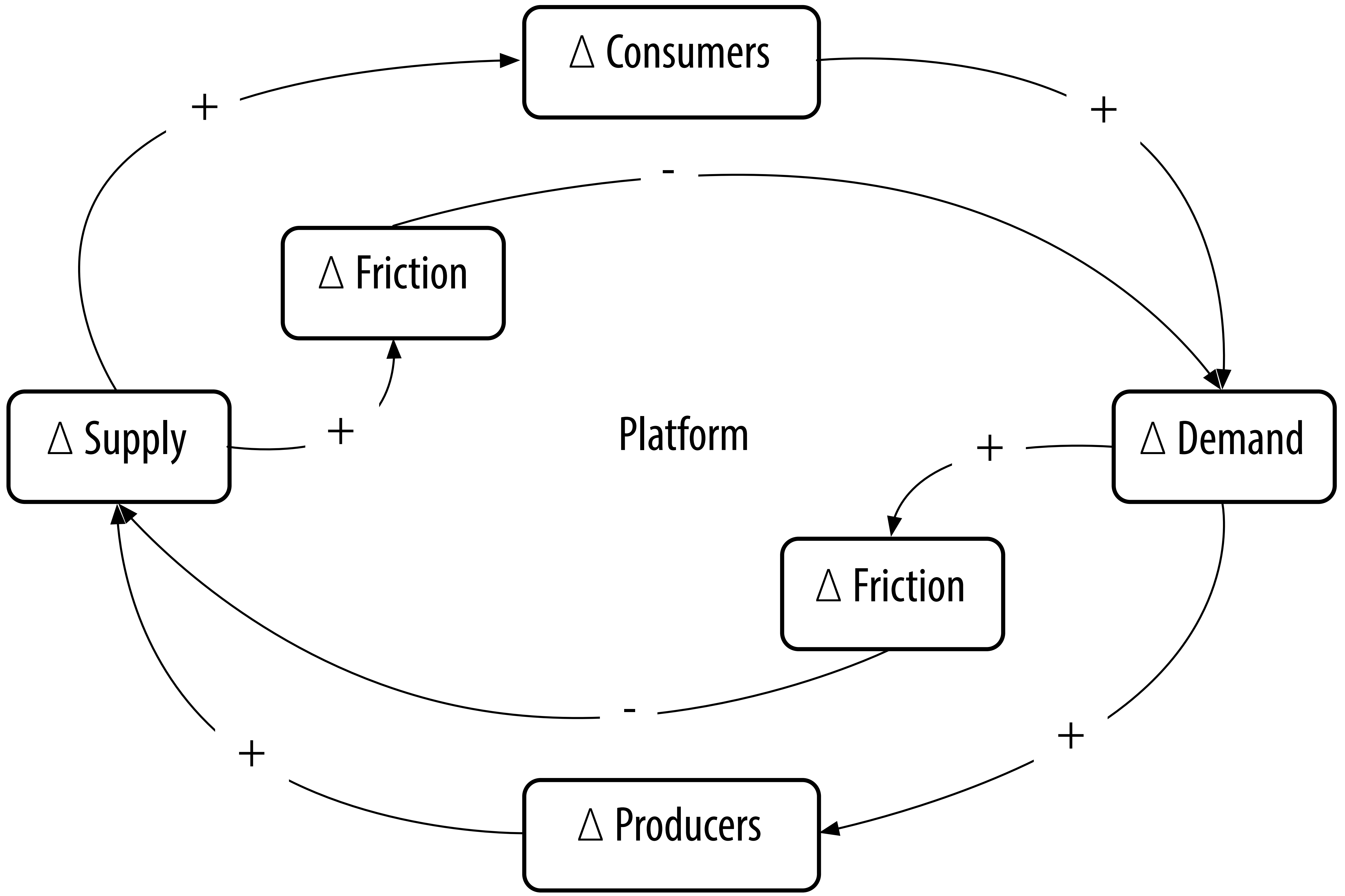


more consumers drive demand which attracts more producers

more producers drive supply which attracts more consumers

both demand and supply side driven

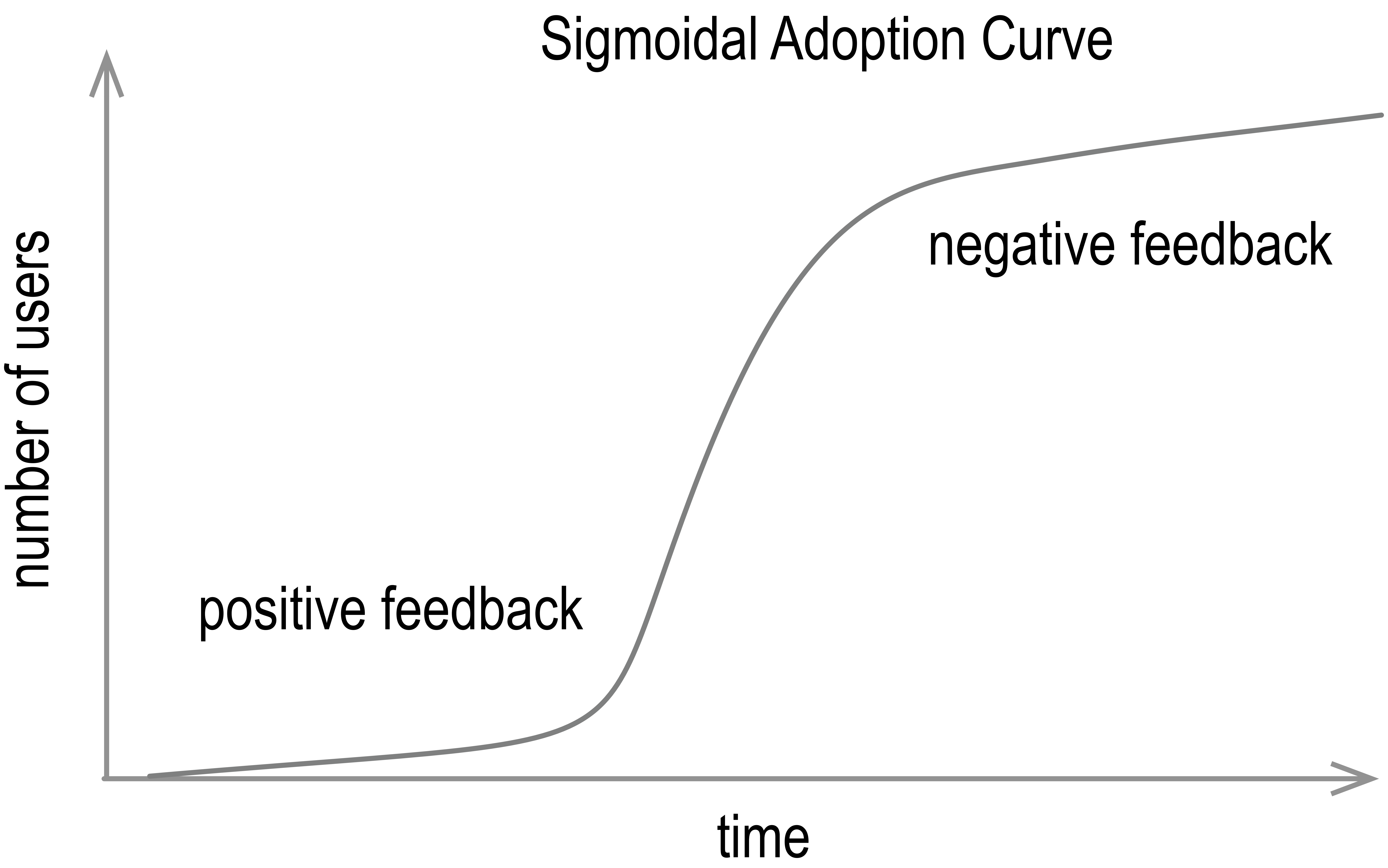
Cross-Side Negative Feedback Loops



More supply choice increases friction e.g. customer confusion in producer selection thereby decreasing demand

More demand choice increases friction e.g. producer failure in customer satisfaction thereby decreasing supply

Feedback and Adoption Growth Rate



Transaction Costs

Triangulation:

Connecting = Find, Filter, Match

Transfer:

Facilitation = Transport, Deliver, Pay

Trust:

Competency, Reliability, Honesty, Privacy, Alignment of Interests

Platforms sell reductions in transaction costs

To a consumer, all costs look like transaction costs

Reducing total transaction costs (triangulation, transfer, and trust) is the vital activity of any platform.

