The Emergence of Outliers in Entrepreneurship:

A Rock Star Theory

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Kauffman Emerging Scholars Conference

OHIO UNIVERSITY
1804

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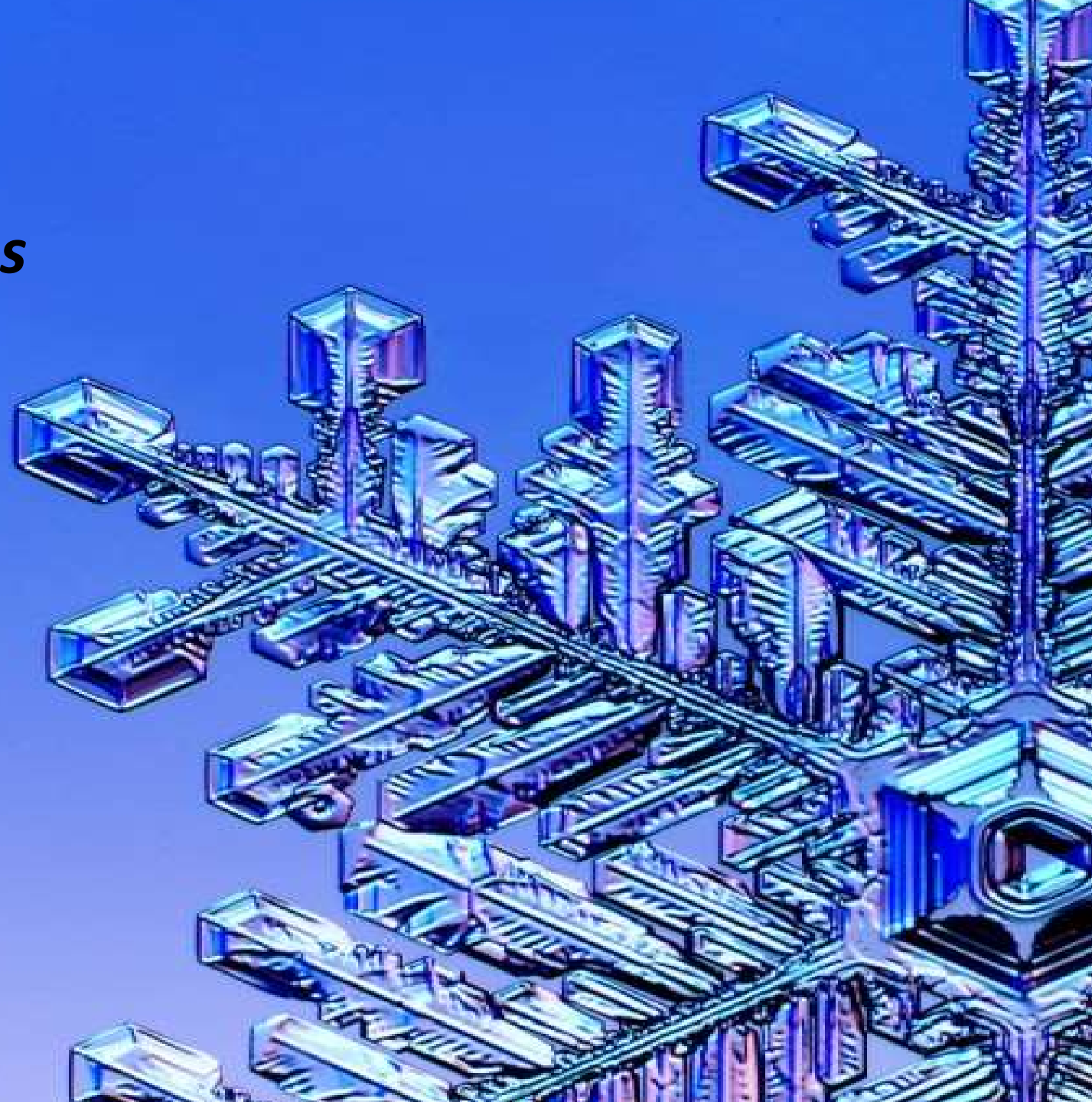
The real world is
controlled as much
by the tails of the distributions
as by the means or averages;
by the exceptional,
not the mean;
by the catastrophe,
not the steady drip;
by the very rich,
not the middle class.
We must free ourselves from
“average” thinking.

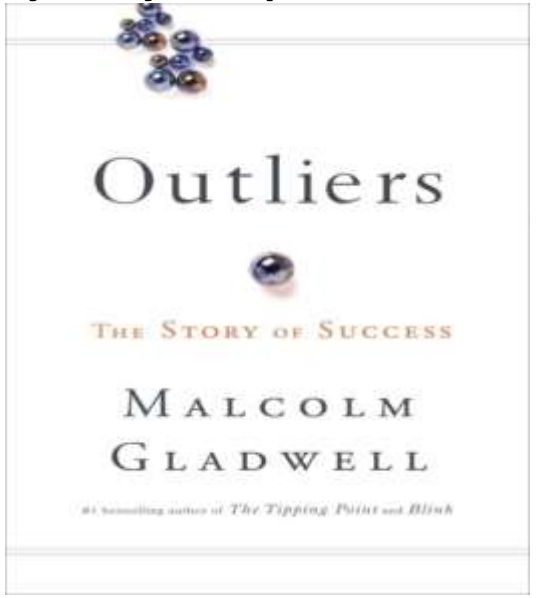
(Anderson, 1997:566)

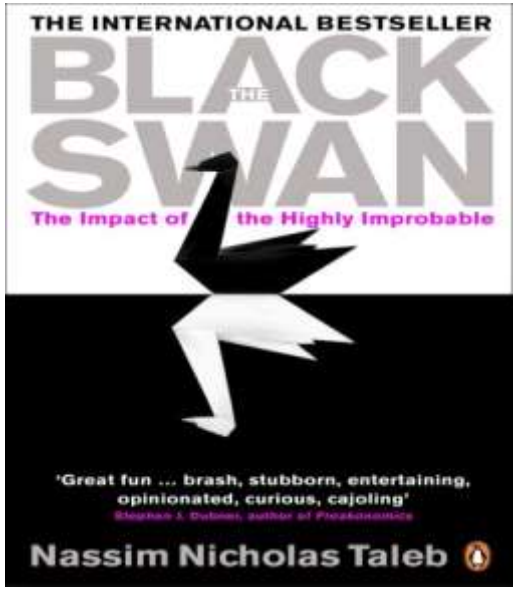


Outlier

Definition: outlier (noun)

1. *something that is situated away from or classed differently from a main or related body (M-W, 2011);*
2. *observation that is markedly different from the others of the sample;*
3. *unexpected, rare, unique attributes, dramatic impact with positive or negative consequences (Taleb, 2007);*
4. *outside everyday experience, where normal rules do not apply (Gladwell)*





What drives the emergence of outliers in social systems?

1. Foundations
2. Definitions
3. Constructs
4. Assumptions
5. Implications

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Power law distri
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3rd Benyamin B. Lichtenstein
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Last Bill Mckelvey
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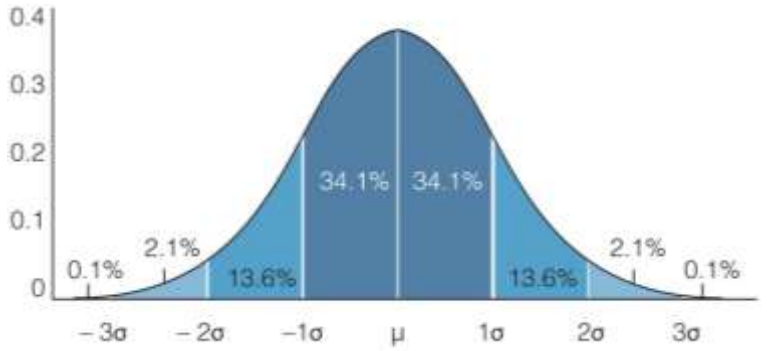
In entrepreneurship
—the domain of new order creation—
all inputs and all outcomes
are power law distributed.

Normal → Novel

1.



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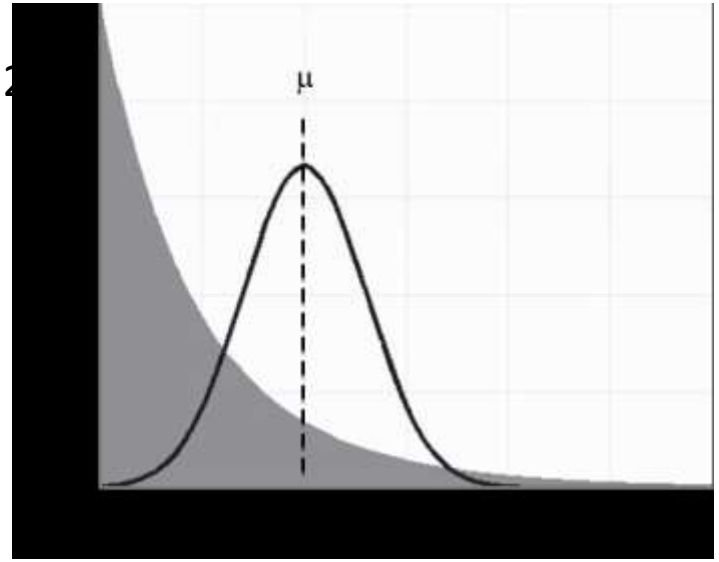

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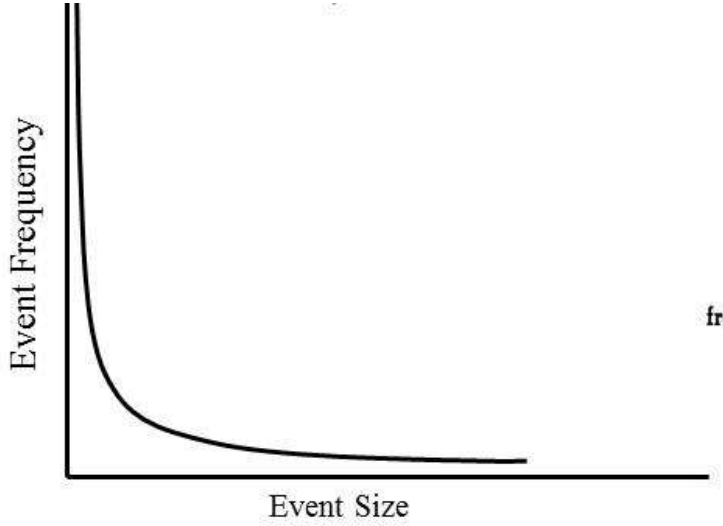

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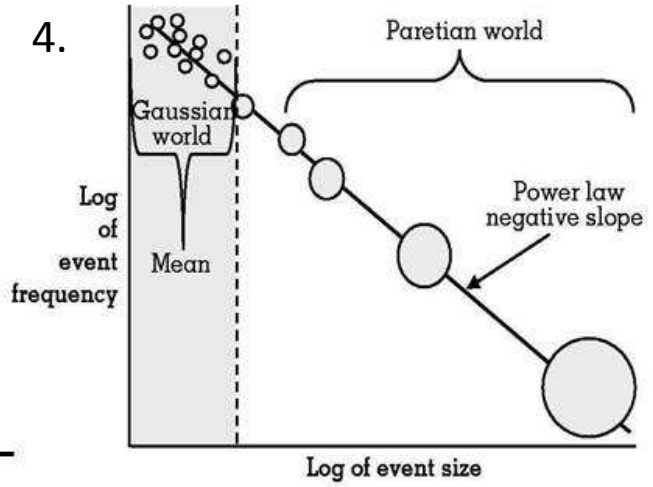

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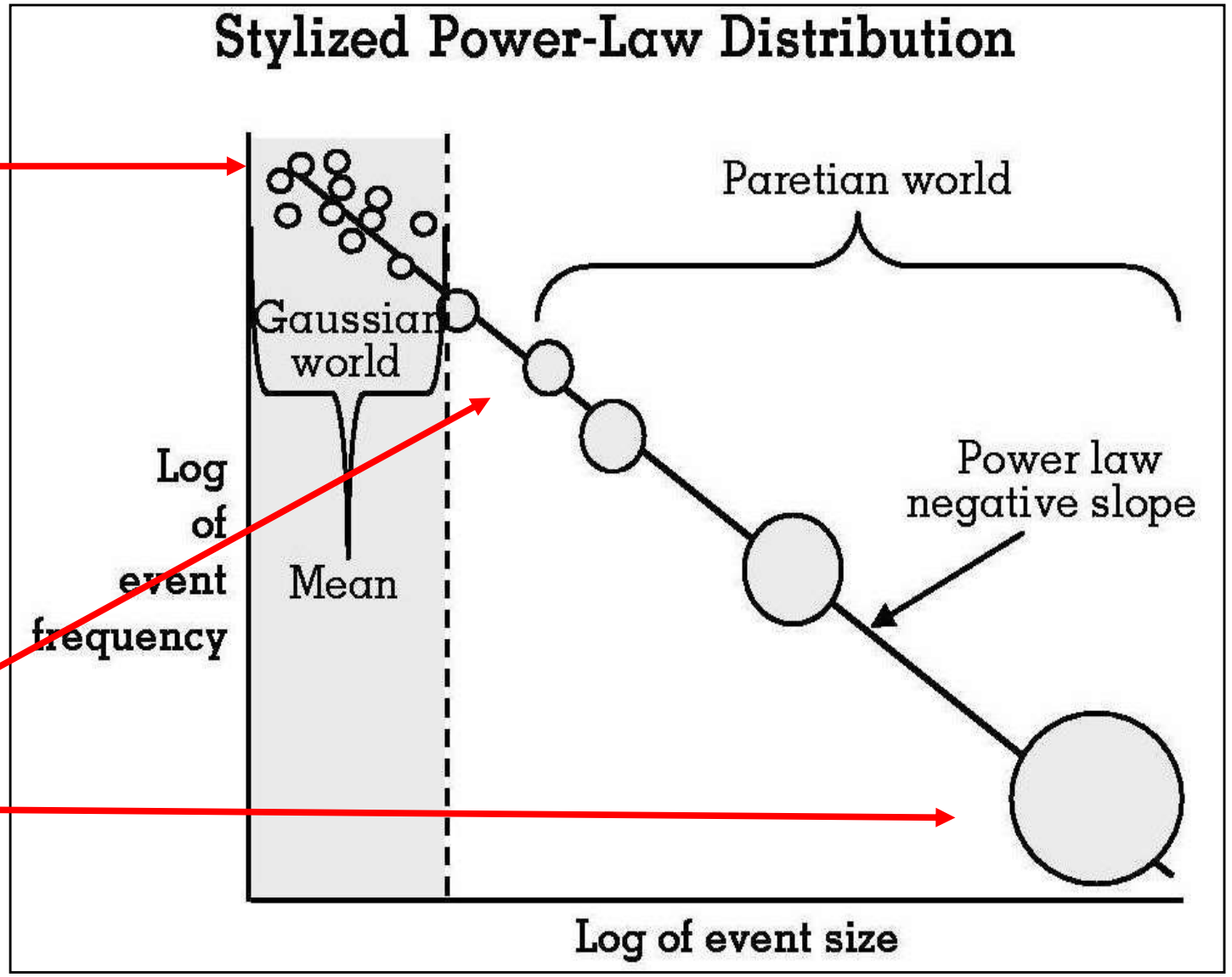
Outliers



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Outliers

The Story of Success

Malcom
Gladwell

#1 bestselling author of *The Tipping Point* and *Blink*

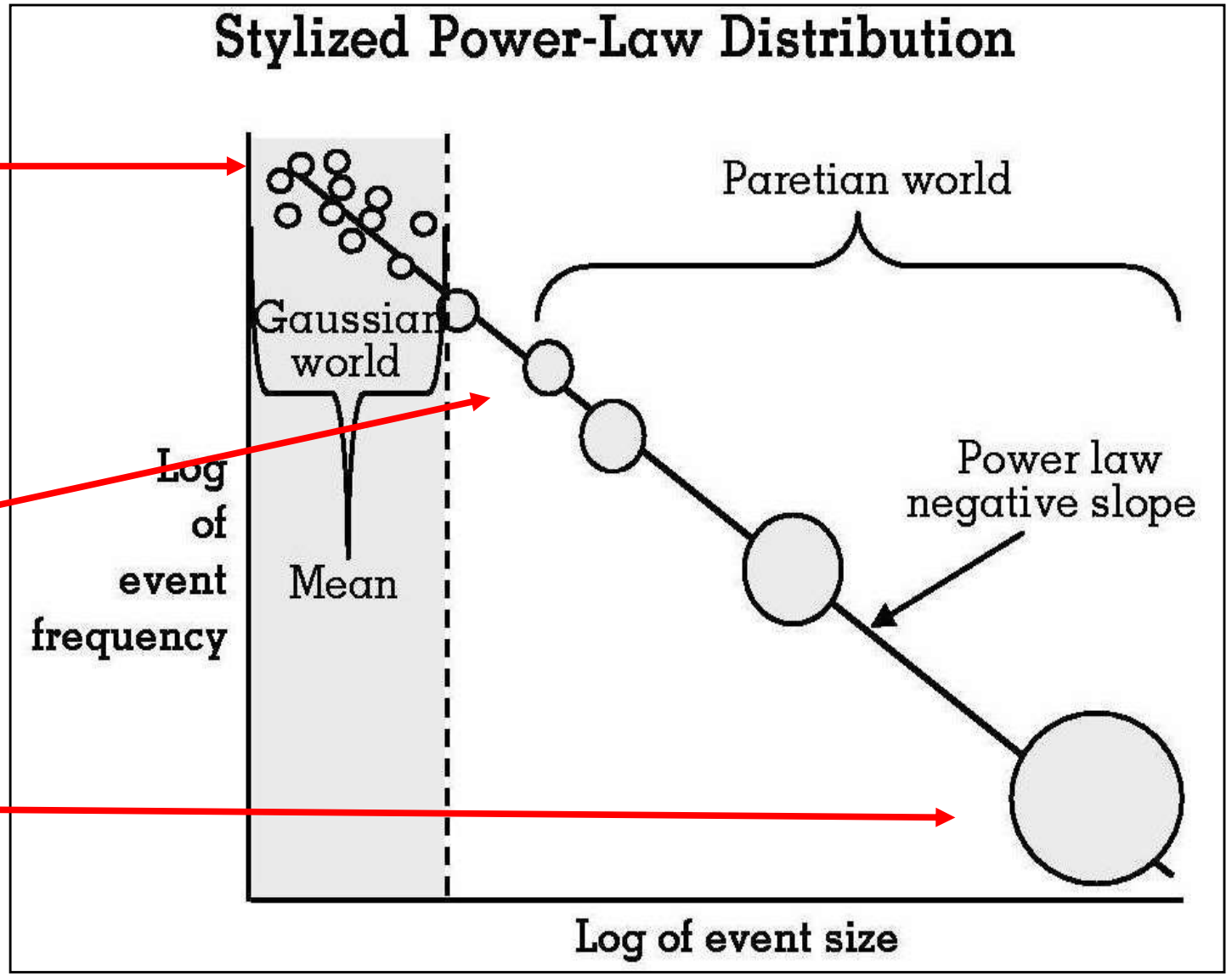
Little, Brown and Company

There are many more outliers in social systems than normal statistics would lead us to believe.

