

Voting, Success, and Superstars

Last updated: 2020/10/05, 16:17:25 EDT

Principles of Complex Systems, Vol. 1 | @pocsvox
CSYS/MATH 300, Fall, 2020

Prof. Peter Sheridan Dodds | @peterdodds

Computational Story Lab | Vermont Complex Systems Center
Vermont Advanced Computing Core | University of Vermont



Licensed under the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License.

PoCS, Vol. 1
@pocsvox
Voting, Success,
and Superstars

Winning: it's not
for everyone
Superstars
Musiclub
References

Superstars

Rosen's theory:

- Individual quality q maps to reward $R(q)$.
- $R(q)$ is 'convex' ($d^2R/dq^2 > 0$).
- Two reasons:
 - Imperfect substitution:**
A very good surgeon is worth many mediocre ones
 - Technology:**
Media spreads & technology reduces cost of reproduction of books, songs, etc.
- Joint consumption versus public good.
- No social element—success follows 'inherent quality'.

1 of 26

PoCS, Vol. 1
@pocsvox
Voting, Success,
and Superstars

Winning: it's not
for everyone
Superstars
Musiclub
References

Superstars



"Stardom and Talent"
Moshe Adler,
American Economic Review, **75**, 208–212,
1985. [1]

- "Consumption capital": "Appreciation [of music] increases with knowledge. But how does one know about music? By listening to it, *and discussing it with other persons who know about it.*"
- Assumes extreme case of equal 'inherent quality'
- Argues desire for coordination in knowledge and culture leads to differential success
- Success can be purely a social construction
- (How can we measure 'inherent quality?')

2 of 26

PoCS, Vol. 1
@pocsvox
Voting, Success,
and Superstars

Winning: it's not
for everyone
Superstars
Musiclub
References

Voting

Evidence from the web suggestions (Huberman et al.)

- Easy decisions (yes/no) lead to bandwagoning
e.g. jyte.com
 - More costly evaluations lead to oppositional votes
e.g. amazon.com
- Self-selection:** Costly voting may lower incentives for those who agree with the current assessment and increase incentives for those who disagree.

5 of 26

Voting

PoCS, Vol. 1
@pocsvox
Voting, Success,
and Superstars

Winning: it's not
for everyone
Superstars
Musiclub
References

Score-based voting versus rank-based voting:



"A theory of measuring, electing, and ranking"
Balinski and Laraki,
Proc. Natl. Acad. Sci., **104**, 8720–8725,
2007. [2]

6 of 26

PoCS, Vol. 1
@pocsvox
Voting, Success,
and Superstars

Winning: it's not
for everyone
Superstars
Musiclub
References

Voting



"Aggregating partial, local evaluations to achieve global ranking"
Laureti, Moret, and Zhang,
Physica A, **345**, 705–712, 2004. [4]

- Model: participants rank n objects based on underlying quality q
- Assume evaluation of object i is a random variable with mean q_i
- Choose objects based on votes:

$$p_i(t) \propto v_i(t)^\alpha \text{ or } p_i(t) \propto q_i v_i(t)^\alpha.$$

- If $\alpha < 1$, correct quality ordering is uncovered
- If $\alpha > 1$, some objects are never evaluated and mistakes are made...
- Related to Adler's approach

7 of 26

PoCS, Vol. 1
@pocsvox
Voting, Success,
and Superstars

Winning: it's not
for everyone
Superstars
Musiclub
References

Dominance hierarchies



"Individual differences versus social dynamics in the formation of animal dominance hierarchies"
Chase et al.,
Proc. Natl. Acad. Sci., **99**, 5744–5749, 2002. [3]

- The aggressive female Metriaclicma zebra:



8 of 26

PoCS, Vol. 1
@pocsvox
Voting, Success,
and Superstars

Winning: it's not
for everyone
Superstars
Musiclub
References

9 of 26

PoCS, Vol. 1
@pocsvox
Voting, Success,
and Superstars

Winning: it's not
for everyone
Superstars
Musiclub
References

10 of 26

PoCS, Vol. 1
@pocsvox
Voting, Success,
and Superstars

Winning: it's not
for everyone
Superstars
Musiclub
References

11 of 26

Outline

Winning: it's not for everyone
Superstars
Musiclub

References

Where do superstars come from?