Distributed and Decentralized Computing Systems

distributed = computation happens at multiple sites

non-distributed = computation happens at one site

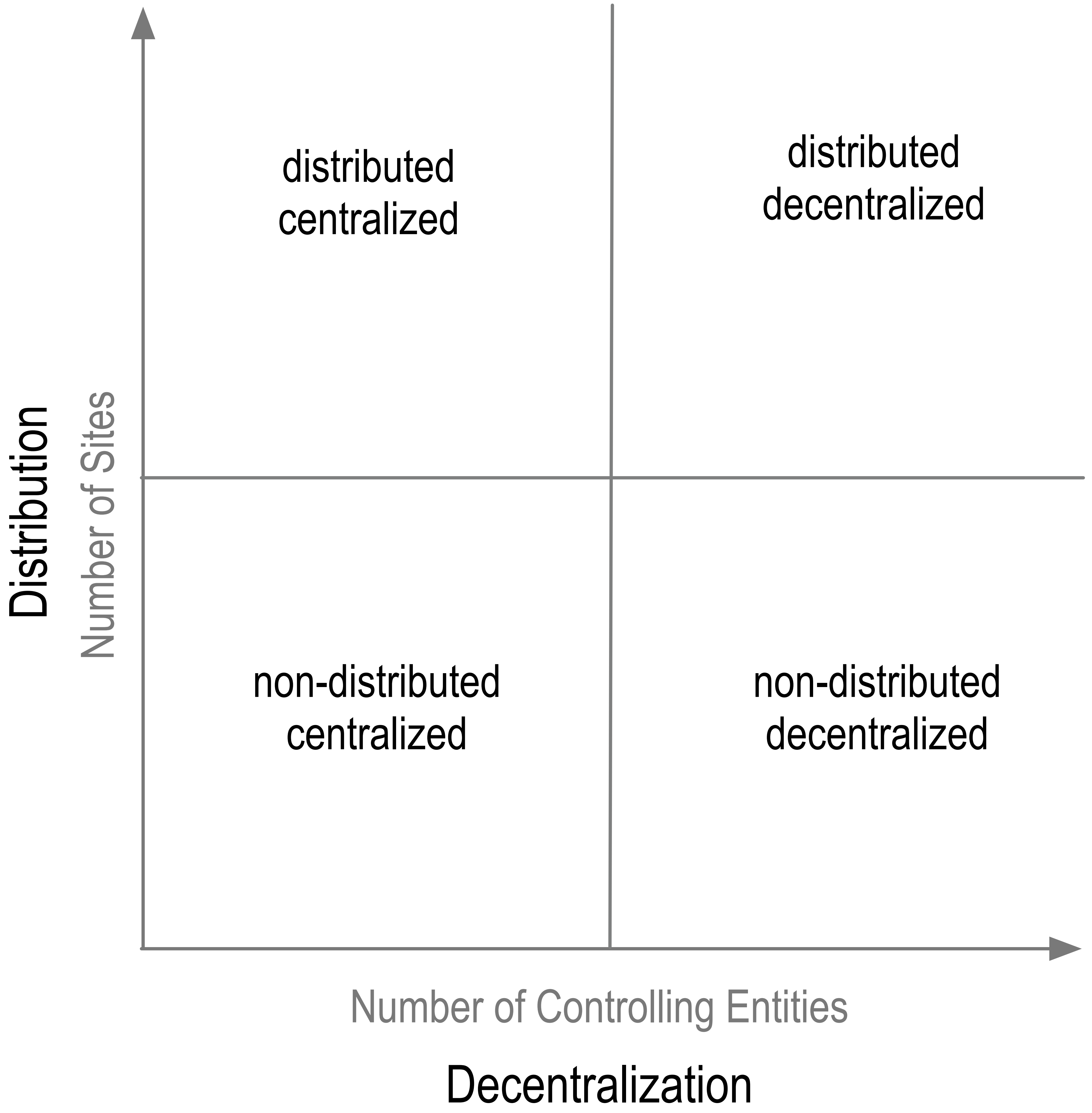
centralized = computation controlled by a single entity

decentralized = computation controlled by more than one entity

computing system may be some combination of *centralized* (*decentralized*) and distributed (*non-distributed*).

decentralization may occur to a degree.

- system decentralization may lie on a spectrum of strongly decentralized to weakly decentralized.



Decentralization Advantage

Although *decentralization* can reduce triangulation and transfer costs, its primary *potential advantage* is in reducing trust costs!

Online interactions make trust harder = increased trust costs

Hidden trust costs are still costs

Conventional ways to reduce trust costs:

- Branding & Reputation
- Certification
- Bonding
- Regulation

Algorithmic Decentralized Governance

autonomic system:

self-regulating, self-governing, self-managing, self-certifying, self-protecting

Distributed decentralized computing systems may provide trustworthy algorithmic market behavioral incentivization and regulation

carrot and stick

Enablement

Distributed network computation enables platforms

Distributed consensus enables more secure platforms

Platform lock-in induces exploitation via information asymmetry

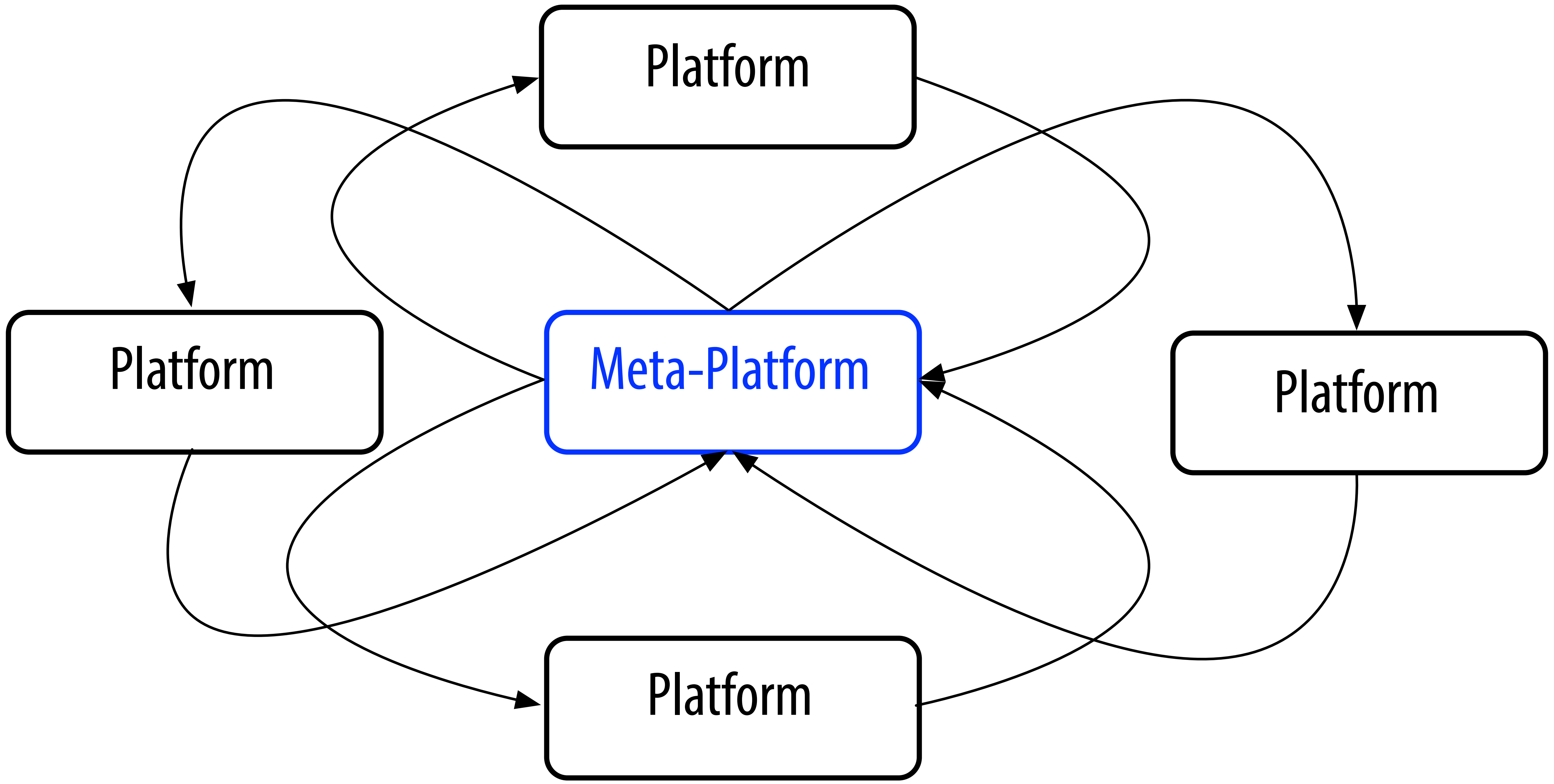
Decentralized distributed consensus enables more trustworthy platforms