21M Mom & Pop retail stores with 0-5 employees

Target (347K)

Walmart (2.2M)



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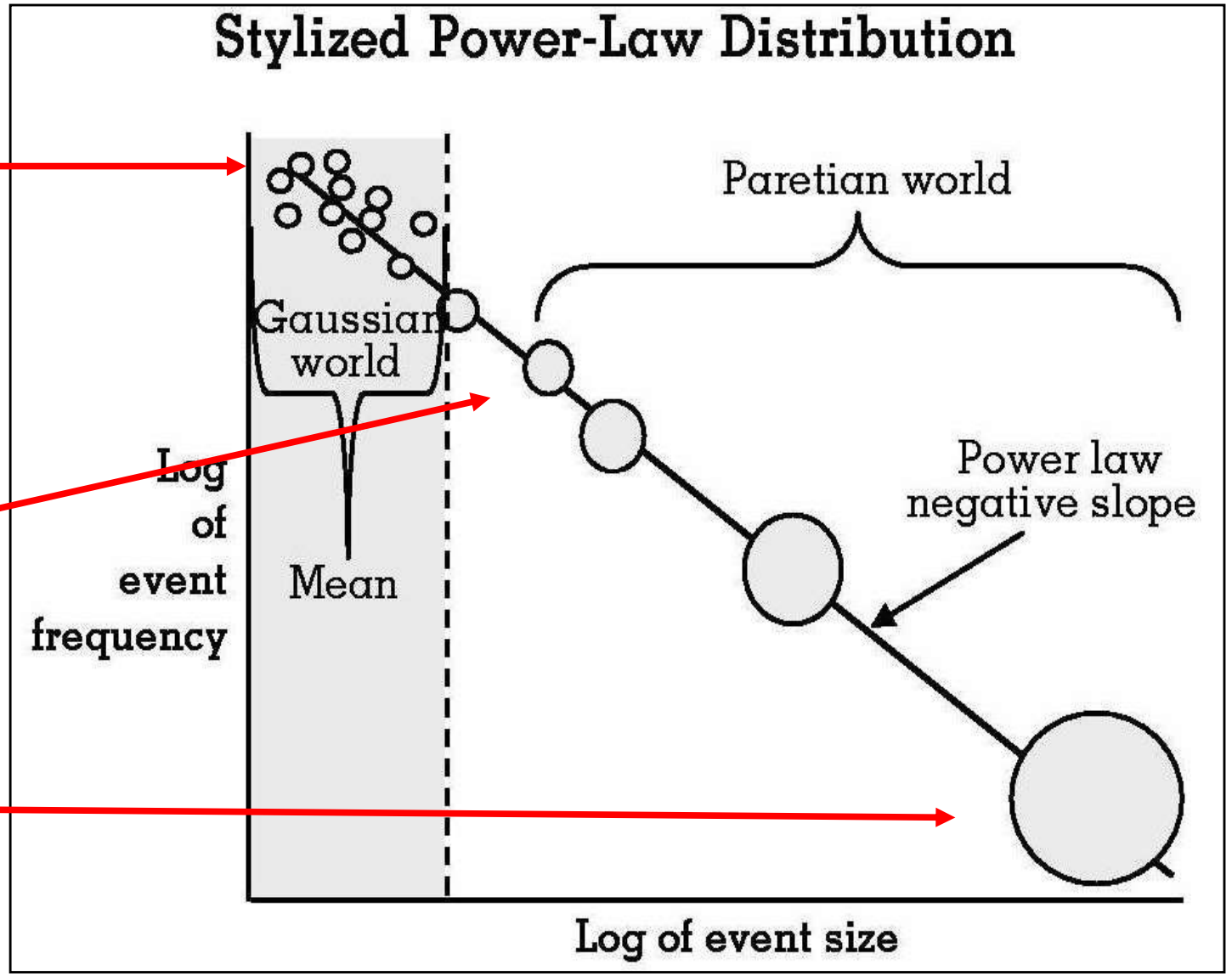
Stars

(Aguinis & O'Boyle, 2014)



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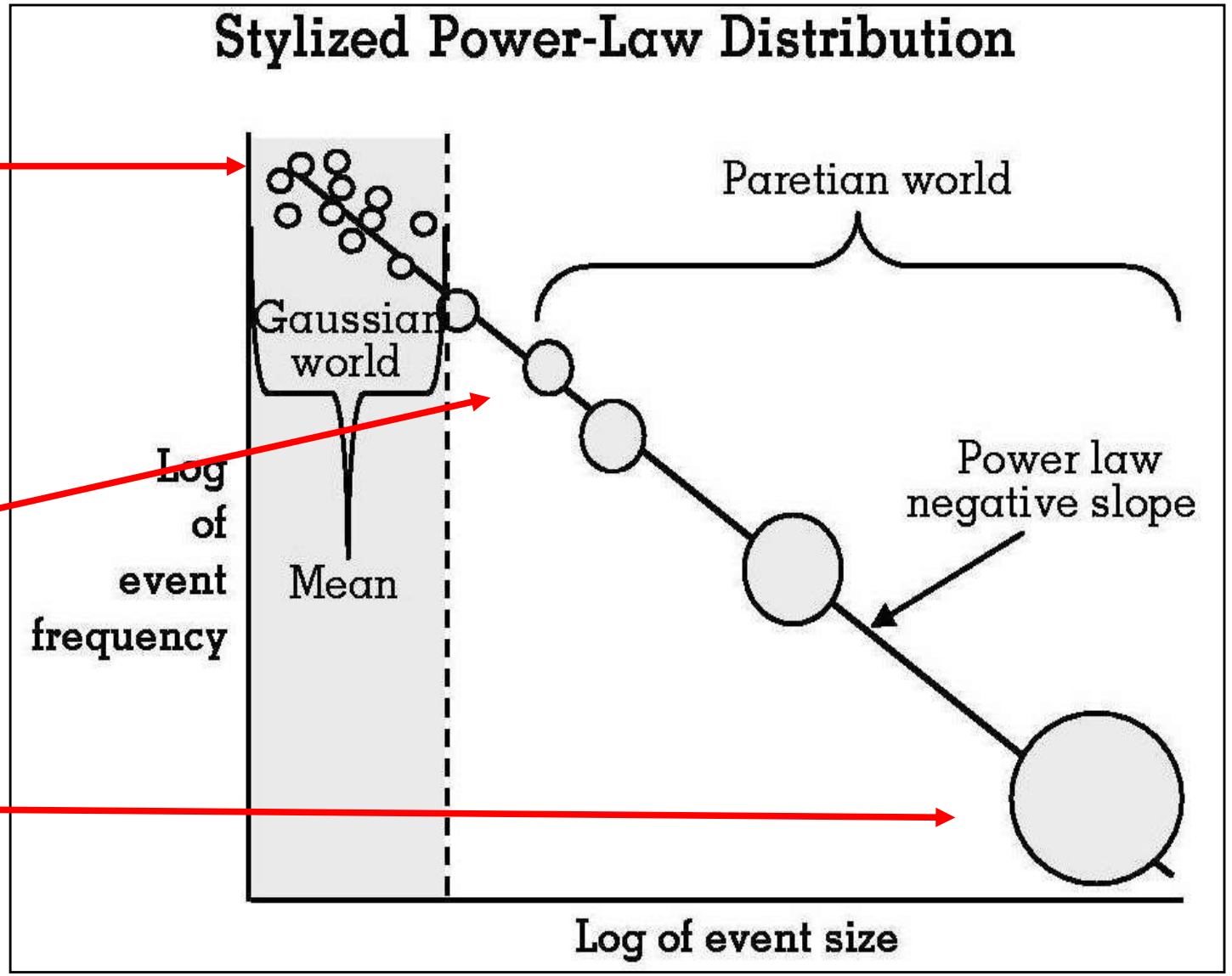
Movie Stars



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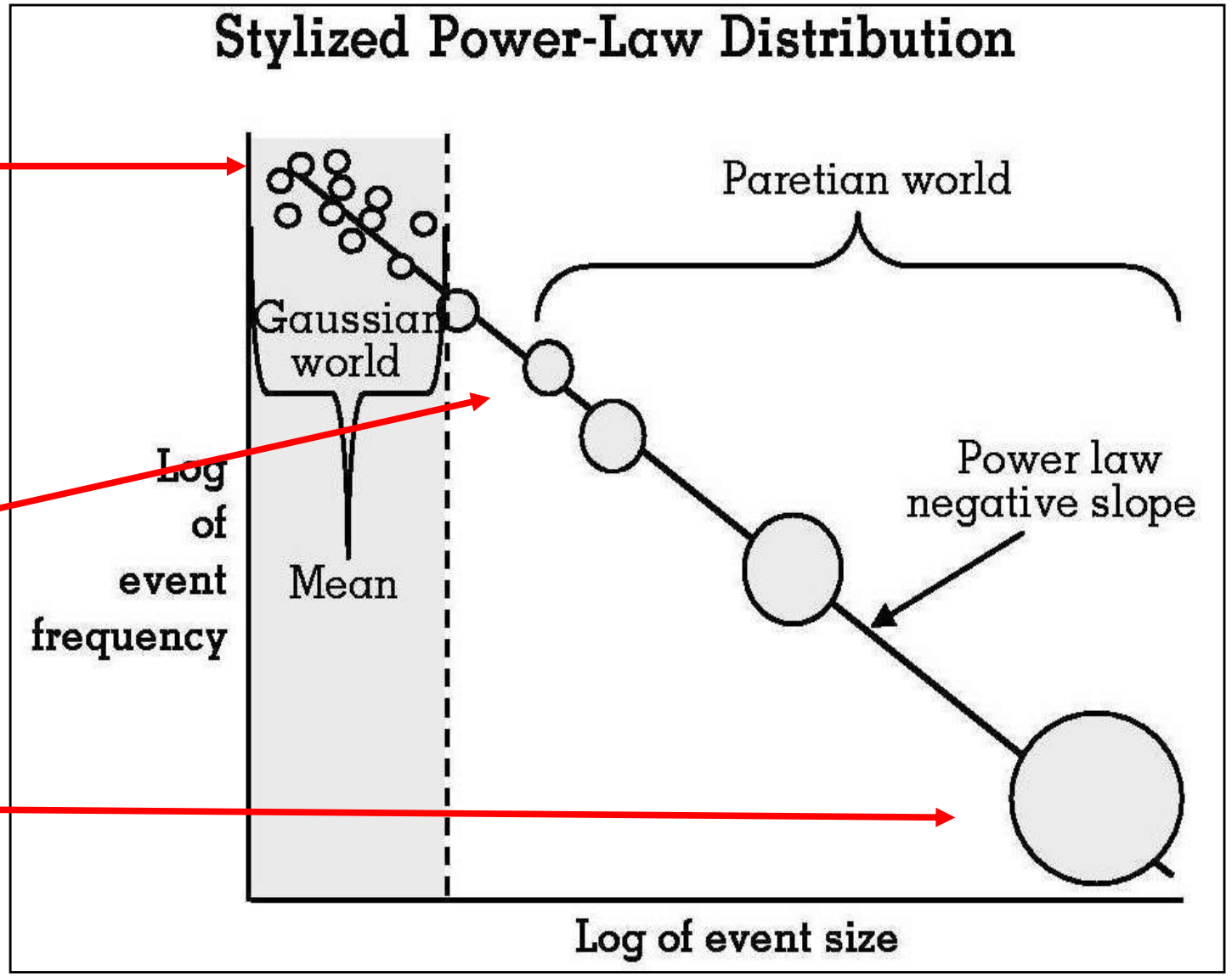
Porn Stars



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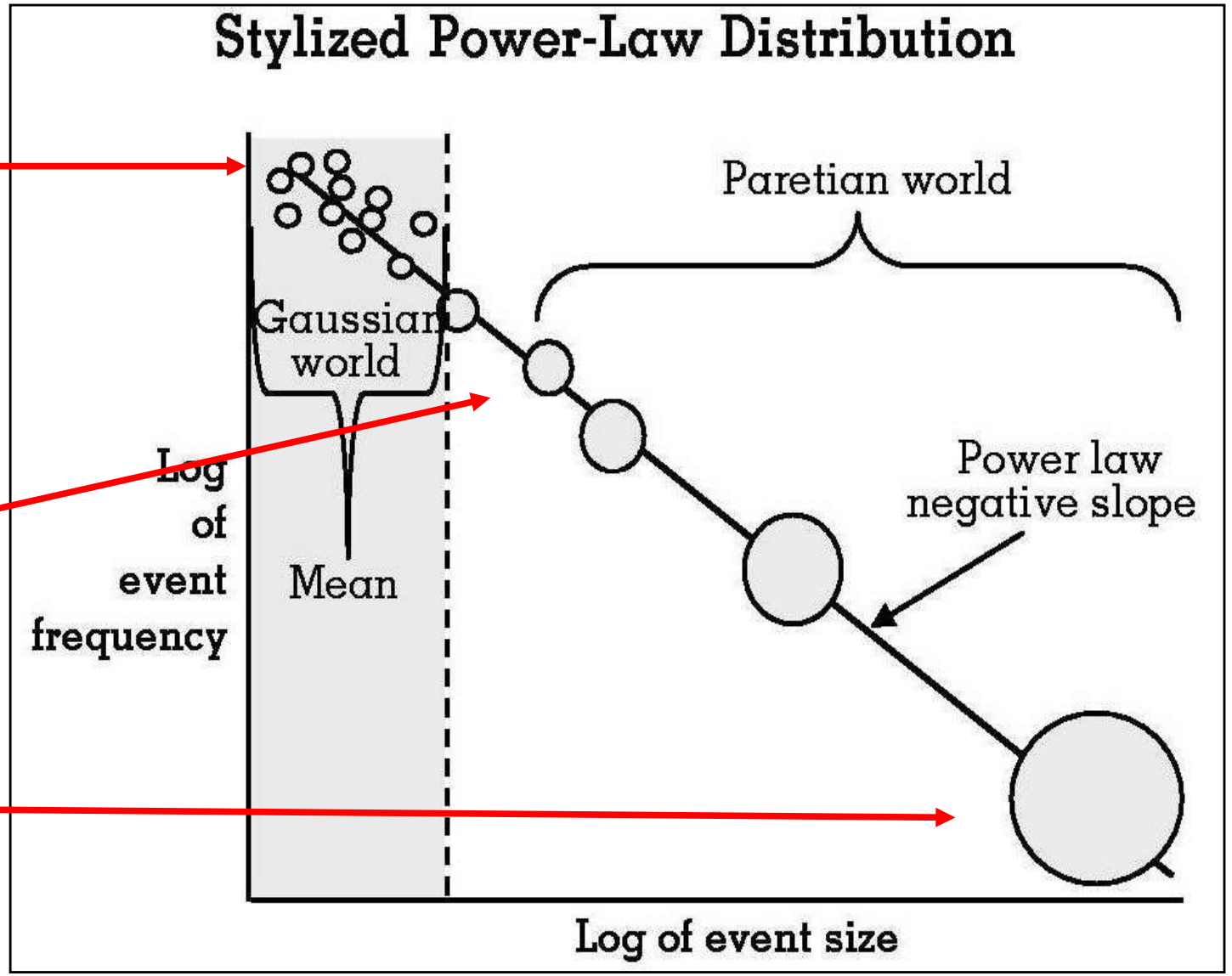
Political Stars