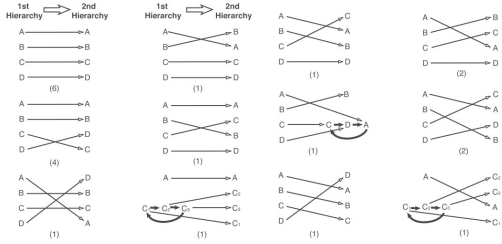
"The economics of superstars"
S. Rosen,
Am. Econ. Rev., **71**, 845–858, 1981. [5]

Examples:

- Full-time Comedians (≈ 200)
- Soloists in Classical Music
- Economic Textbooks (the usual myopic example)
- Highly skewed distributions again...

Dominance hierarchies

Fish forget—changing of dominance hierarchies:

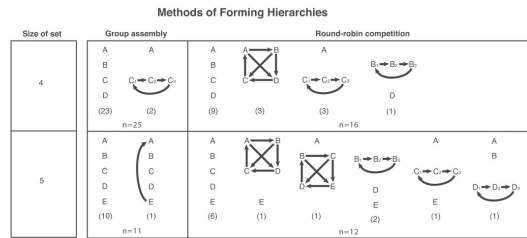


22 observations: about 3/4 of the time, hierarchy changed



12 of 26

Dominance hierarchies



Group versus isolated interactions produce different hierarchies

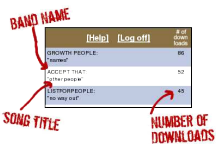


13 of 26

Music Lab Experiment



48 songs
30,000 participants



multiple 'worlds'
Inter-world variability

- How probable is the world?
- Can we estimate variability?
- Superstars dominate but are unpredictable. Why?



15 of 26

Music Lab Experiment

Rank	Market share in indep. world	Rank	Market share in indep. world
1	0.01	25	0.01
2	0.02	26	0.01
3	0.03	27	0.01
4	0.04	28	0.01
5	0.05	29	0.01
6	0.06	30	0.01
7	0.07	31	0.01
8	0.08	32	0.01
9	0.09	33	0.01
10	0.10	34	0.01
11	0.11	35	0.01
12	0.12	36	0.01
13	0.13	37	0.01
14	0.14	38	0.01
15	0.15	39	0.01
16	0.16	40	0.01
17	0.17	41	0.01
18	0.18	42	0.01
19	0.19	43	0.01
20	0.20	44	0.01
21	0.21	45	0.01
22	0.22	46	0.01
23	0.23	47	0.01
24	0.24	48	0.01

Winning: it's not for everyone
Superstars
Musiclab
References

"An experimental study of inequality and unpredictability in an artificial cultural market"
Salganik, Dodds, and Watts, Science, 311, 854–856, 2006.

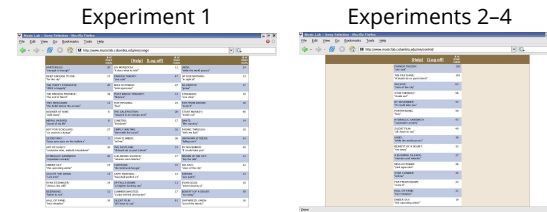
PoCS, Vol. 1
@pocsvox
Voting, Success, and Superstars

Winning: it's not for everyone
Superstars
Musiclab
References



16 of 26

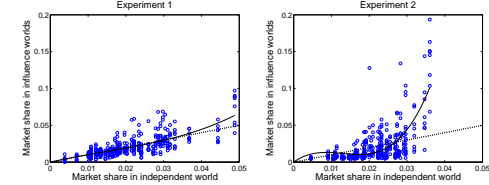
Music Lab Experiment



Winning: it's not for everyone
Superstars
Musiclab
References

Winning: it's not for everyone
Superstars
Musiclab
References

Music Lab Experiment



Variability in final number of downloads.