Distributed AI enables scalable super-efficient user controlled re-intermediation

Platform governance matters

Meta-Platform

A platform that enables and fosters participant controlled value transfer across and among other platforms.



Enables network of network effects

Enabled by *contextual transitivity* = trans-contextual value creation and capture

Enables long-tail network network of networks effects

Value Portability

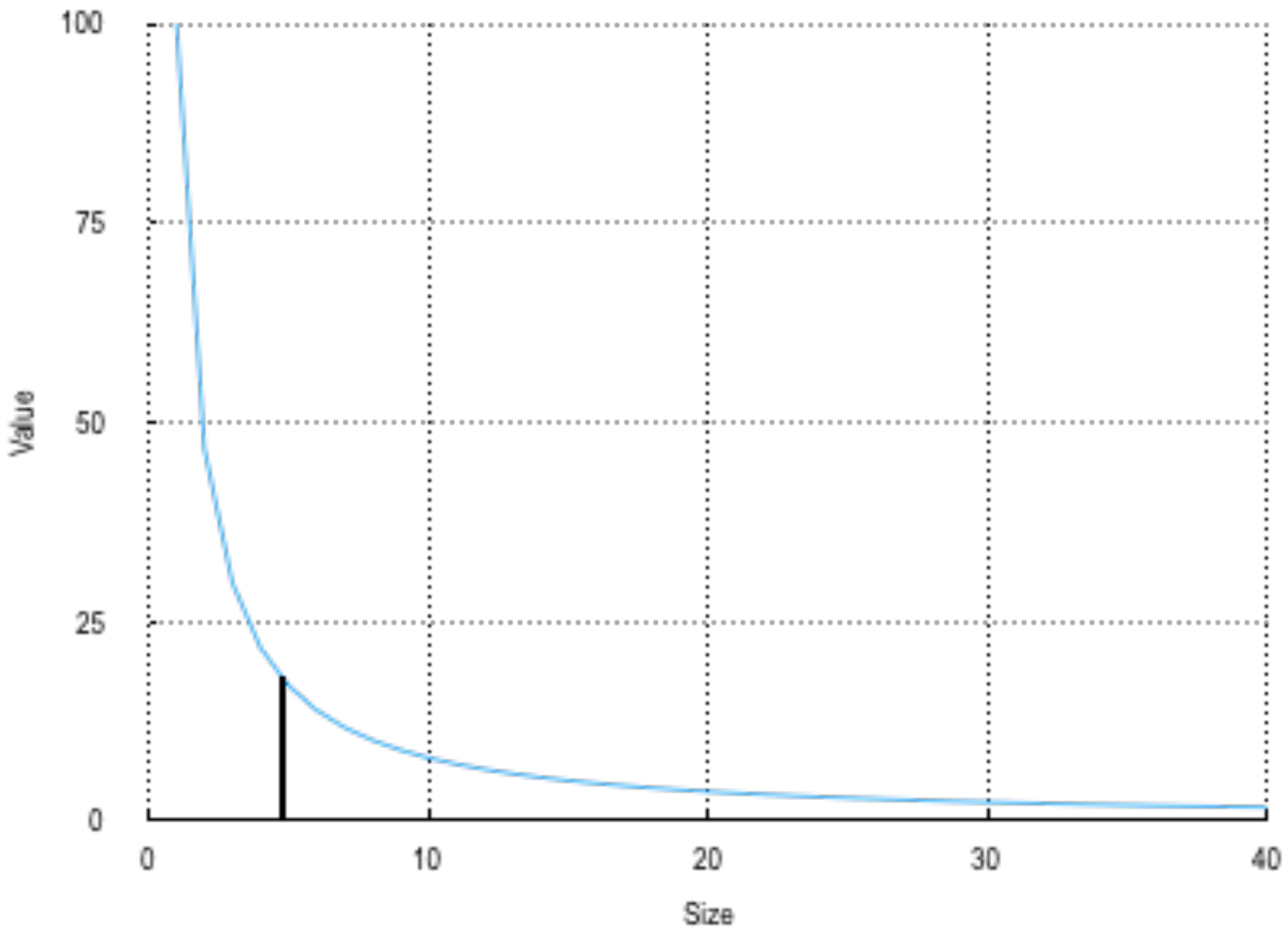
Contextual Transitivity & The Long Tail

long-tail = value capture of contextual value = unique value from extreme customization

meta-platform technology enables transfer of value between platforms

meta-platforms may aggregate contextual value from multiple long-tails

enables long-tail network-of-networks effects



participant's amplify their value across multiple platforms at minimal transaction costs