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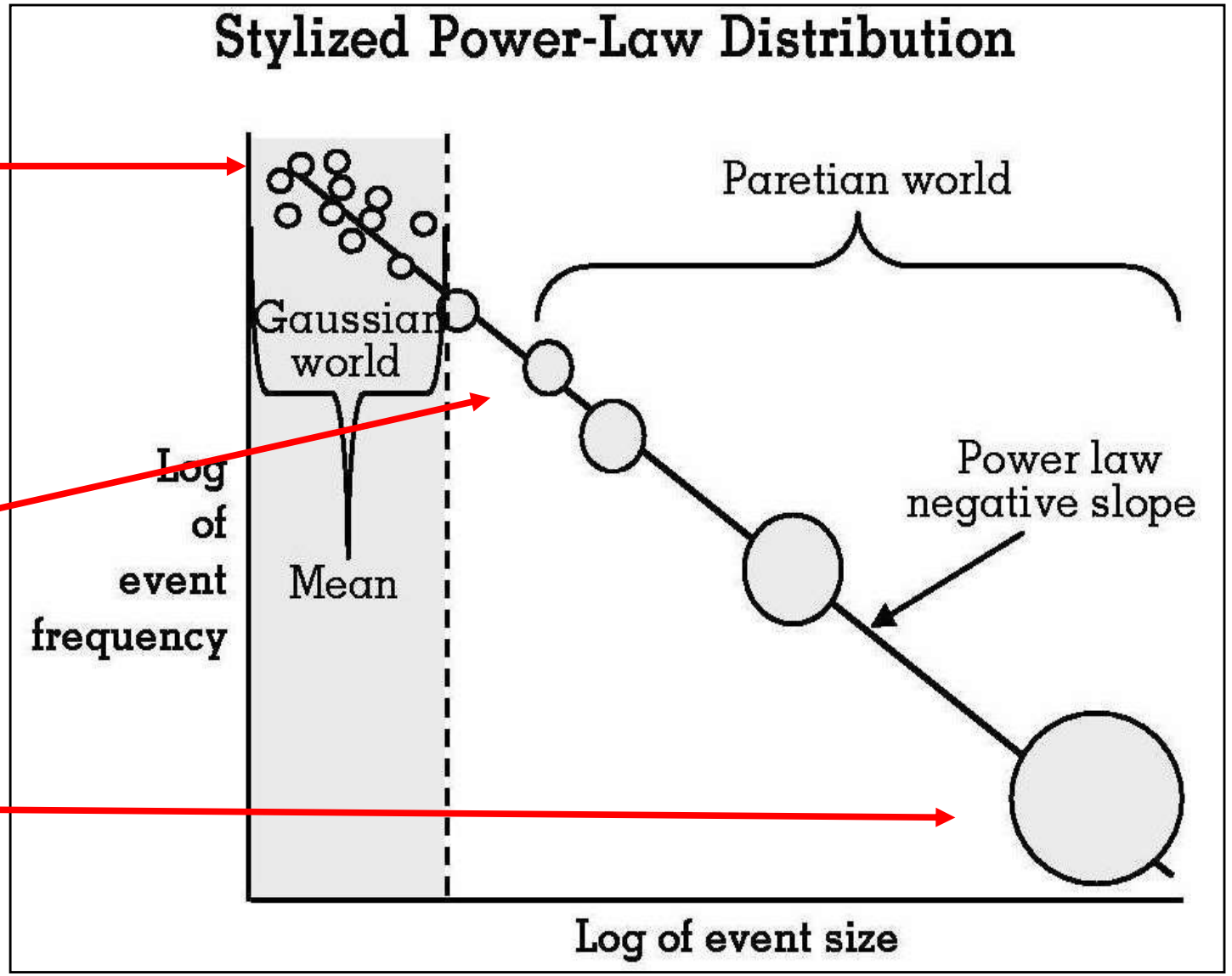
Rock Stars



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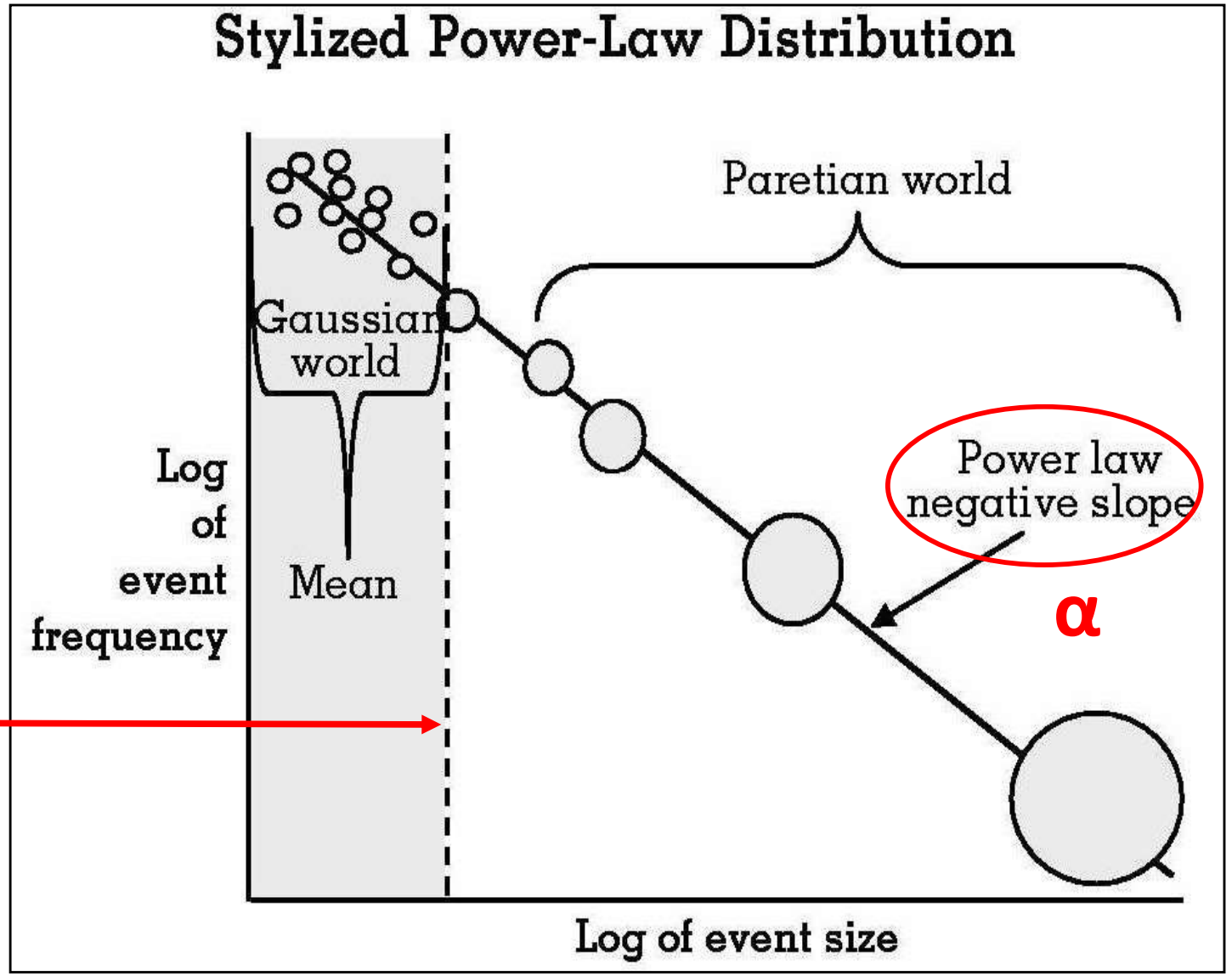
Critical threshold



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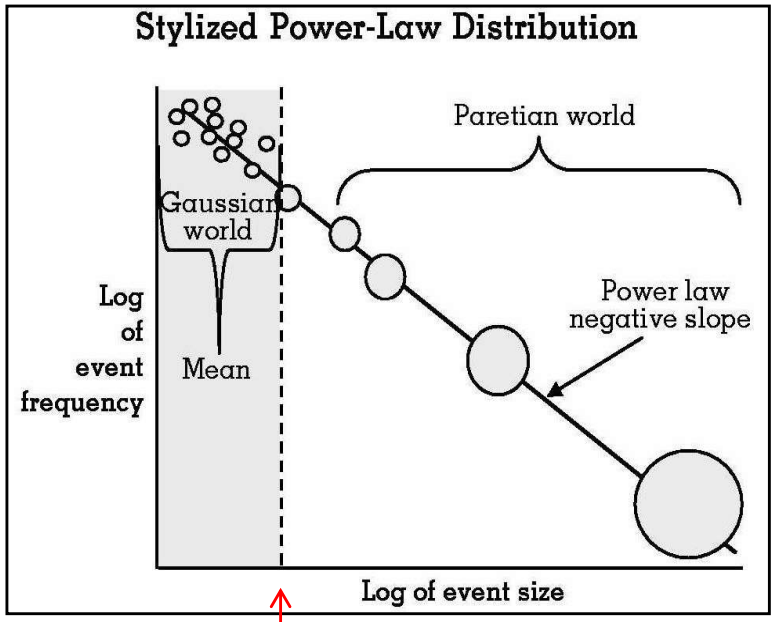
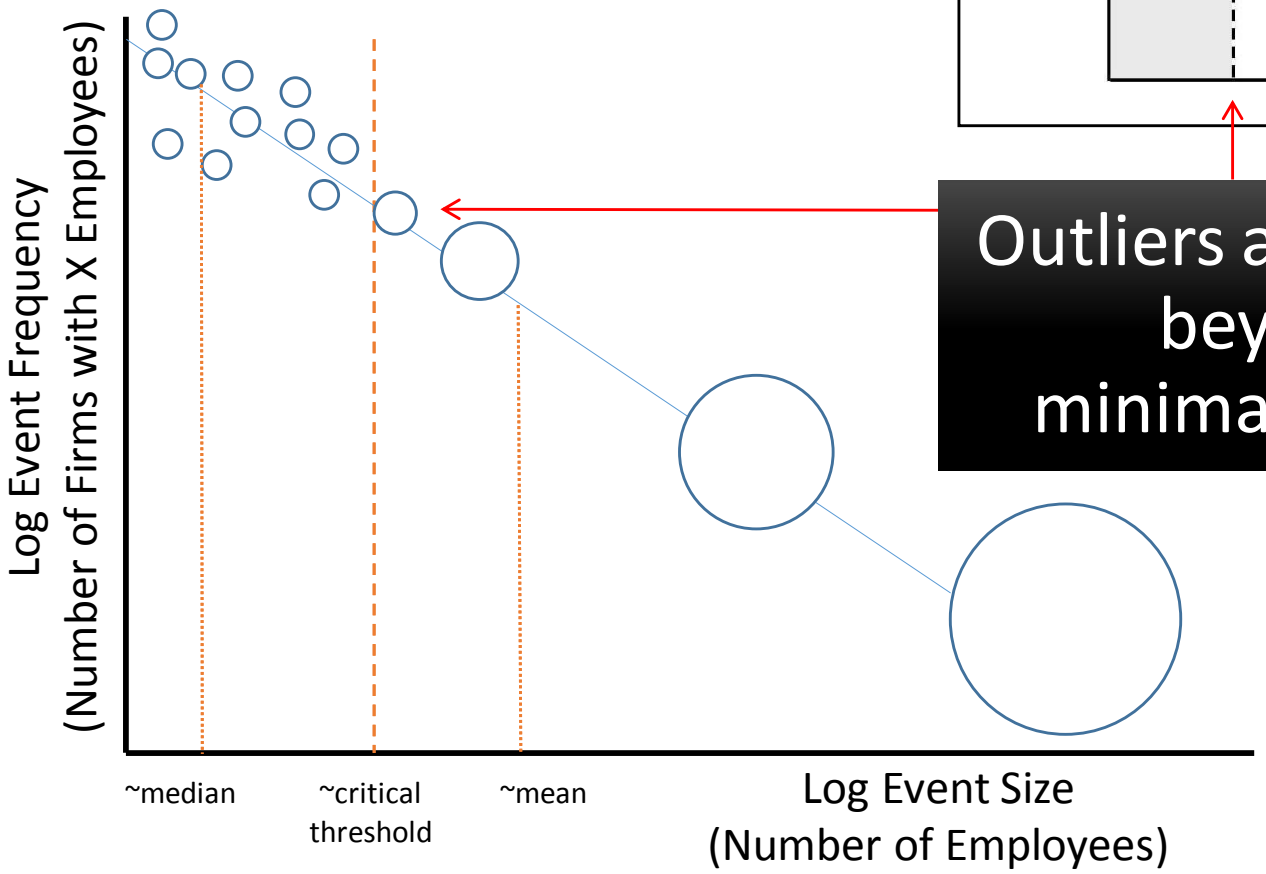
Critical Threshold
Tipping Point
Edge of Chaos
The Tip of the Power Law Tail





Outliers are observations beyond some minimal threshold (x_{min})

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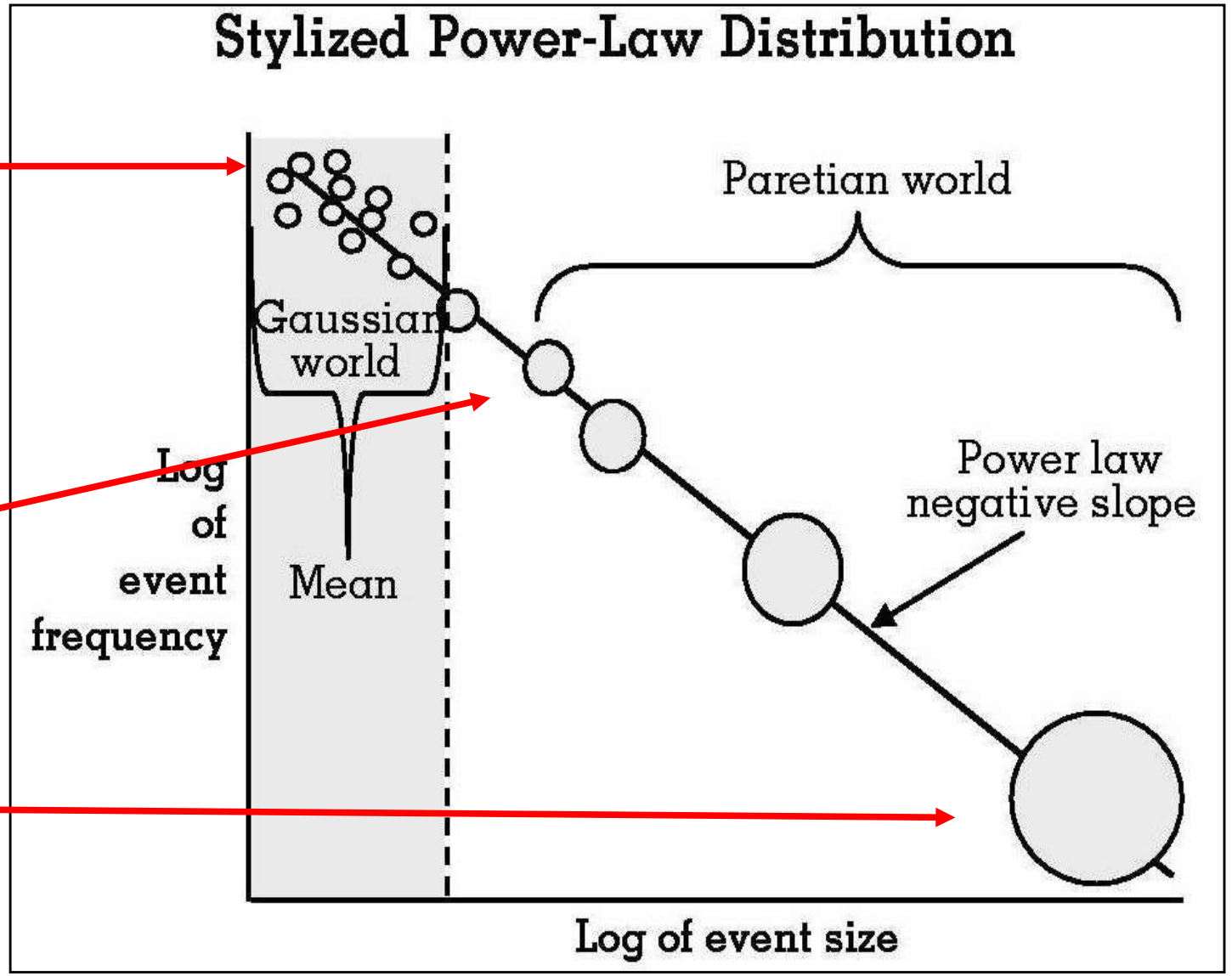
Outliers



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Outliers

The Story of Success

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Little, Brown and Company

The Beatles:
Removed Slide of Abbey Road Cover

N = 1 studies lack generalizability

N = 1 studies discount the significant influence of other outliers

Total Certified Units Sold

1. The Beatles: 269.5M
2. Elvis Presley: 210.8M
3. Rihanna: 198.6M
4. Michael Jackson: 181.1M
5. Madonna: 170M
6. Elton John: 166.9M
7. Led Zeppelin: 139.3M