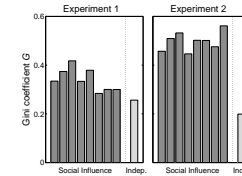
PoCS, Vol. 1
@pocsvox
Voting, Success, and Superstars

Winning: it's not for everyone
Superstars
Musiclab
References



19 of 26

Music Lab Experiment



Inequality as measured by Gini coefficient:

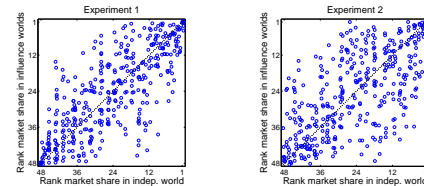
$$G = \frac{1}{(2N_s - 1)} \sum_{i=1}^{N_s} \sum_{j=1}^{N_s} |m_i - m_j|$$

Winning: it's not for everyone
Superstars
Musiclab
References



17 of 26

Music Lab Experiment

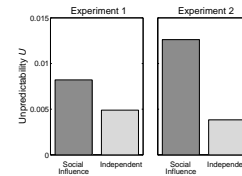


Winning: it's not for everyone
Superstars
Musiclab
References

Variability in final rank.

Winning: it's not for everyone
Superstars
Musiclab
References

Music Lab Experiment



Unpredictability

$$U = \frac{1}{N_s \binom{N_w}{2}} \sum_{i=1}^{N_s} \sum_{j=1}^{N_w} \sum_{k=j+1}^{N_w} |m_{i,j} - m_{i,k}|$$

Winning: it's not for everyone
Superstars
Musiclab
References



18 of 26



21 of 26

Music Lab Experiment

Sensible result:

- Stronger social signal leads to **greater following** and **greater inequality**.

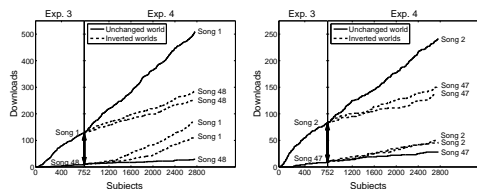
Peculiar result:

- Stronger social signal leads to greater **unpredictability**.

Very peculiar observation:

- The most unequal distributions would suggest the greatest variation in underlying 'quality.'
- But success may be due to social construction through **following**. (so let's tell a story... [8, 9])

Music Lab Experiment—Sneakiness [7]



- Inversion of download count
- The pretend rich get richer ...
- ... but at a slower rate

PoCS, Vol. 1
@pocsvox
Voting, Success,
and Superstars

Winning: it's not
for everyone
Superstars
Musiclab
References



22 of 26

PoCS, Vol. 1
@pocsvox
Voting, Success,
and Superstars

Winning: it's not
for everyone
Superstars
Musiclab
References



23 of 26

References I

- M. Adler. **Stardom and talent.** *American Economic Review*, pages 208–212, 1985. [pdf](#)
- M. Balinski and R. Laraki. **A theory of measuring, electing, and ranking.** *Proc. Natl. Acad. Sci.*, 104(21):8720–8725, 2007. [pdf](#)
- I. D. Chase, C. Tovey, D. Spangler-Martin, and M. Manfredonia. **Individual differences versus social dynamics in the formation of animal dominance hierarchies.** *Proc. Natl. Acad. Sci.*, 99(8):5744–5749, 2002. [pdf](#)

PoCS, Vol. 1
@pocsvox
Voting, Success,
and Superstars

Winning: it's not
for everyone
Superstars
Musiclab
References



24 of 26

PoCS, Vol. 1
@pocsvox
Voting, Success,
and Superstars

Winning: it's not
for everyone
Superstars
Musiclab
References



25 of 26

References II

- P. Laureti, L. Moret, and Y.-C. Zhang. **Aggregating partial, local evaluations to achieve global ranking.** *Physica A*, 345(3–4):705–712, 2004. [pdf](#)
- S. Rosen. **The economics of superstars.** *Am. Econ. Rev.*, 71:845–858, 1981. [pdf](#)
- M. J. Salganik, P. S. Dodds, and D. J. Watts. **An experimental study of inequality and unpredictability in an artificial cultural market.** *Science*, 311:854–856, 2006. [pdf](#)

References III

- M. J. Salganik and D. J. Watts. **Leading the herd astray: An experimental study of self-fulfilling prophecies in an artificial cultural market.** *Social Psychology Quarterly*, 71:338–355, 2008. [pdf](#)
- C. R. Sunstein. **Infotopia: How many minds produce knowledge.** Oxford University Press, New York, 2006.
- N. N. Taleb. **The Black Swan.** Random House, New York, 2007.

PoCS, Vol. 1
@pocsvox
Voting, Success,
and Superstars

Winning: it's not
for everyone
Superstars
Musiclab
References



26 of 26