maximum platform pull = fastest spin-up of network effects

meta-platforms eat non-meta-platforms

Meta-Platform Technology

Curation

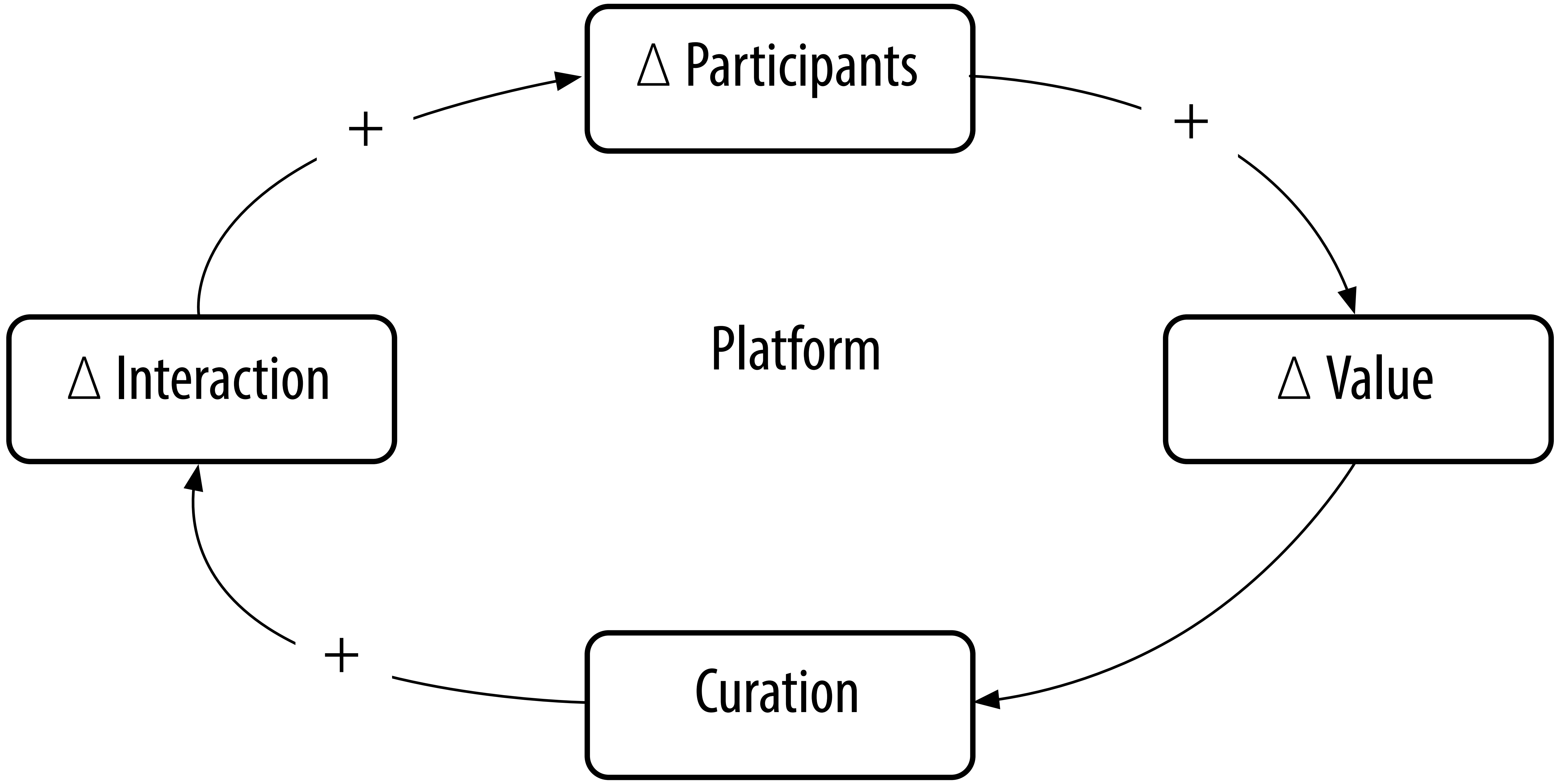
Match + Filter = Curation

Reduces negative cross-side network effects

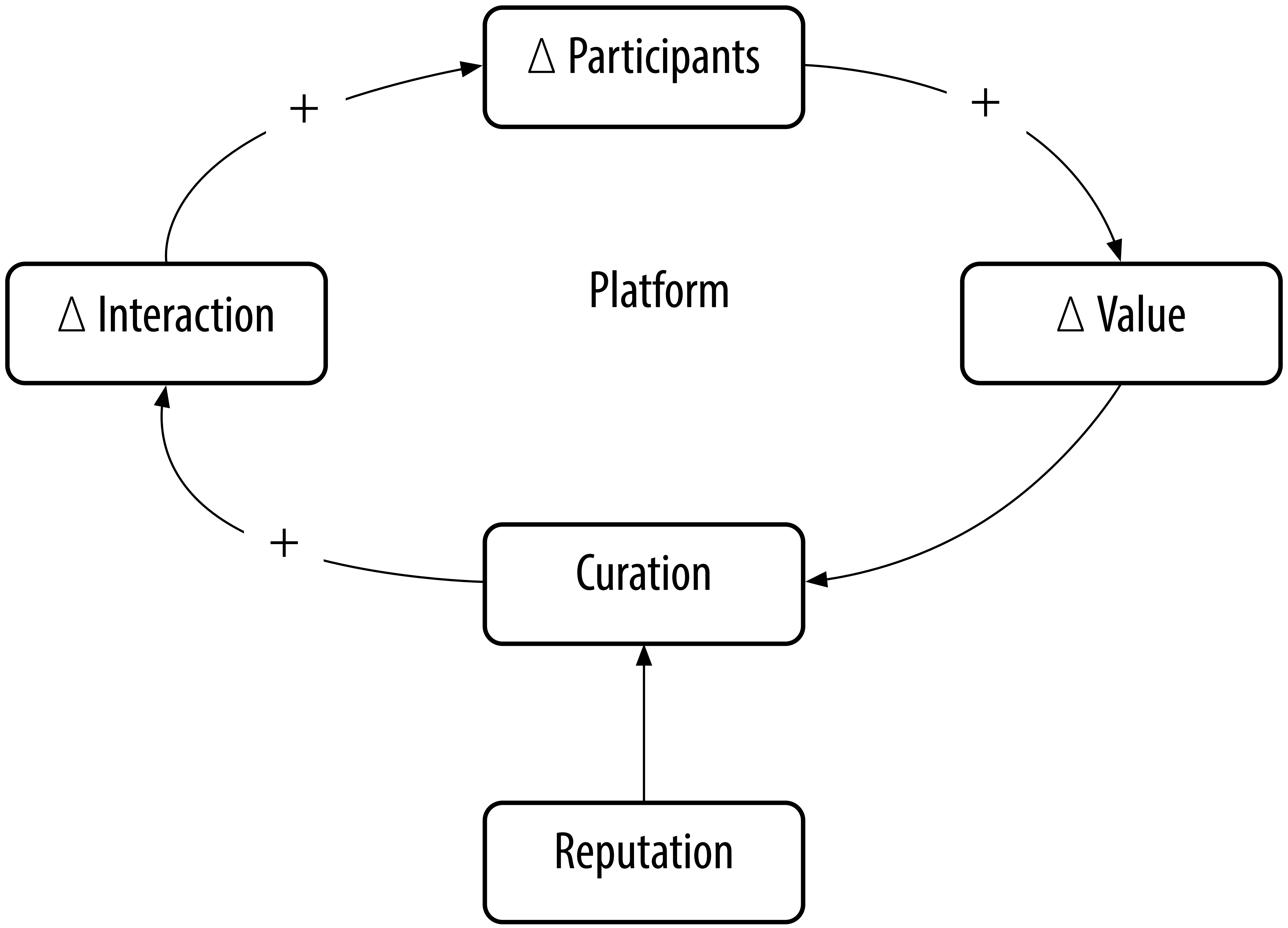
Enhances positive cross-side network effects