This pattern indicates a heavily skewed, non-normal distribution:
A power law

Elvis Presley:
Removed Slide of B&W Concert Footage

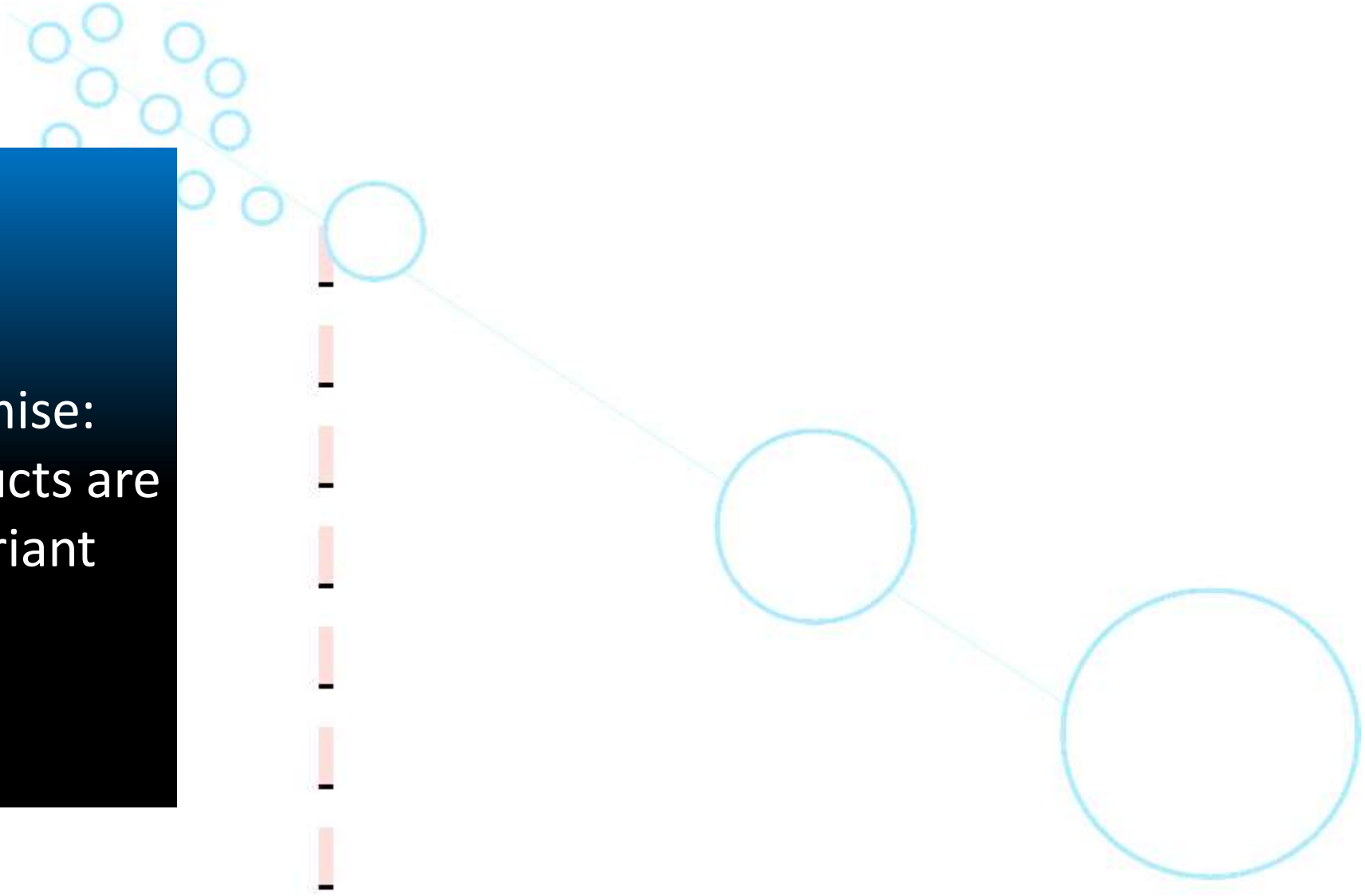
Identical power law distributions
in multiple domains
suggest universality—
same origin, mechanisms, and dynamics

PLDs require theory that is
is more abstract and generalizable

Meta-constructs

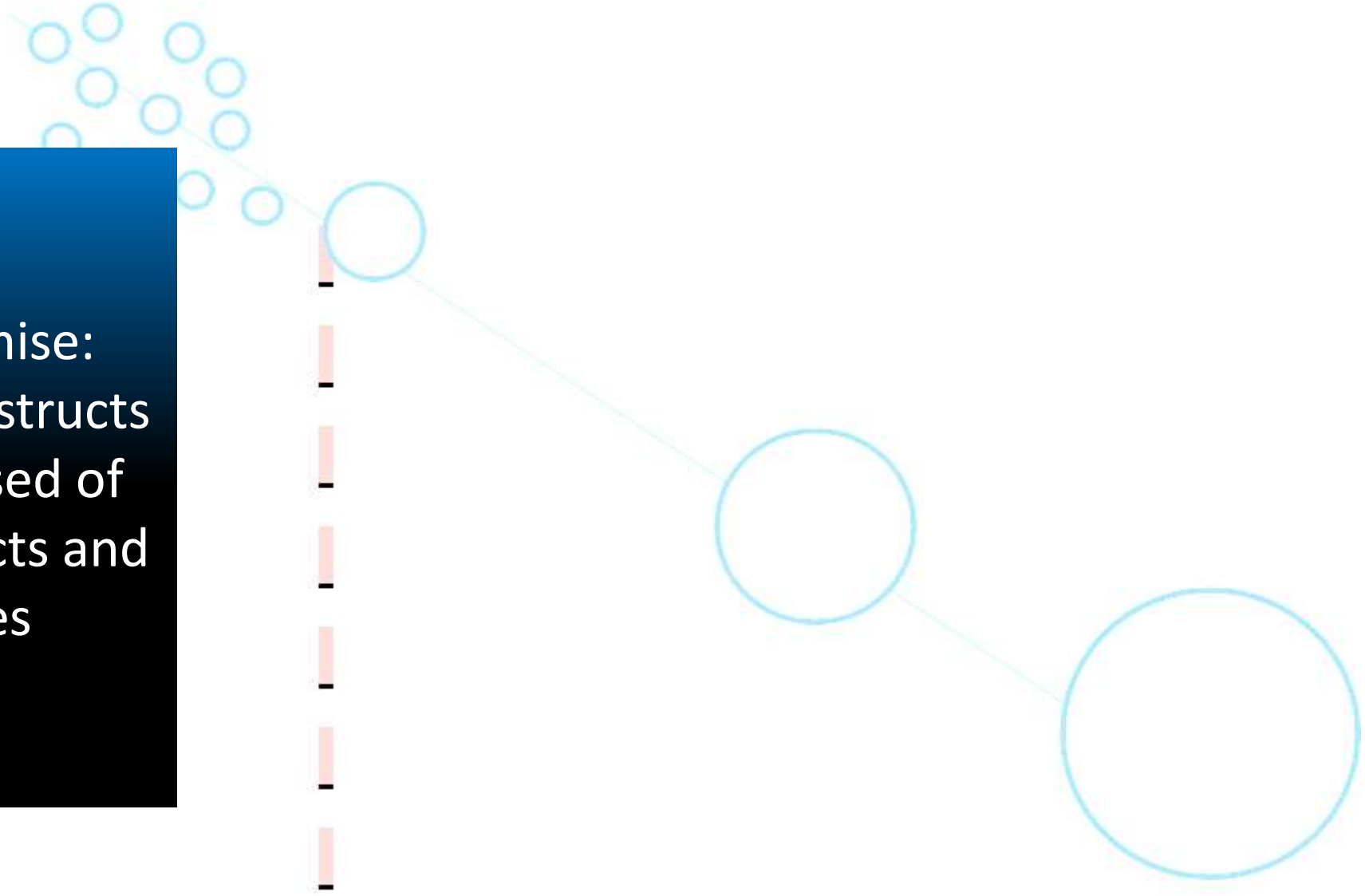
Rockstar Theory: Conceptual Framework

Basic premise: meta-constructs are scale-invariant



Rockstar Theory: Conceptual Framework

Basic premise:
all meta-constructs are composed of PLD constructs and variables



Empirical Support for Meta-constructs: PLD Inputs

Table 1
Descriptors of distributions of input and outcome variables used in theories of entrepreneurship.

	n	Mean	Med	Skew	sd	Min	Max	α	K-S
Input variables									
Resources: human capital									
Employees supervised[a]	1179	20	4	12	83	0	1500	2.12	0.07
Number of owners	1213	2	1	8	1	1	30	3.50	0.04
Owner(s) Education	1214	25	18	7	21	8	377	4.38	0.05
Team industry experience	1214	14	8	2	16	0	149	5.50	0.09
Previous ventures founded	1214	2	1	4	3	0	30	3.06	0.04
Resources: social capital									
Strong ties	1214	1	0	10	2	0	50	2.61	0.02
Weak ties	1190	2	1	5	2	0	25	2.86	0.05
Resources: financial capital ($000)									
Individual net worth	892	667	152	23	5810	0	153,000	2.44	0.04
Individual investment	1191	23	2	18	110	0	3000	2.11	0.07
Team investment[b]	1213	42	3	29	398	0	13,000	2.04	0.06
Venture debt	121	212	8	5	766	0	5000	1.55	0.09
Cognitions									
PSED expected Yr5 employees	1173	34	3	19	335	0	8500	1.75	0.07
CAUSEE expected 12 m employees[c]	700	9	1	26	133	0	3500	2.12	0.08
PSED expected Yr5 revenue ($000)	1105	31	10	14	2530	0.2	500,000	1.71	0.08
CAUSEE expected 12 m rev ($000)	1232	4141	100	14	35,124	0.06	700,000	1.53	0.06
Actions									
Total team activities	1214	2	7	1	4	0	51	3.50	0.09
Total team hours[d]	1211	1931	400	7	5681	0	73,000	2.16	0.07
Environment: industry sector ($000)									
Construction	84	20	8	3	34	6	1137	2.03	0.07
Retail	204	86	10	8	416	3	4000	2.20	0.05
Manufacturing[e]	233	96	11	7	403	3	3800	1.79	0.06
Consumer products & services	246	66	13	8	277	2	2900	1.74	0.04
Software	308	22	128	17	54	2	748	2.27	0.03
Business products & services	592	113	13	7	318	2	4600	1.49	0.06

Endowments

Empirical Support: PLD Inputs

Descriptors of distributions of input and outcome variables used in theories of entrepreneurs

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Input variables				
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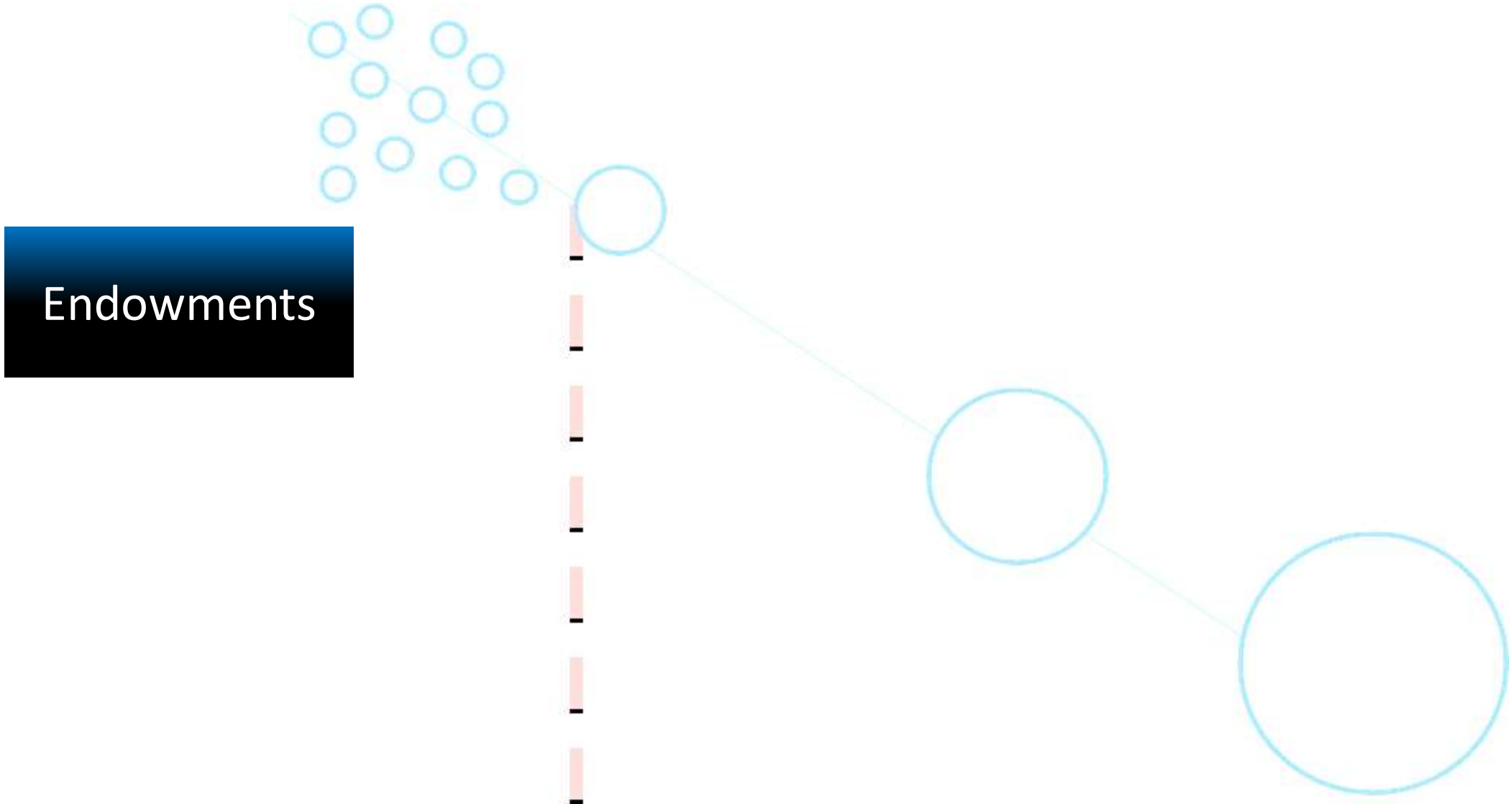
Owner(s) Education	1214	25	18	7
Team industry experience	1214	14	8	2
Previous ventures founded	1214	2	1	4
Resources:				
Strong ties	1214	1	0	10
Weak ties	1190	2	1	5
Resources: ($000)				
Individual net worth	892	667	152	23
Individual investment	1191	23	2	18

Endowments

Agent resources

(innate talent)
(genetics)
(experience)
(networks)
(intellectual capital)

Rockstar Theory: Conceptual Framework



Assumption

Endowments are power law distributed

Assumption

Endowments (i.e., previous experience) influence our
Expectations for future outcomes

Expectations

Empirical Support: PLD Inputs

t	1191	23	2	18
	1213	42	3	29
	121	212	8	5
Cognitions				
	1173	34	3	19
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Actions				
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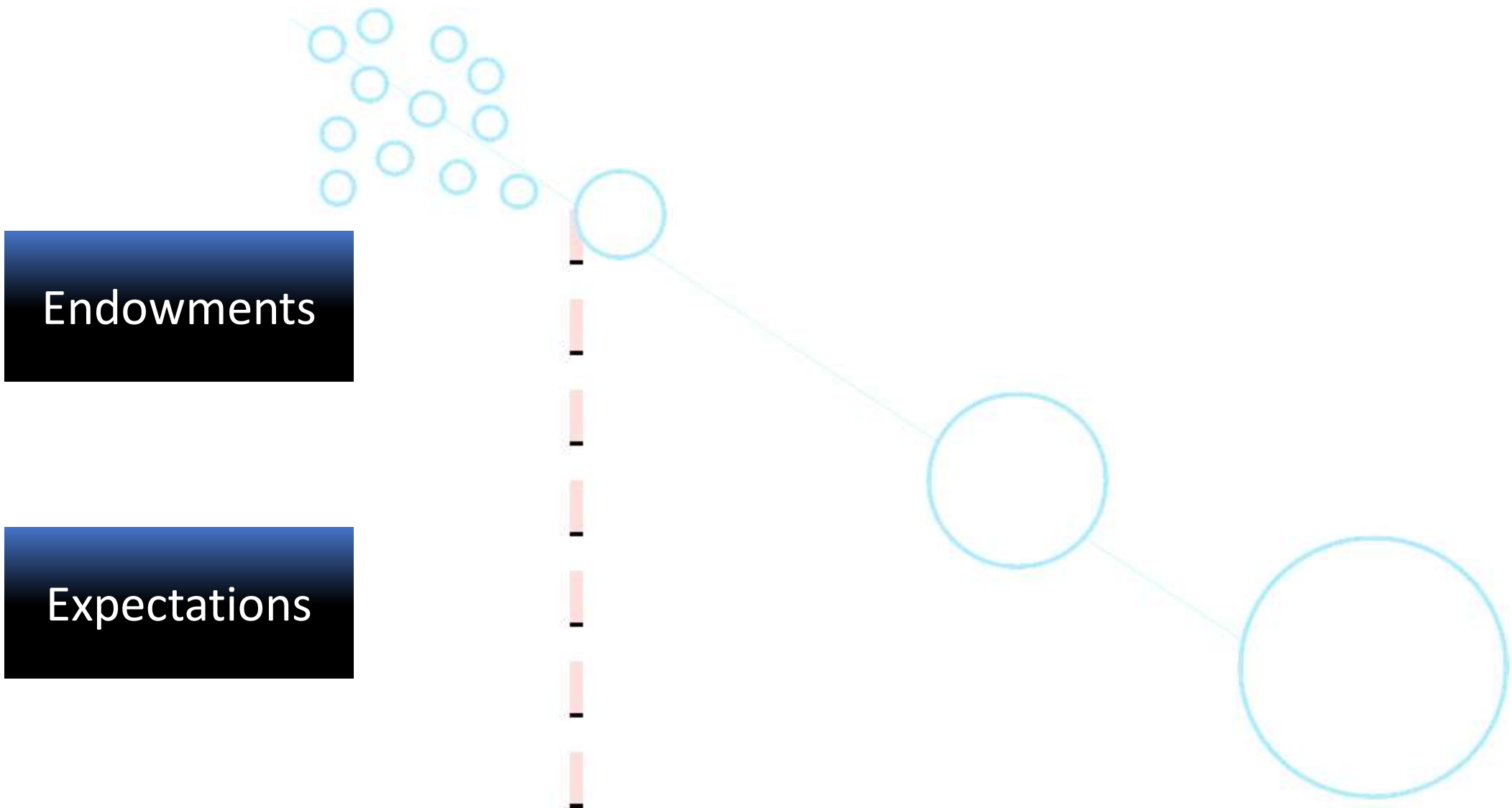
Expectations

envisioned future outcomes; goals

Normal → Novel

Rockstar Theory: Conceptual Framework



Assumption

Expectations are power law distributed

Expectations drive action;

Action drives outcomes.

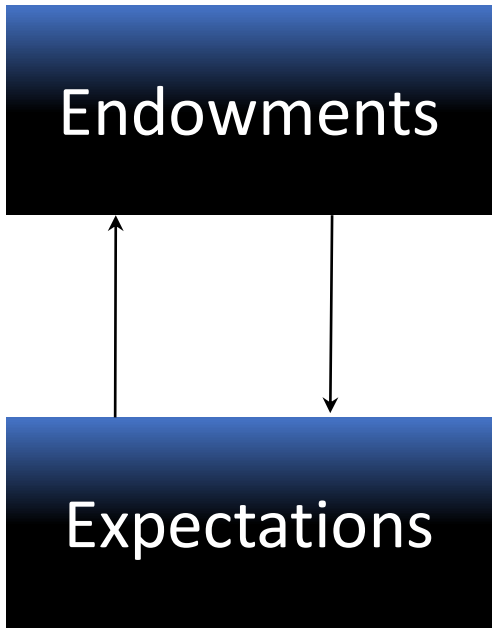
When you *expect* outlier outcomes, you *do* things differently than those who expect "normal" outcomes.

When you *expect* outlier outcomes, you *do* different things than those who expect "normal" outcomes.

Assumption

Expectations for novel outcomes
drive novel interaction
with the environment

Rockstar Theory: Conceptual Framework



Hypothesis

Significant differences between agent Expectations and Endowments will be nonlinearly associated with Engagement.

~Hypothesis

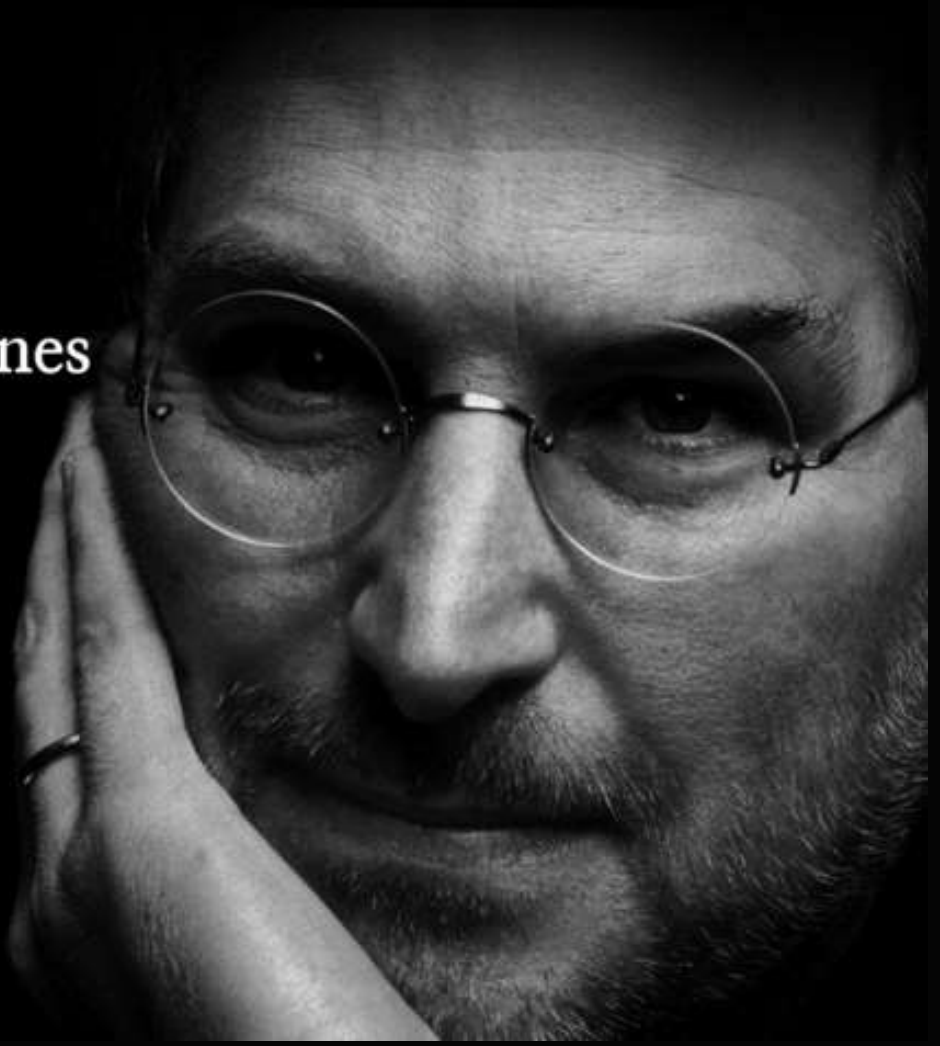
~ if want to achieve outlier outcomes,
but you don't have the skills,
you have to **do** things that normal people
don't (or won't or can't) do.

Get Rich Or Die Tryin'

50 CENT

"The people who are crazy enough to think they can change the world are the ones who do."

– Steve Jobs



#PatiencetoPerfection

Engagement

Empirical Support: PLD Inputs

[illegible]t	1191	23	2	18
	1213	42	3	29
[illegible]	121	212	8	5
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[redacted]	1214	2	7	1
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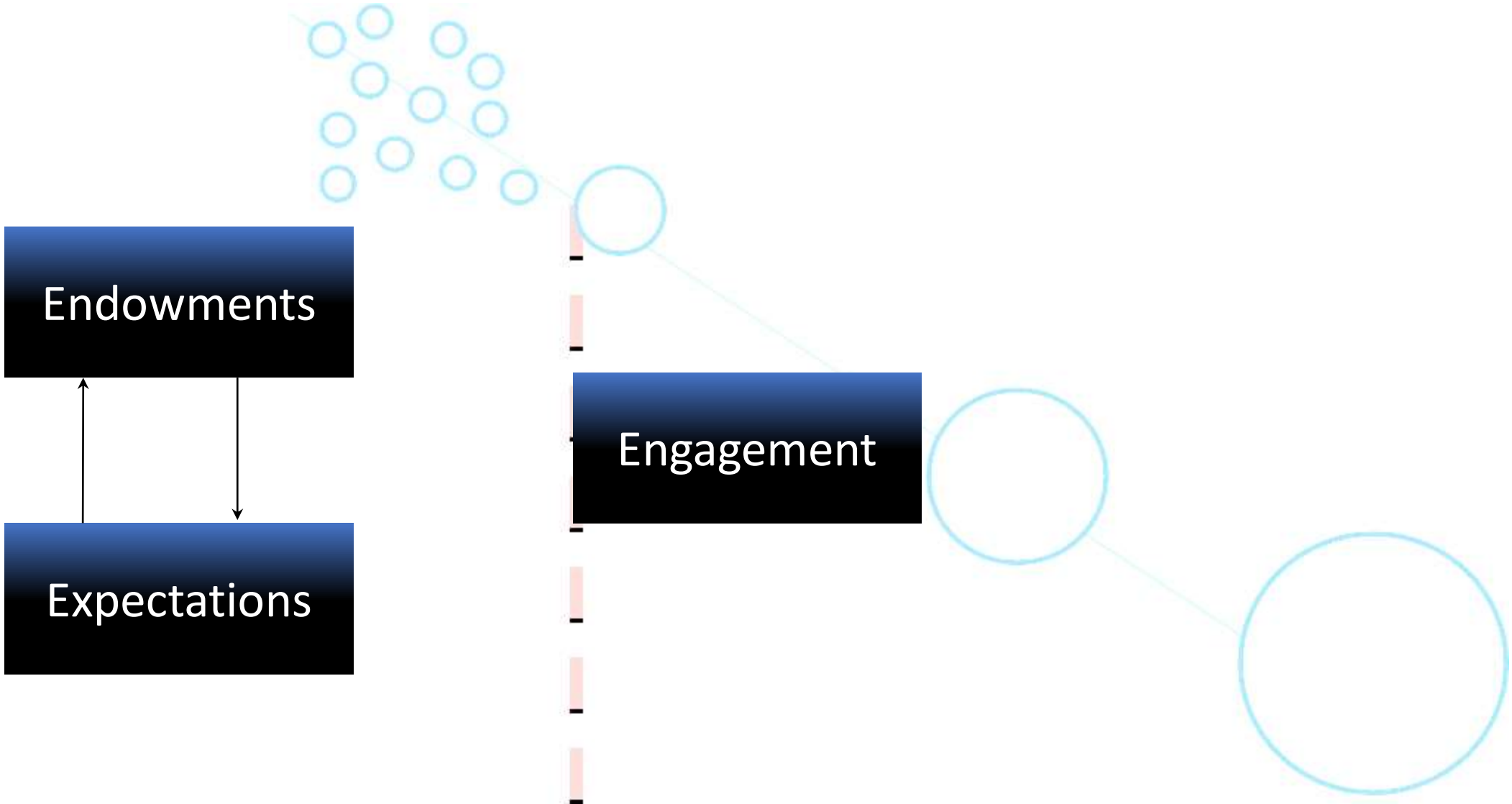
Engagement

Total time, interactions, and degree of novelty exhibited in pursuit of an envisioned outcome

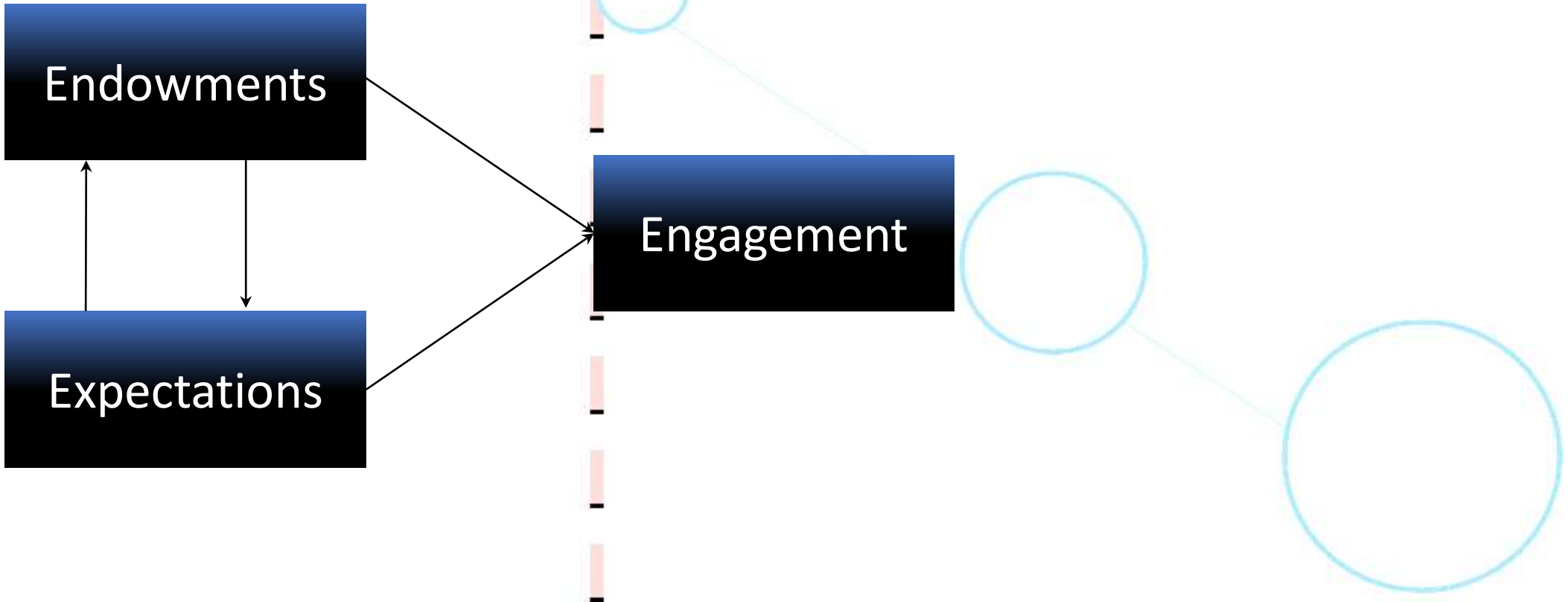
Assumption

Engagement is power law distributed

Rockstar Theory: Conceptual Framework



Rockstar Theory: Conceptual Framework



Hypothesis

Outlier Endowments will be nonlinearly associated with outlier engagement

Hypothesis

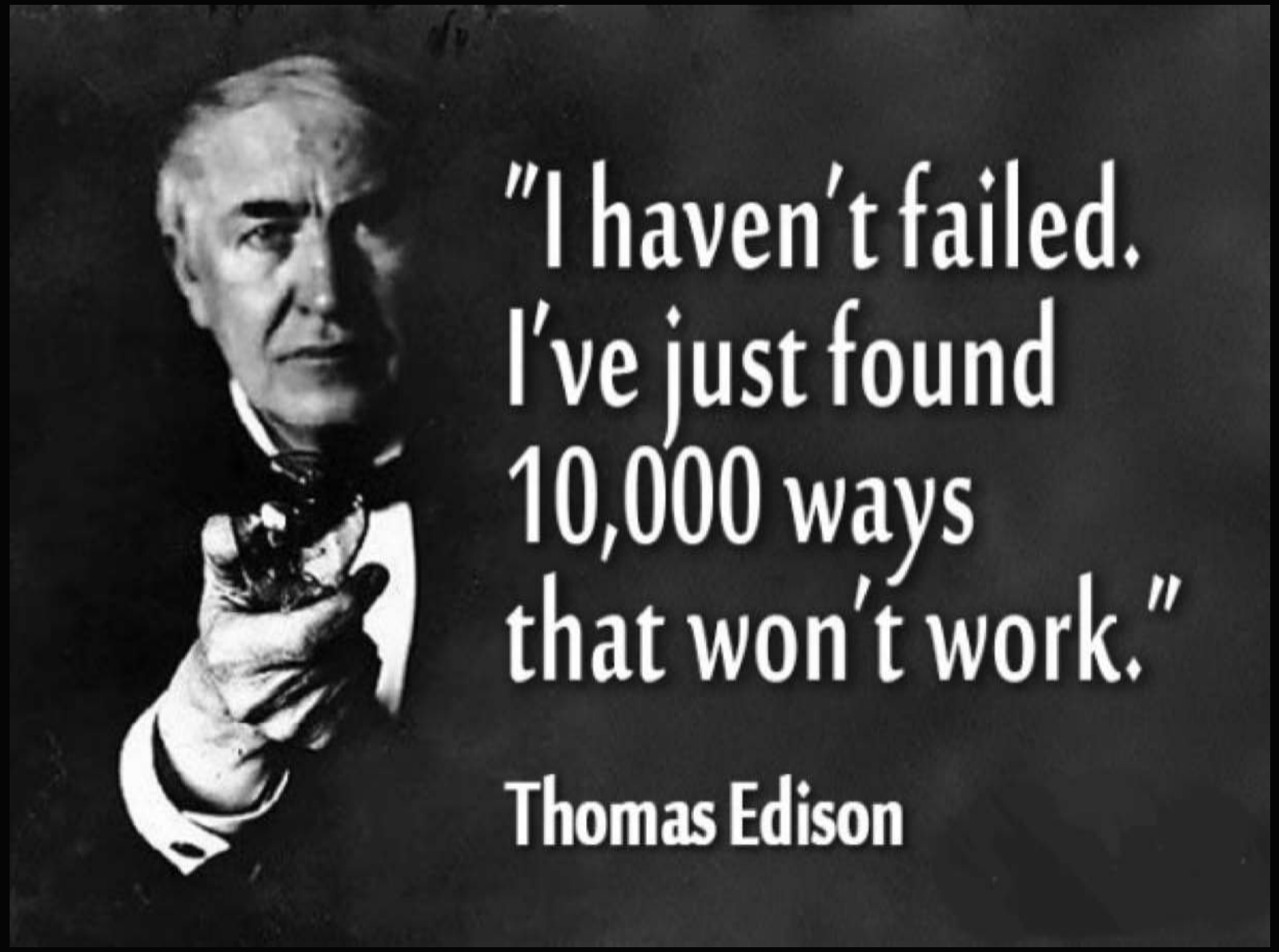
Outlier Expectations will be nonlinearly associated with outlier Engagement

~Hypothesis

~ if you're really really good,
you're more likely
to think and act in very novel ways