Essential enabling capability for any platform

Curation is applied reputation



Reputation Based Curation



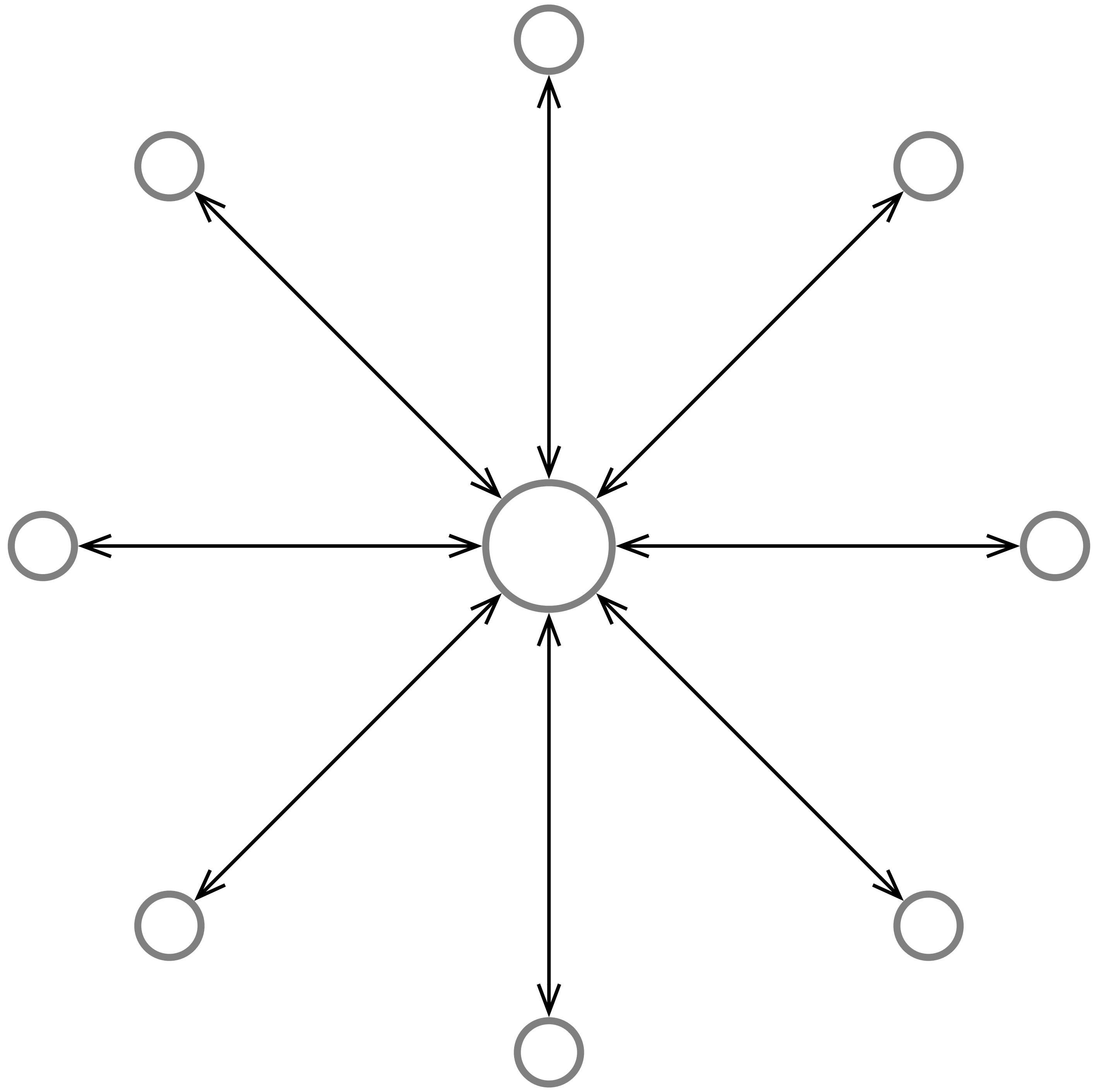
Verifiable Credentials are a form of reputation.

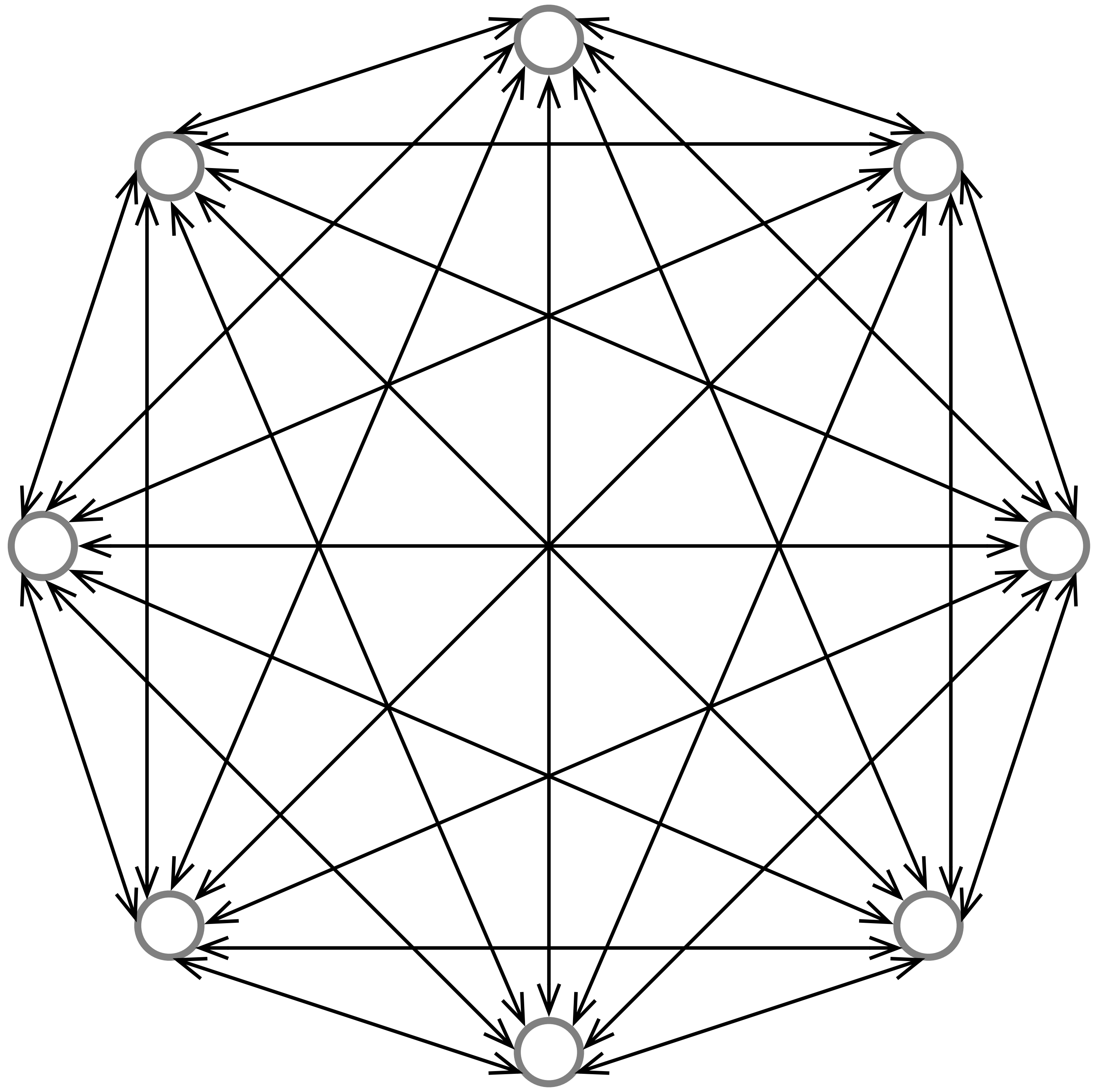
Its all about reducing trust transaction costs!

Networks Effects

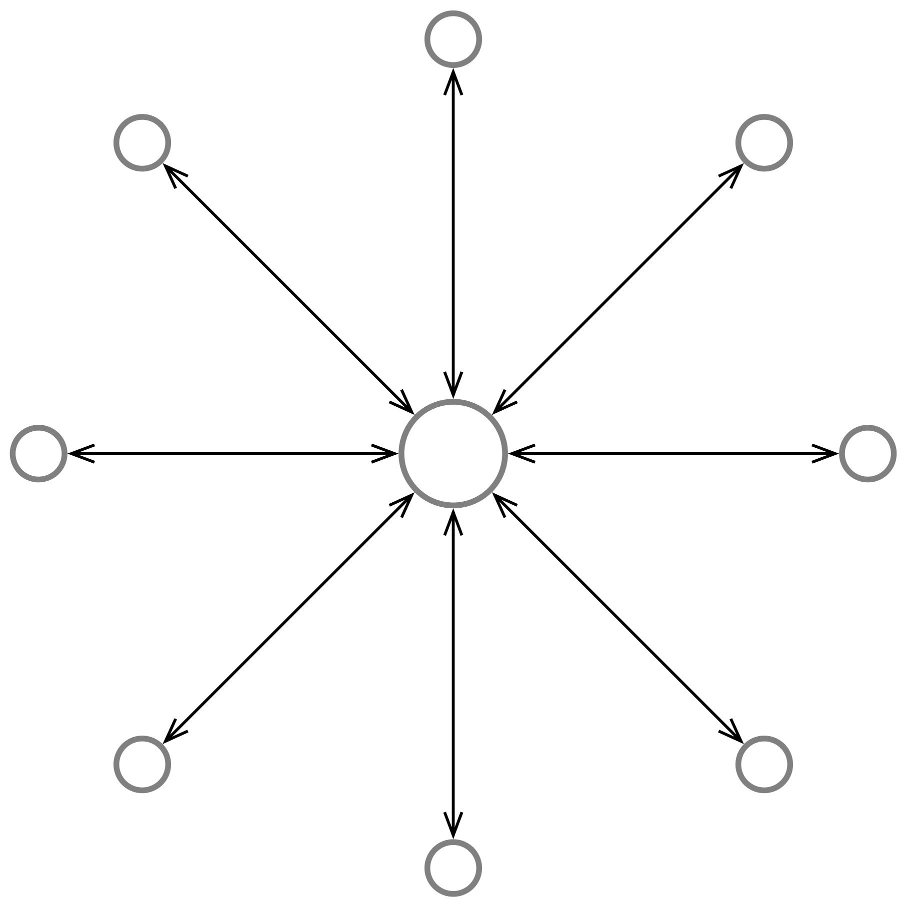
Network scaling law describes how some property of the network changes as a function of the size of the network.

Platform networks: the relevant property is network value and the size is the number of participants.





Network Value



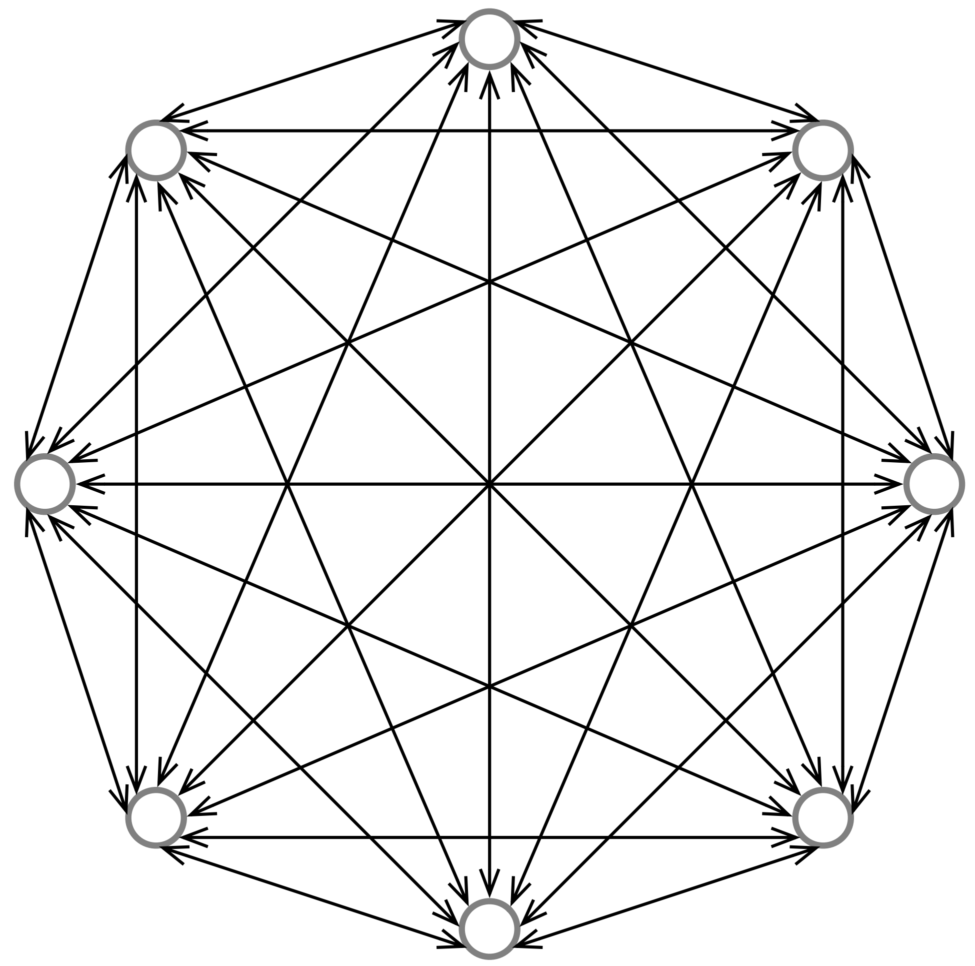
$v_i = b_i$

$b = \sum_i b_i / N$

$v = b$

$V = b \cdot N$

Sarnoff's Law



$v_i = a_i \cdot N$

$a = \sum_i a_i / N$

$v = a \cdot N$

$V = a \cdot N^2$

Metcalfe's Law

Properties that Scale with Size

Reach, Affinity, Optionality

$$a_i = 0.001 \cdot 0.02 \cdot \$\,50.00 = \$\,0.0001 = \$\,10^{-4} \text{ per day.}$$

$$v_i = a_i \cdot N = \$\,10^{-4} \cdot N \text{ per day.}$$

$$v_i = \$\,10^{-4} \cdot 10^{6} = \$100 \text{ per day.}$$

$$V = a \cdot N \cdot N = \$\,100 * 10^{6} = \$10^{8} = \$100 \text{ million per day}$$

$$0.001 \cdot \$100 \text{ million per day} = \$100{,}000 \text{ per day}$$

Critical Network Size

$$a \cdot N = c$$

$$N = c/a$$

Metcalfe's Law Empirical?

Briscoe B., A. Odlyzko and B. Tilly, "Metcalfe's law is wrong-communications networks increase in value as they add members-but by how much," *IEEE Spectrum*, vol. 43, no. 7, pp. 34–39, 2006

$$v = a \cdot \log N$$

$$V = a \cdot N \cdot \log N$$

BOT's Law

$$V = a \cdot 2^N$$

Reed's Law

$$V = a \cdot N^3$$

KK's Law

Metcalfe’s Law Validation

Madureira A., F. den Hartog, H. Bouwman *et al.*, “Empirical validation of Metcalfe’s law: How Internet usage patterns have changed over time,” *Information Economics and Policy*, vol. 25, no. 4, pp. 246–256, 2013

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Cooperating Networks

What happens if two competing networks combine so that the combined network has a larger N than either network on its own?