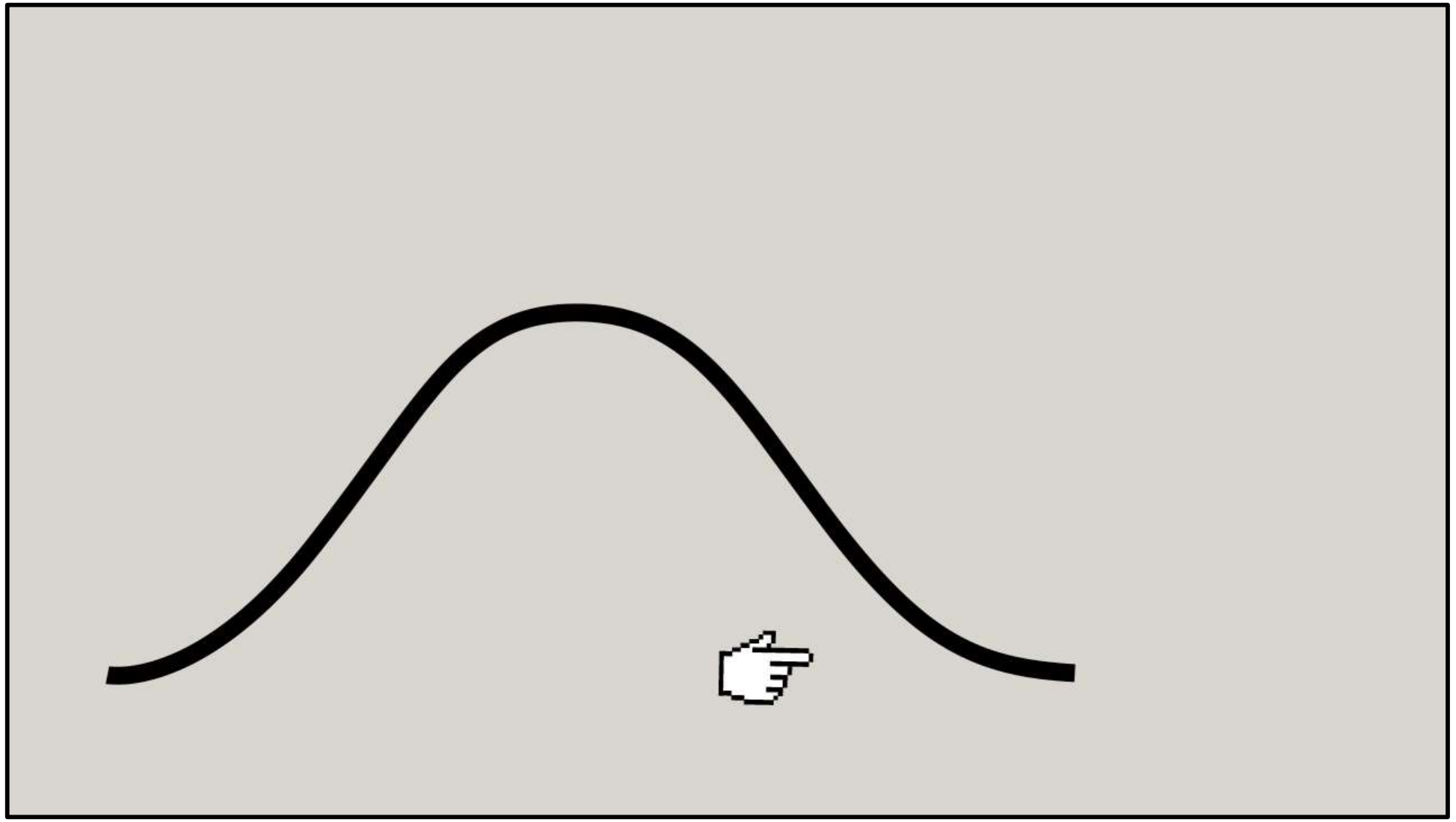
Outlier Engagement

- 10,000 hour rule (Gladwell, 2008)
- 10 years for scientific genius (Ericsson et al., 2003; Simonton, 2011)
- # of attempts for scientific breakthrough (Fleming, 2007)
- human trajectories (Song, Koren, Wang, & Barabási, 2010)


"I haven't failed.
I've just found
10,000 ways
that won't work."
Thomas Edison

How do power laws emerge?

Outlier engagement



Assumption

Outlier Engagement has nonlinear effects

“A greater probability of breakthroughs comes at the cost of a greater probability of failures”

(Singh & Fleming 2010)

Environments

Empirical Support: PLD Inputs

ent	1191	23	2	18
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	233	96	11	7
	246	66	13	8
	308	22	128	17
	592	113	13	7

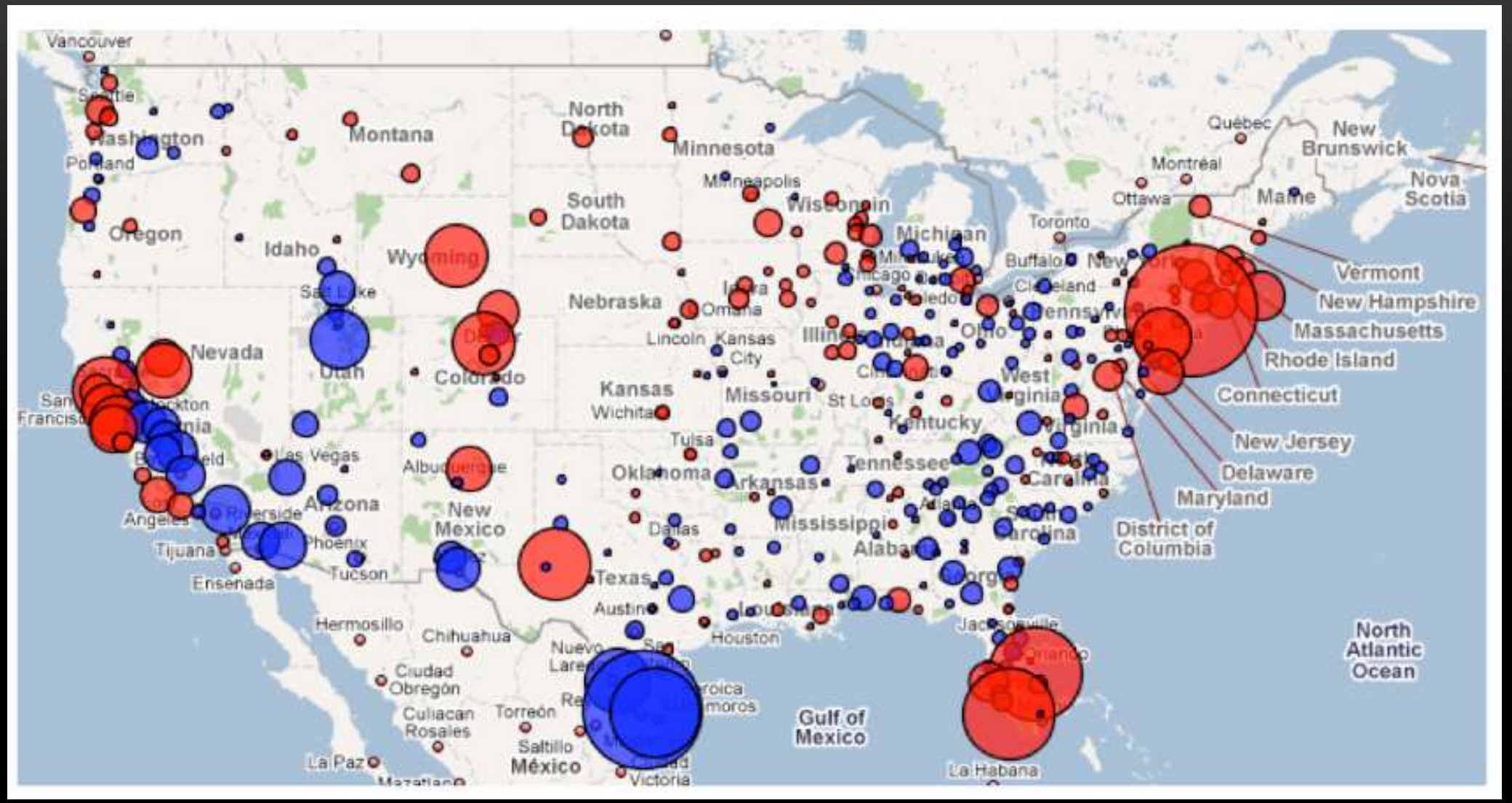
Environments

Local and global resource munificence

Environmental Munificence

Environmental Munificence

- city size (Clauset et al., 2009)
- crimes, innovations, $ wealth per MSA (Bettencourt et al., 2010)

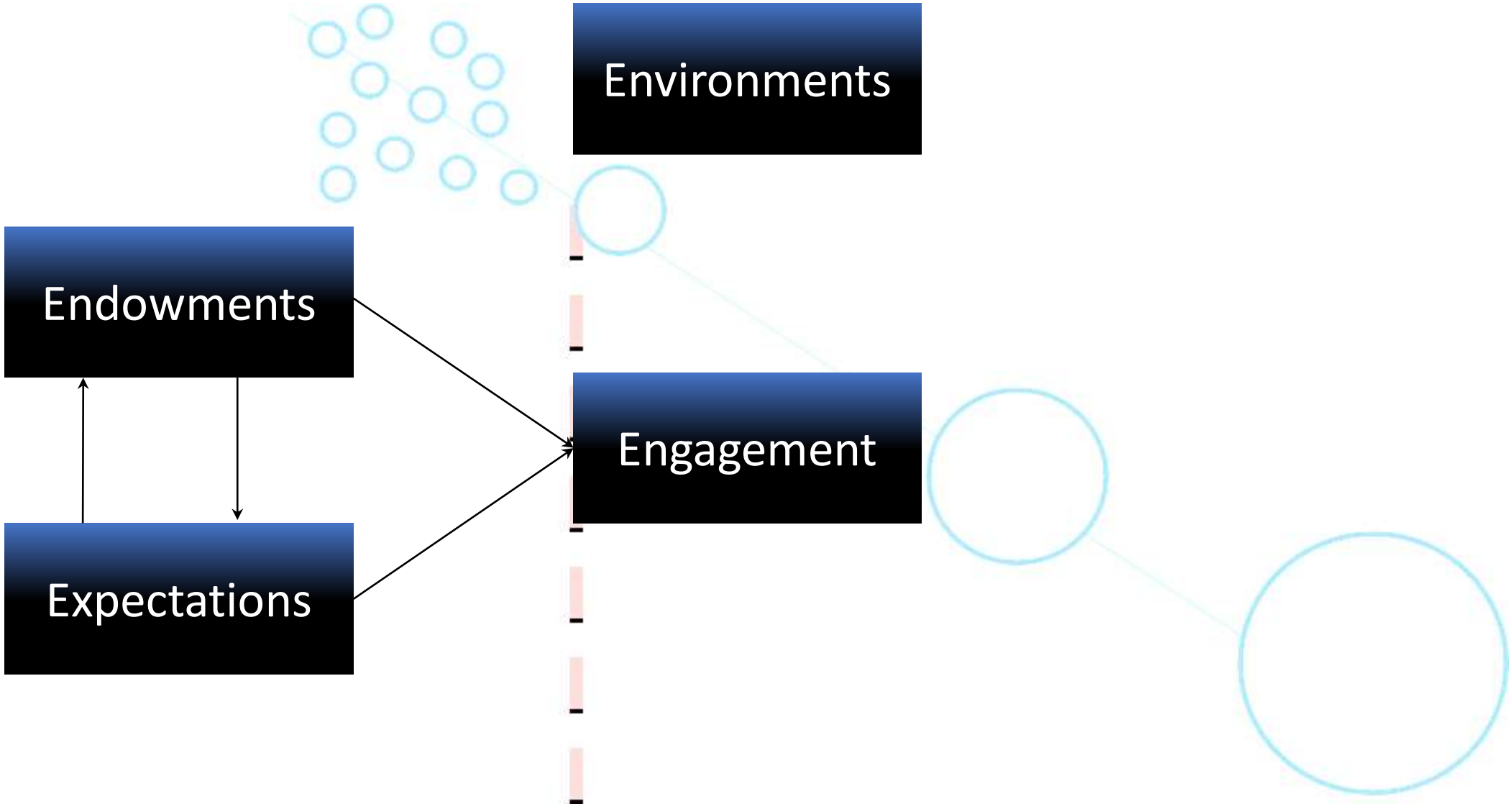


(Bettencourt et al., 2010)

Assumption

Environments are power law distributed

Rockstar Theory: Conceptual Framework



Assumption

Agents engage with Environment to capture resources.

Resources in the Environment

- People
- Money
- Information

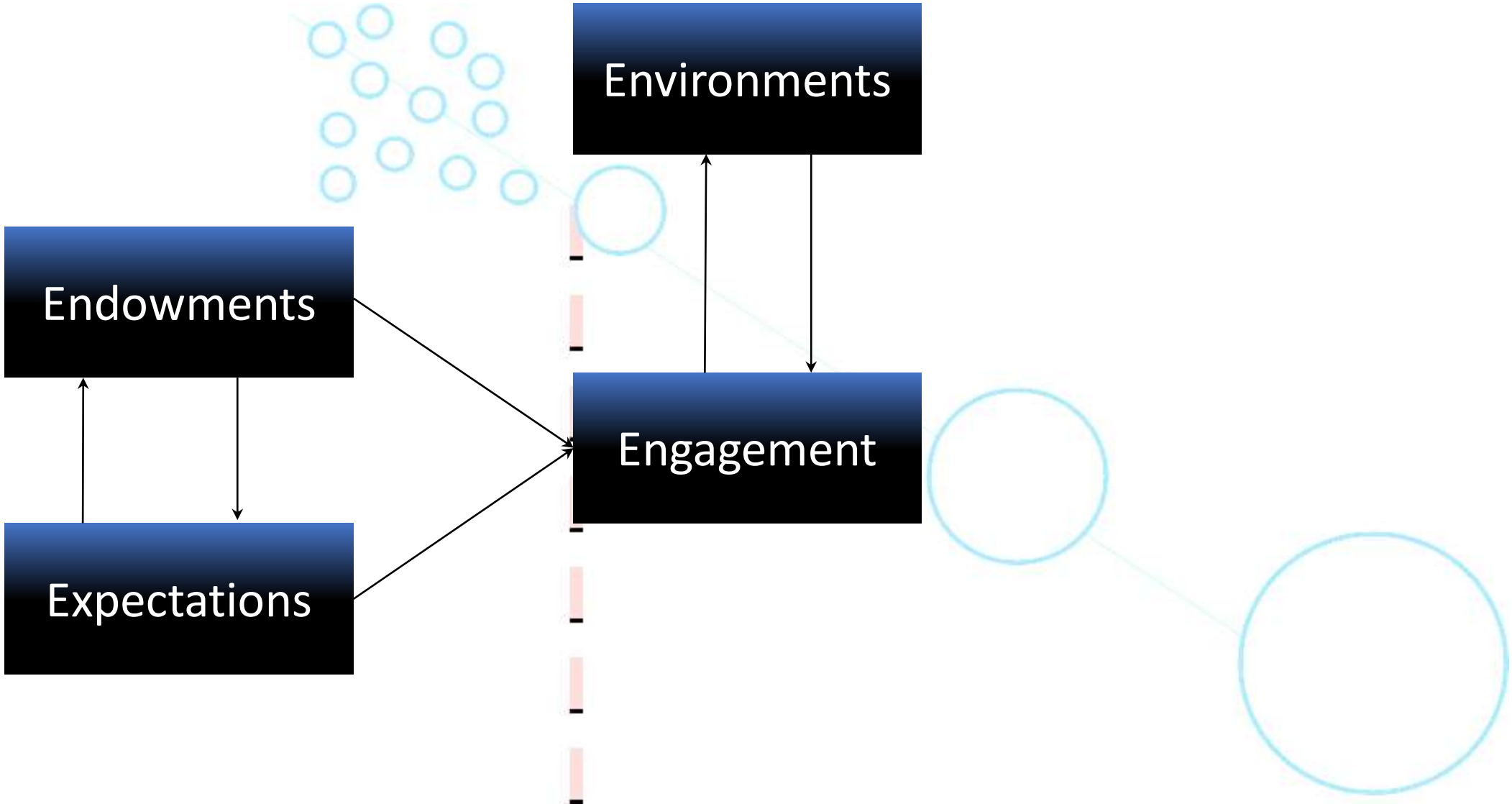
Assumption

Capture of resources is probabilistic. Outlier agents have higher probability for successful capture than normal agents.

Assumption

Capture of resources is probabilistic. Those who have novel talent have higher probability for successful capture than normal agents.