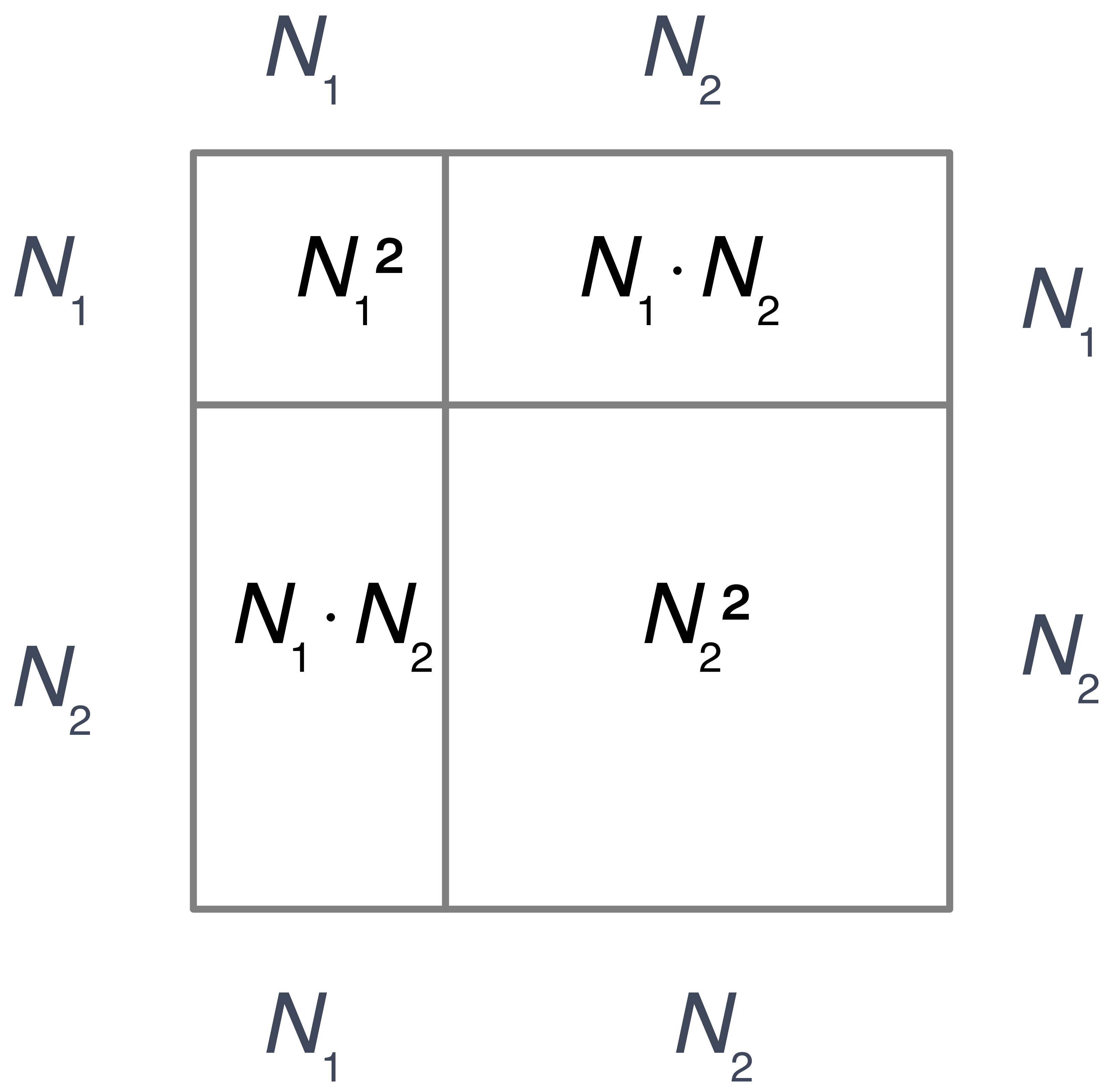
$$v_1 = v_2 = a \cdot (N_1 + N_2)$$

$$V_1 = a \cdot N_1 \cdot (N_1 + N_2) = a \cdot N_1^2 + a \cdot N_1 \cdot N_2$$

$$V_2 = a \cdot N_2 \cdot (N_1 + N_2) = a \cdot N_2^2 + a \cdot N_1 \cdot N_2$$

$$V = V_1 + V_2 = a \cdot N_1^2 + 2 \cdot a \cdot N_1 \cdot N_2 + a \cdot N_2^2 = a \cdot (N_1 + N_2)^2$$

$$a \cdot N_1 \cdot N_2.$$



Cooperating Network Lifetime Value

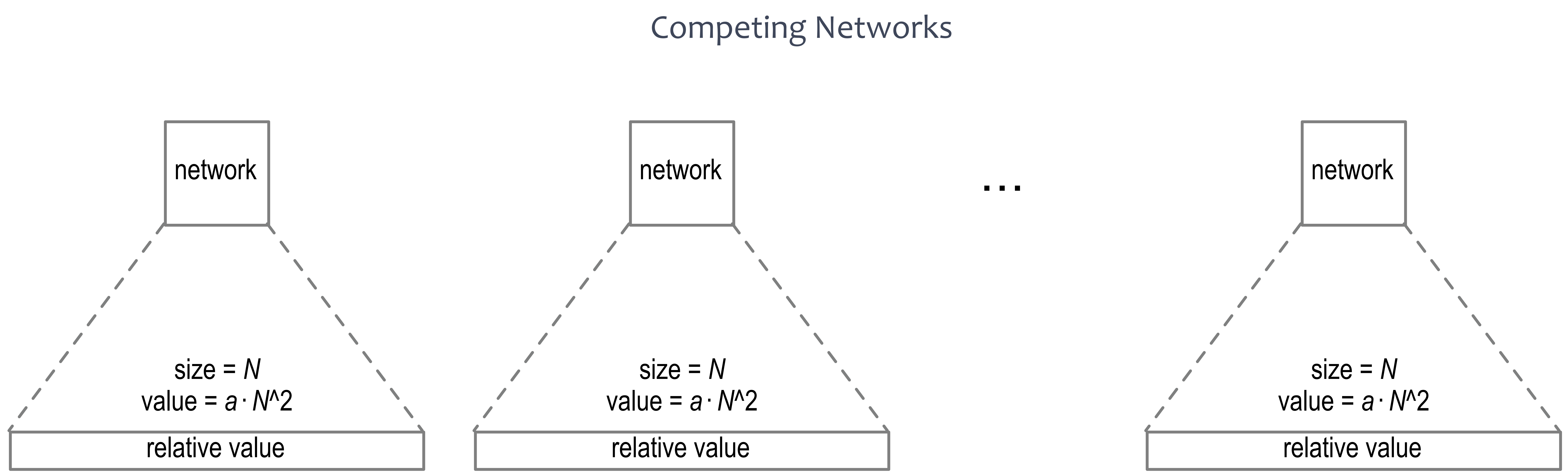
Xie, J. and Sirbu, M., “Price competition and compatibility in the presence of positive demand externalities,” *Management science*, vol. 41, no. 5, pp. 909-926, 1995

When the two networks are symmetric then it is always more profitable for both to combine.

When the two networks are asymmetric then it is always more profitable for the smaller network to combine.

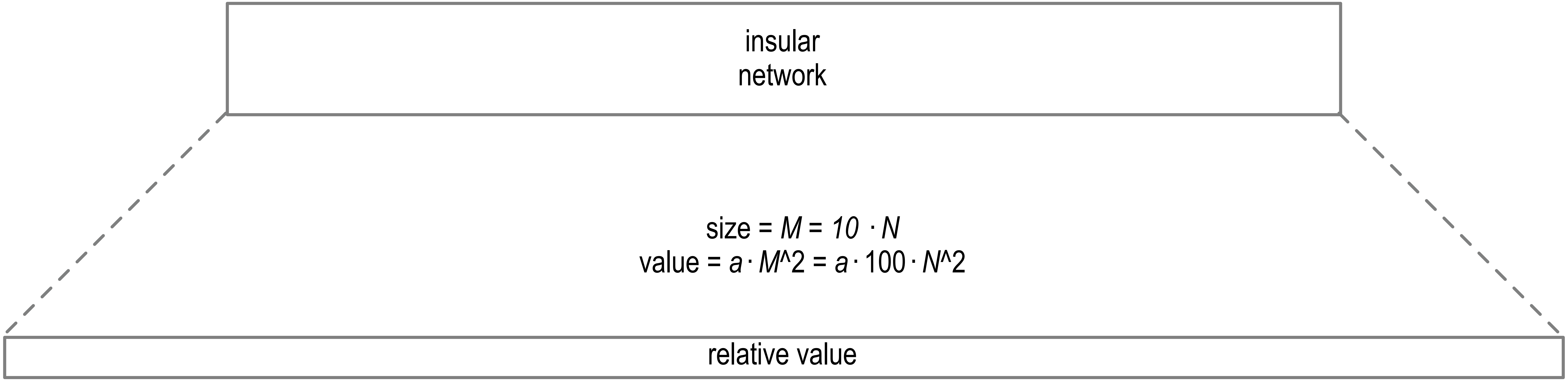
When the two networks are asymmetric and when the larger network’s size is below a threshold then it is also always more profitable for the larger network to combine.