Rockstar Theory: Conceptual Framework



Outcomes

Theoretical Consideration

Outcomes should be as generalizable as possible and applicable to the domain’s entire population

Empirical Support: PLD Outcomes

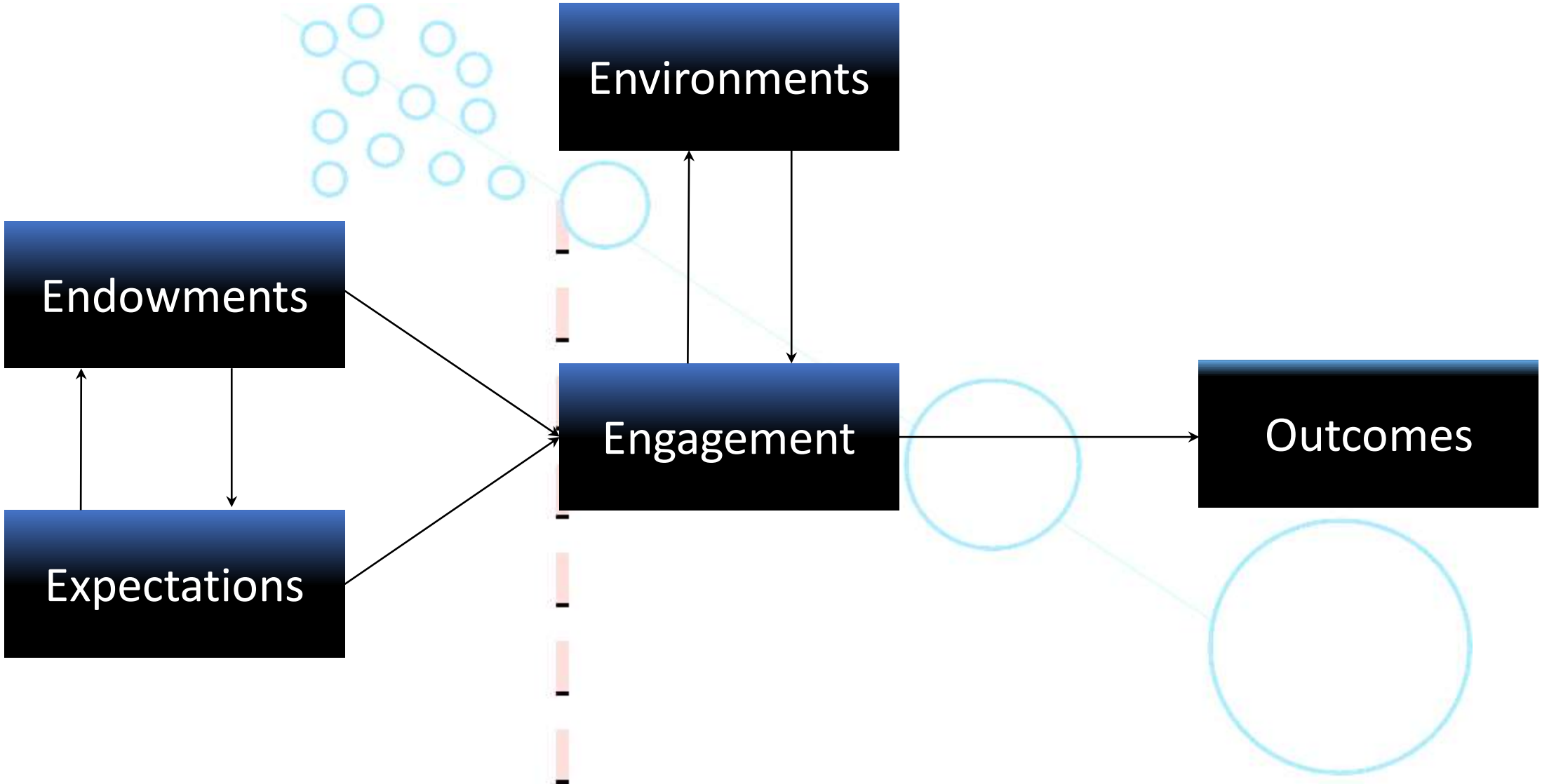
		Mean	Med	Skew	sd	Min	Max	α	K-S
Outcome variables									
PSED II Yr0	119	400	60	6	1600	1	500	1.76	0.05
PSED II Yr3	126	360	42	7	1753	1	15,000	1.80	0.08
CAUSEE Yr0	587	1311	80	18	12,921	0.15	270,000	1.92	0.06
CAUSEE Yr3	150	339	160	5	788	0.50	6000	1.94	0.08
KFS Yr0	2602	393	40	49	7500	0	375,000	2.00	0.04
KFS Yr3	2209	1153	120	21	9866	0	250,000	1.97	0.04
INC	4990	44,056	10,000	17	223,984	2000	62,000,000	2.09	0.02
PSED ($000)	111	45	22	14	2182	1	4500	1.82	0.09
CAUSEE ($000)	202	959	100	6	3392	0.3	31,800	1.67	0.05
KFS ($000)	2085	698	60	24	6129	1	200,400	1.99	0.04
INC	4990	21,764	4991	19	99,350	1000	30,770,175	2.00	0.01
INC	4990	298	127	11	763	2	19,812	2.57	0.02
PSED II Yr0	125	4	0	6	3	0	16	3.50	0.43
PSED II Yr3	57	11	4	5	27	0	170	2.02	0.08
CAUSEE Yr0	309	9	1	3	7	0	45	3.21	0.08
CAUSEE Yr3	137	16	4	9	77	0	900	1.99	0.07
KFS Yr0	4823	2	0	11	7	0	165	2.20	0.06
KFS Yr3	2944	4	1	30	21	0	900	2.55	0.07
INC[(f)]	4990	202	50	26	1173	1	52,152	2.09	0.02
PSED	59	33	1	33	38	0	1495	1.83	0.08
CAUSEE	61	25	4	9	114	0	894	1.87	0.09

Grammy Awards
song downloads
Twitter followers
YouTube views

Assumption

Outcomes are power law distributed

Rockstar Theory: Conceptual Framework



Assumption

Outlier outcomes change expectations about what is possible

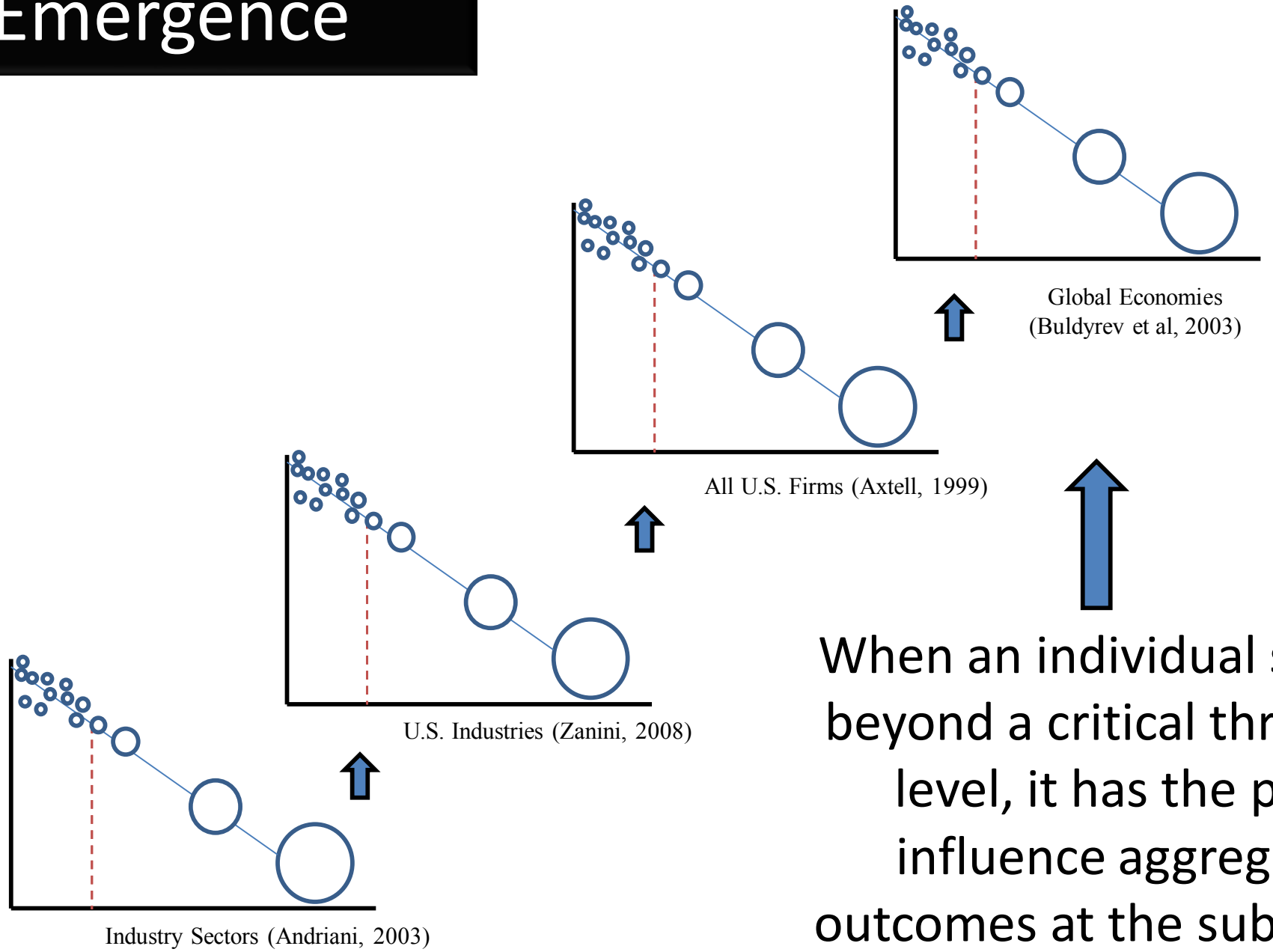
Outliers drive emergence:
transition from
non-existence and existence.

Boundary Condition

Since top-down constraints usually force Outcome distributions to look normal, this theory is bound to free-market societies.

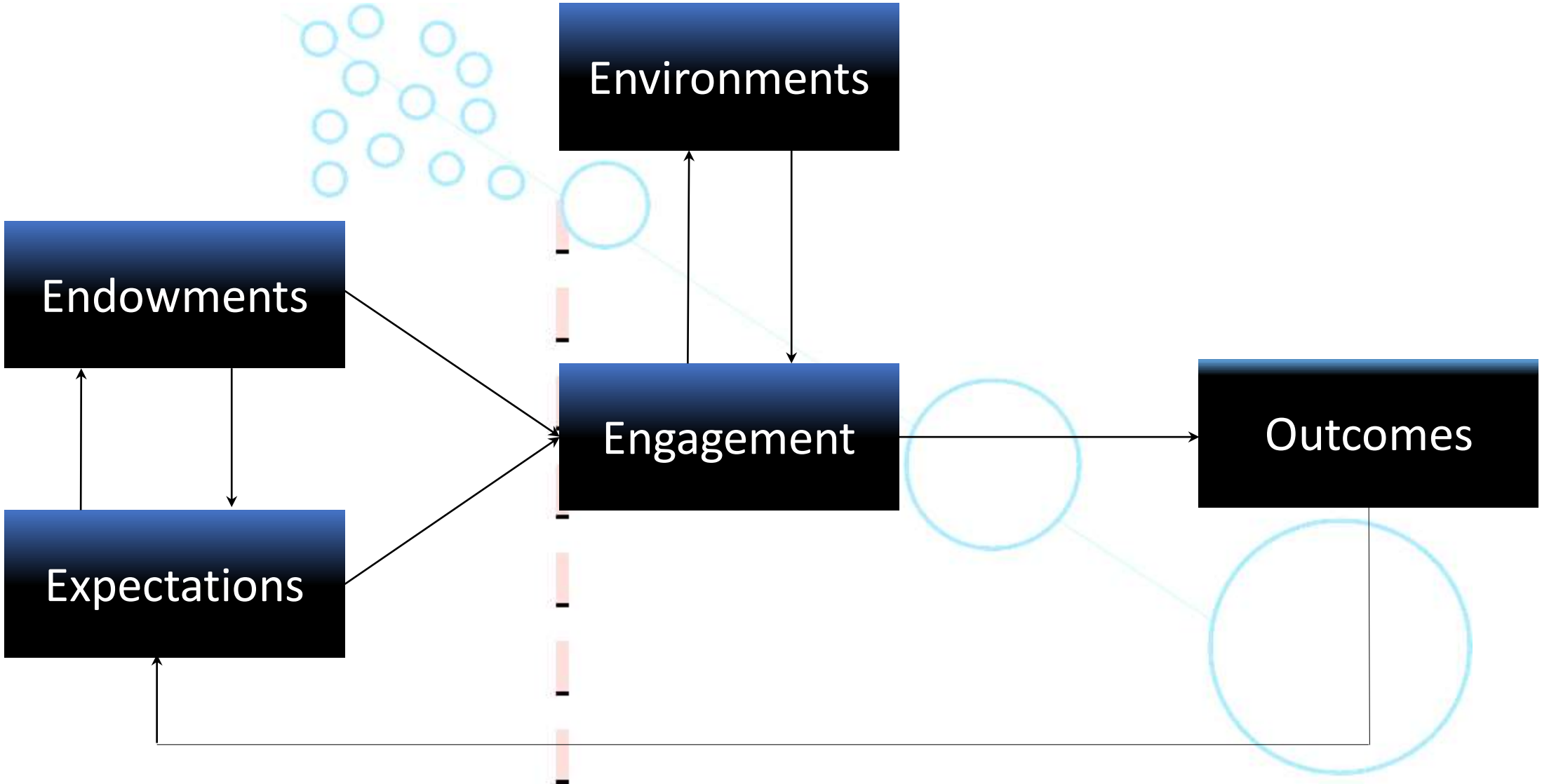
Bottom-Up Emergence

Threshold-Based Causality



When an individual system passes beyond a critical threshold at one level, it has the potential to influence aggregate system outcomes at the subsequent level.

Rockstar Theory: Conceptual Framework

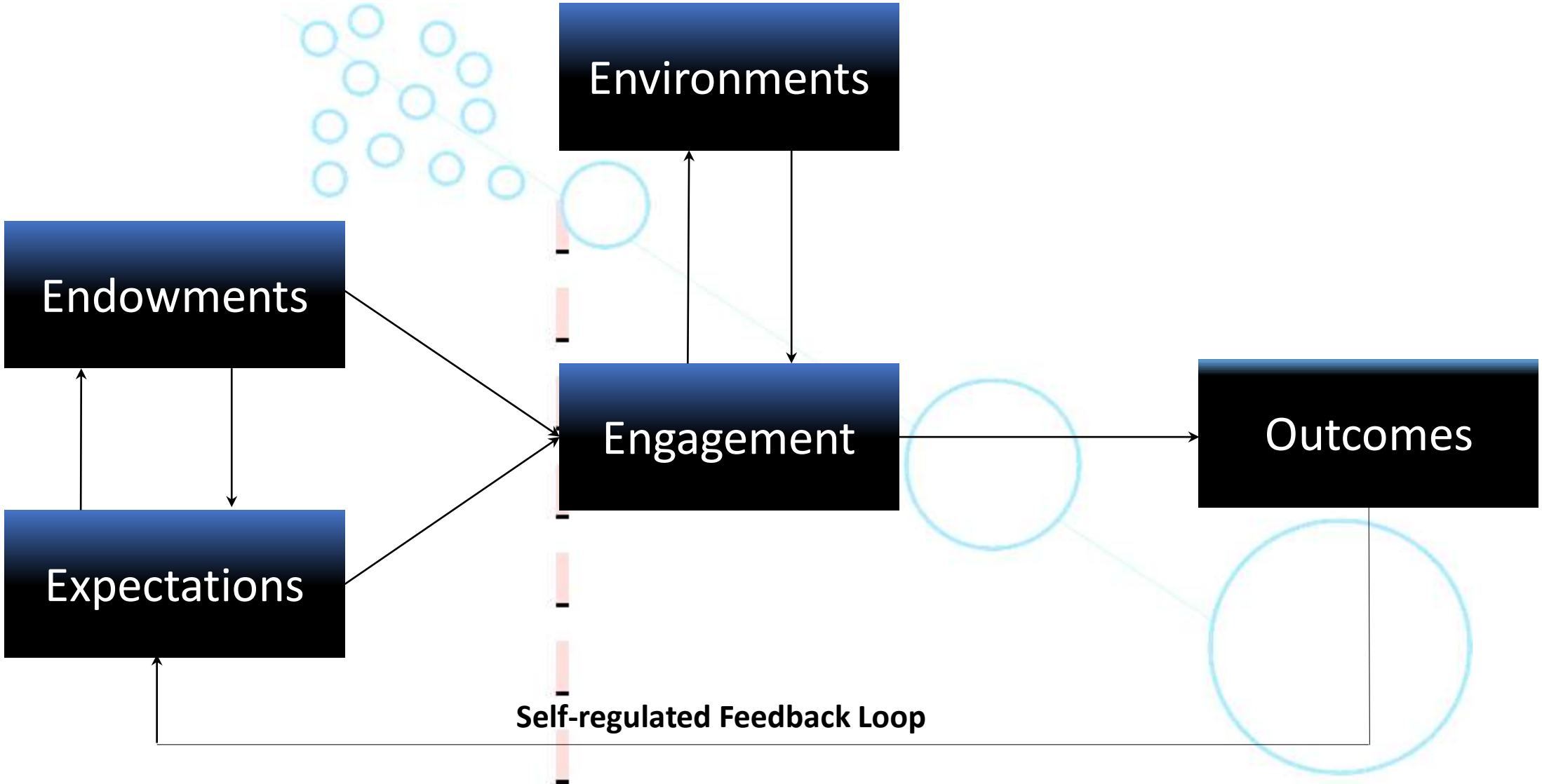


Assumption

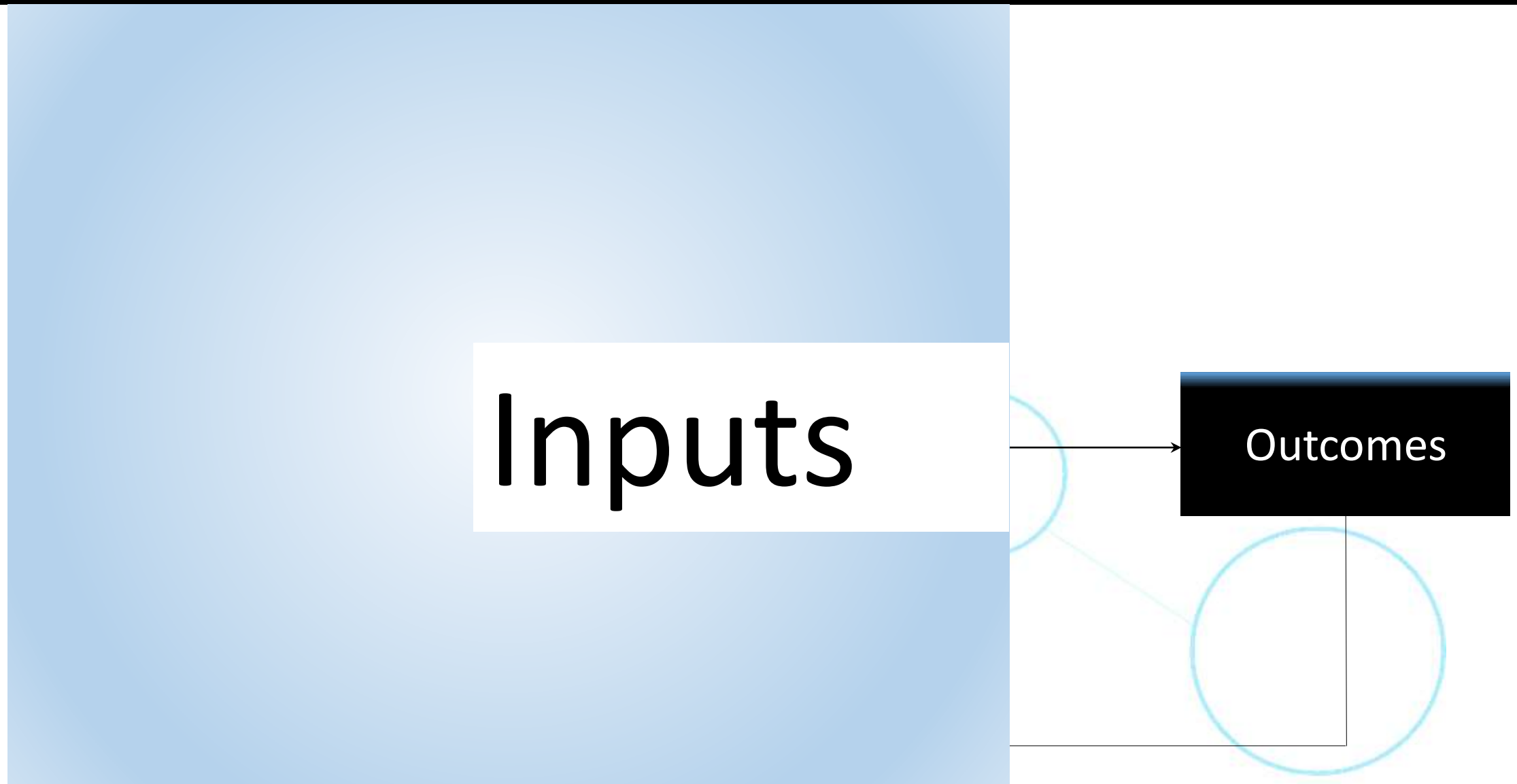
Outcomes provide a feedback loop that updates Expectations and Endowments.

Agent self-regulates the feedback's influence on Expectations.

Rockstar Theory: Conceptual Framework

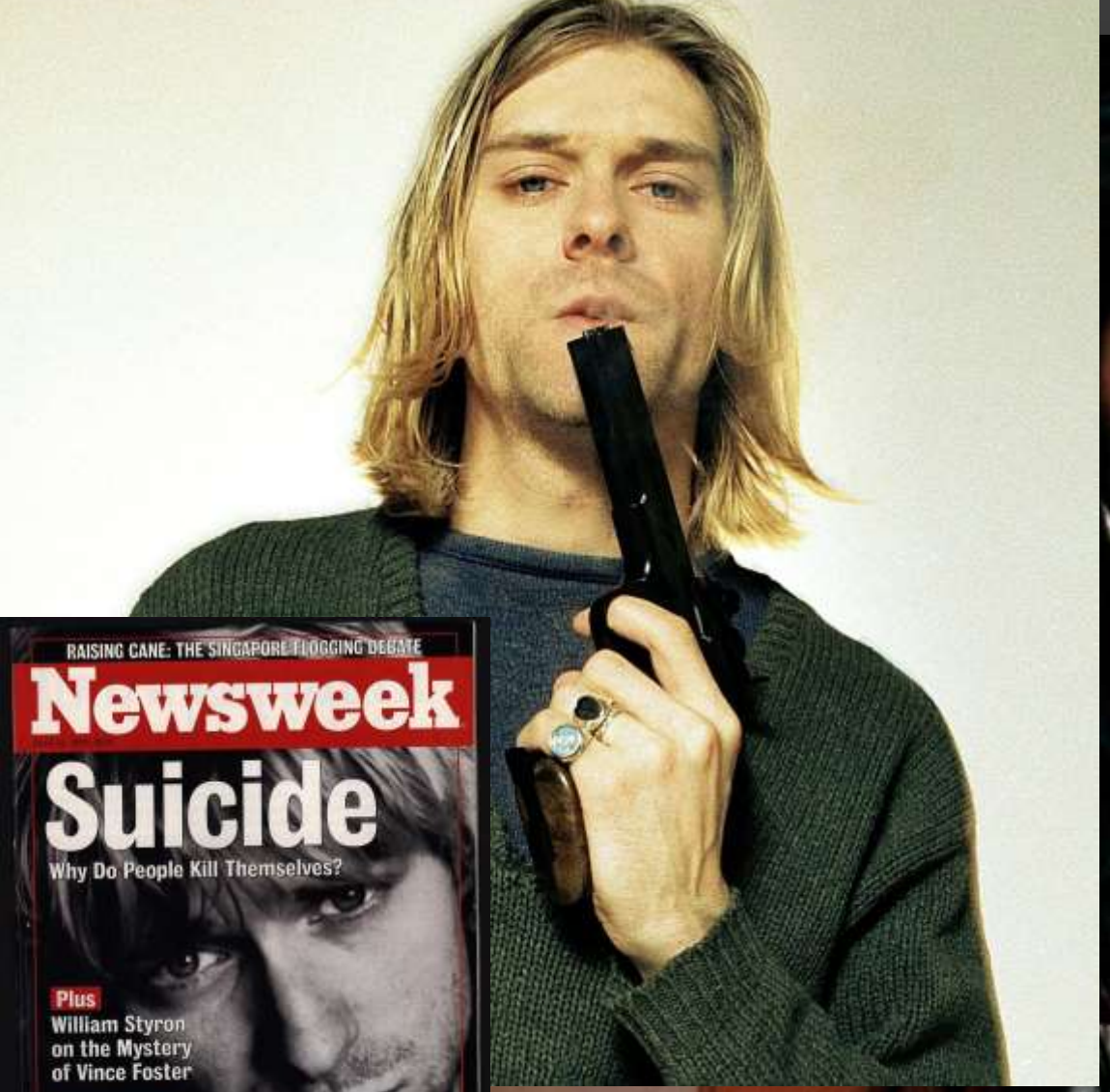


Rockstar Theory: Conceptual Framework



Hypothesis

Outlier inputs
will be nonlinearly associated with
Outlier outcomes



RAISING CANE: THE SINGAPORE FLOGGING DEBATE
Newsweek
Suicide
Why Do People Kill Themselves?
Plus
William Styron
on the Mystery
of Vince Foster
Kurt Cobain, 1967-1994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MANY HALF PRICE & LESS
SUPER INTERNATIONAL TYPEWRITER FROM PETITE.
Now for only £13.25
Crazed gunman charged
JOHN LENNON SHOT DEAD
JOHN LENNON, of the legendary Liverpool pop group, The Beatles, was shot dead in New York to-day by a crazed gunman.
THE MAGIC OF JOHN LENNON
WORLD HAS LOST A GREAT GUY, SAYS SAD PAUL

Assumption

Outliers produce
co-evolutionary effects

Assumption

Outliers disproportionately influence the behavioral properties of the population.

Conceptual Analogy:

Outliers are like Stars—
they have gravity.

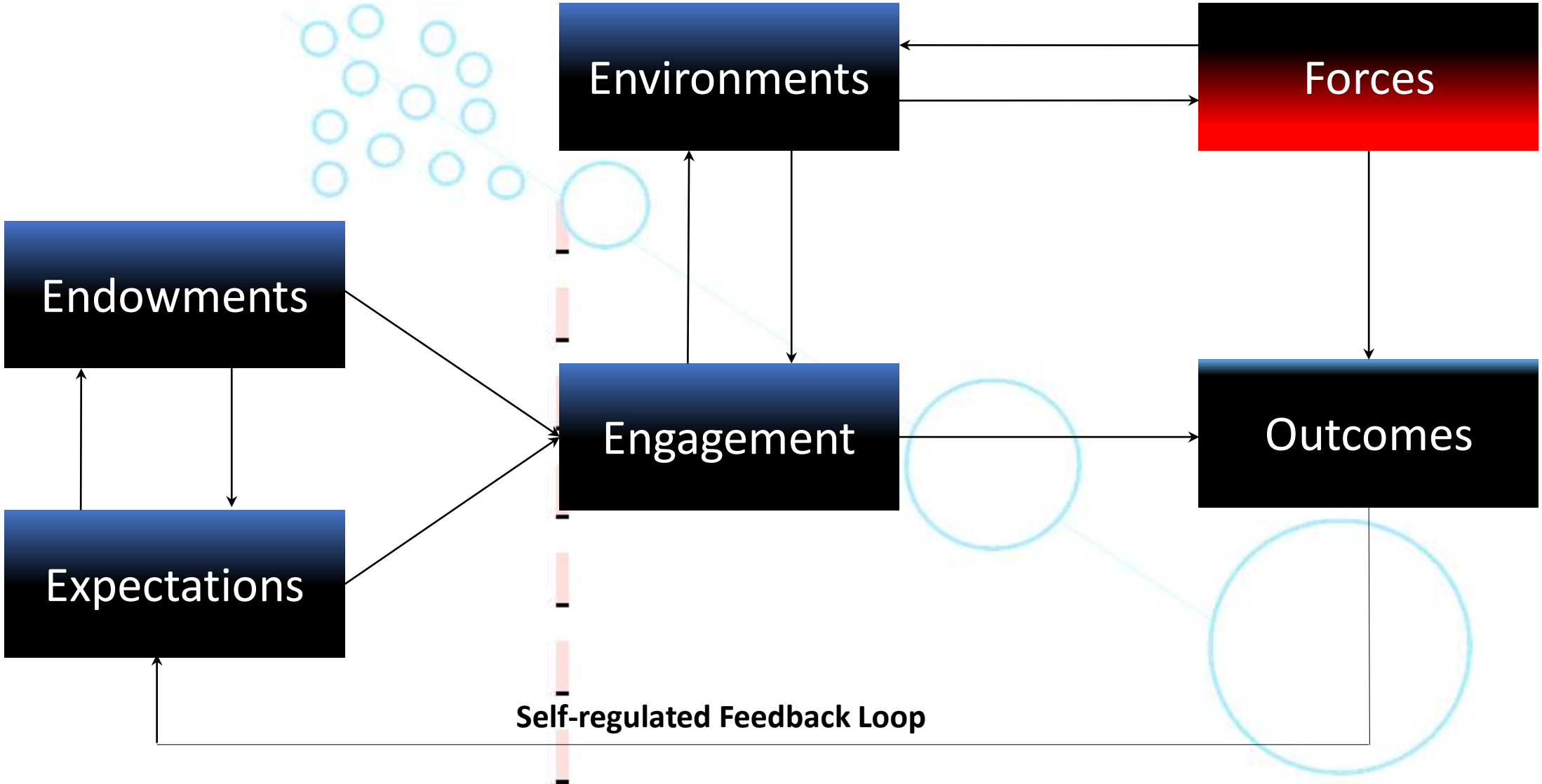
Theory Assumption:

Beyond some minimal threshold, gravity can attract resources without direct engagement.

Theory Assumption:

Beyond some minimal threshold, endowments can attract resources without direct engagement.

Rockstar Theory: Conceptual Framework



Assumption

Selection forces
influence outcomes

Assumption

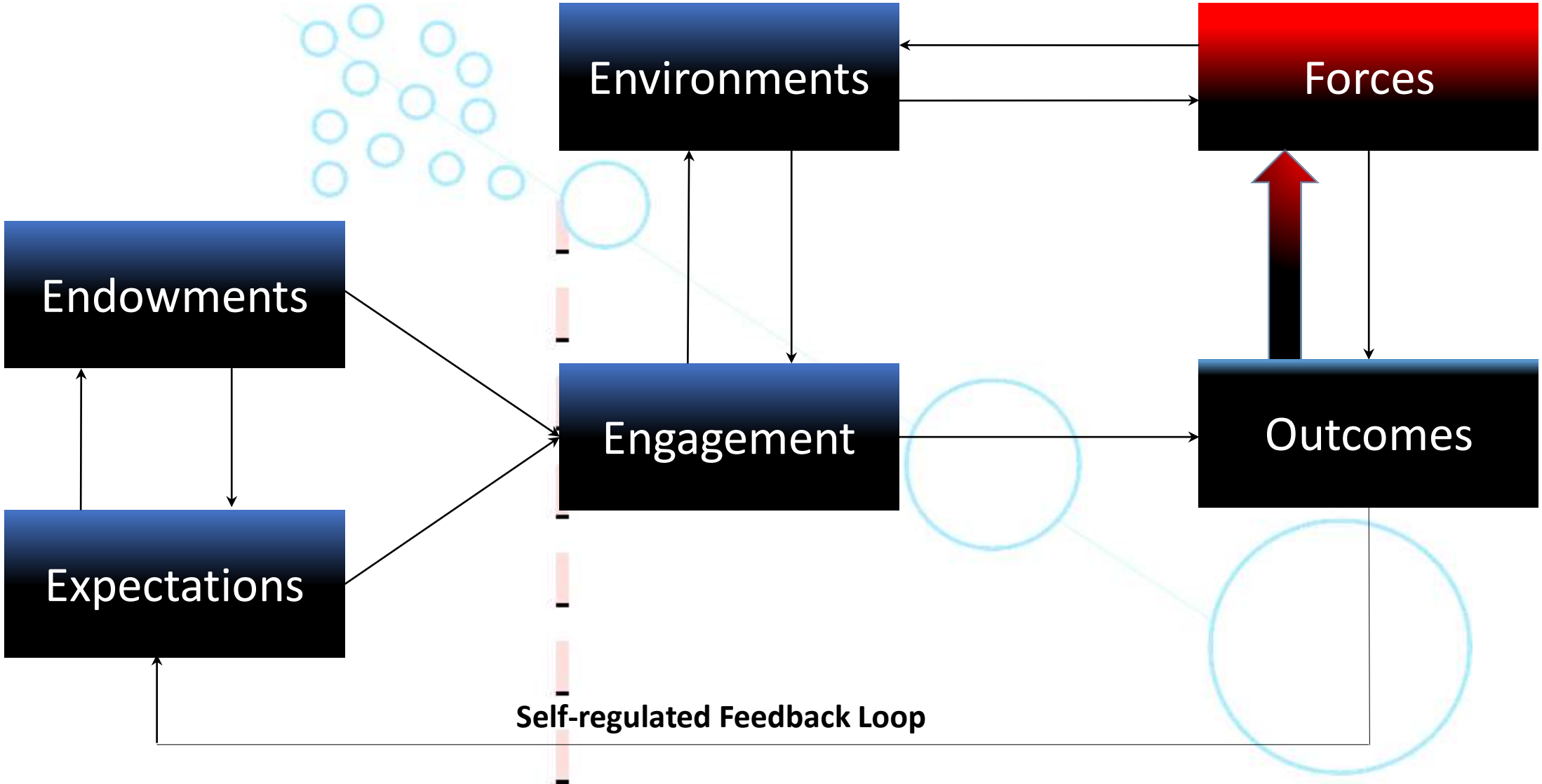
Evolutionary forces influence outcomes

Assumption

Outlier outcomes have potential to push back on evolutionary forces.

Outliers have the ability to do things normal people cannot.

Rockstar Theory: Conceptual Framework



In each meta-construct, an entrepreneur can start small…

But has the potential to scale into extreme outcomes…

The Contribution:

Changing the conversation in social science research to focus on the mechanisms that drive power law distributions and the outliers therein.

Four Mechanisms

Endowments
Expectations
Engagement
Environments

Theoretical Contributions

Theory

- Integration of seminal constructs
- Epistemologically, ontologically, and internally consistent
- Universal framework grounded in empirical reality of PLs
  - Applicable to Strategy & Entrepreneurship
- Can account for significant positive and negative extreme outcomes
- A foundation of truth, with success measured in relation to…

“It should be evident that the mechanisms incorporated in the explanatory theory were not motivated by their falsifiability. They were introduced in order to provide “plausible” premises from which the generalization summarizing the observed data could be deduced. And what does “plausible” mean in this context? It means that the assumptions about [Rockstar inputs and outcomes] are not inconsistent with our everyday general knowledge of these matters.

At the moment they are introduced, they are already known (or strongly suspected) to not be far from the truth.”

(Herbert Simon, On Judging the Plausibility of Theories, 1969 :449)

Thank you.

G. Christopher Crawford, Ph.D.

Kauffman Emerging Scholars Conference

October 2017

OHIO UNIVERSITY 1804

THE CENTER FOR ENTREPRENEURSHIP

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