Small Network Strategy



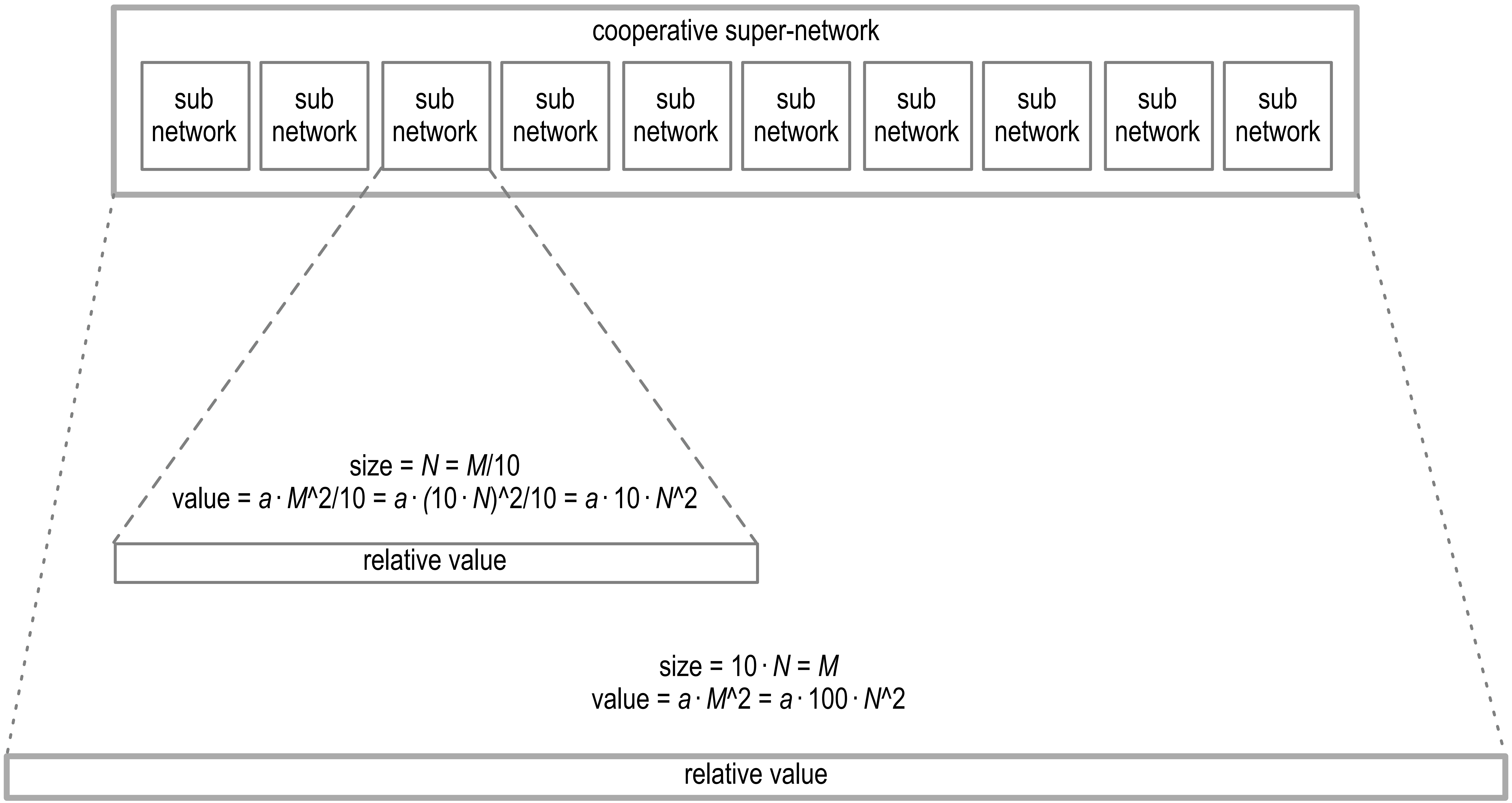
Big Network

Winner Take All Network



Network of Networks Effects

Cooperating Network of Networks



Cooperative Network of Networks Effect

$$V(N{:}M)/V(N) = ((N/M)\cdot a\cdot M^2)/(a\cdot N^2) = M/N$$

$$V(N{:}M) = (M/N)\cdot V(N)$$

The network effect resulting from a platform (sub-network) joining a meta-platform (super-network) is that the platform's (sub-network's) value is increased by the ratio of meta-platform (super-network) to platform (sub-network) size.

Meta-Platforms Will Eat Platforms

Trans-contextual Cooperating Networks

We can model this transitivity effect with an average transitivity factor, *t*.

This factor, *t*, ranges between 0 and 1, that is, $0 \leq t \leq 1$.

When *t*, is 0 then, on average, none of the value is transitive from one platform to another.

When *t* is 1 then, on average, all of the value is transitive from one platform to another.

$$v_1 = a_1 \cdot N_1 + t_{12} \cdot a_2 \cdot N_2 \qquad v_2 = t_{21} \cdot a_1 \cdot N_1 + a_2 \cdot N_2$$

$$V_1 = N_1 \cdot v_1 = N_1 \cdot (a_1 \cdot N_1 + t_{12} \cdot a_2 \cdot N_2) = a_1 \cdot N_1^2 + t_{12} \cdot a_2 \cdot N_1 \cdot N_2$$

$$V_2 = N_2 \cdot v_2 = N_2 \cdot (t_{21} \cdot a_1 \cdot N_1 + a_2 \cdot N_2) = t_{21} \cdot a_1 \cdot N_1 \cdot N_2 + a_2 \cdot N_2^2$$

$$V = V_1 + V_2 = a_1 \cdot N_1^2 + t_{12} \cdot a_2 \cdot N_1 \cdot N_2 + t_{21} \cdot a_1 \cdot N_1 \cdot N_2 + a_2 \cdot N_2^2$$

$$V = a \cdot N_1^2 + 2 \cdot a \cdot N_1 \cdot N_2 + a \cdot N_2^2 = a \cdot (N_1 + N_2)^2$$

Matrix Form

$$\mathbf{s} = \begin{bmatrix} a_1 N & a_2 N_2 & \dots & a_m N_m \end{bmatrix}$$

$$\mathbf{T} = \begin{bmatrix} t_{11} & t_{12} & \dots & t_{1m} \\ t_{21} & t_{22} & \dots & t_{2m} \\ \vdots & \vdots & \ddots & \vdots \\ t_{m1} & t_{m2} & \dots & t_{mm} \end{bmatrix} \qquad t_{ij} = 1\Big|_{i=j}$$

$$\mathbf{v} = \begin{bmatrix} v_1 & v_2 & \dots & v_m \end{bmatrix}$$

$$\mathbf{v}^{\mathrm{T}} = \mathbf{T} \cdot \mathbf{s}^{\mathrm{T}}$$

$$\mathbf{n} = \begin{bmatrix} N_1 & N_2 & \dots & N_m \end{bmatrix}$$

$$V = \mathbf{n} \cdot \mathbf{v}^{\mathrm{T}} = \mathbf{n} \cdot \mathbf{T} \cdot \mathbf{s}^{\mathrm{T}}$$

$$\mathbf{M} = \begin{bmatrix} t_{11}N_1 & t_{12}N_1 & \dots & t_{1m}N_1 \\ t_{21}N_2 & t_{22}N_2 & \dots & t_{2m}N_2 \\ \vdots & \vdots & \ddots & \vdots \\ t_{m1}N_m & t_{m2}N_m & \dots & t_{mm}N_m \end{bmatrix} \qquad t_{ij}$$

$$\mathbf{V} = \begin{bmatrix} V_1 & V_2 & \dots & V_m \end{bmatrix}$$

$$\mathbf{V}^{\mathrm{T}} = \mathbf{M} \cdot \mathbf{s}^{\mathrm{T}}$$

$$V = \sum_{i=1}^{m} V_i$$

Examples of Meta-Platforms

concept of meta-platform is relative

yesterday's meta-platforms are today's platforms

key is identifying tomorrow's meta-platforms

Yesterday:

Money

Public Markets

Governments and Quasi-Government Institutions

Today:

Internet

Search

Social

Tomorrow:

Decentralized Identity and Reputation

Decentralized Algorithmically Governed Institutions

Decentralized Algorithmically Regulated Marketplaces

Decentralized Autonomic Services

Portable Identity

(Trustworthy, Private Preserving, Self-Sovereign)

Security, Privacy, Agency

Portable Identifiers & Attributes

Decentralized Root of Trust

Investment Strategy

Optionality 1/N Strategy

N competing investments

Cooperative Meta-platform 1/N Strategy

N cooperating investments

Conclusion

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