

# Disruptive vs. incremental

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We need incremental and disruptive solutions

Big Companies do incremental well...

...VC targets disruptive & holistic

*Often out of labs like these...*

Disruptive challenges demand  
disruptive solutions

*“all progress depends upon the unreasonable  
man”*

George Bernard Shaw

“evolutionary pathways  
to revolution”

... adjacent possibles

groups

clusters

autocatalysis

disruption from increments

*“Cynics never do the impossible, achieve the improbable, take on the inadvisable. Hope is only path to extraordinary success.”*

tweet

“It is not because things are difficult that we do not dare, it is because we do not dare that they are difficult.”

- *Seneca*

“Try and fail, but don't fail to try.”

- *Stephen Kaggwa*

“our willingness to fail gives us the  
“Courage is doing what you're afraid to do. There can be no courage unless  
you're scared.”  
ability and opportunity to succeed”

- *Eddie Rickenbacker*

“Only those who dare fail greatly can achieve greatly.”

- *Robert F. Kennedy*

“You will face many defeats in your life, but never let yourself be defeated.”

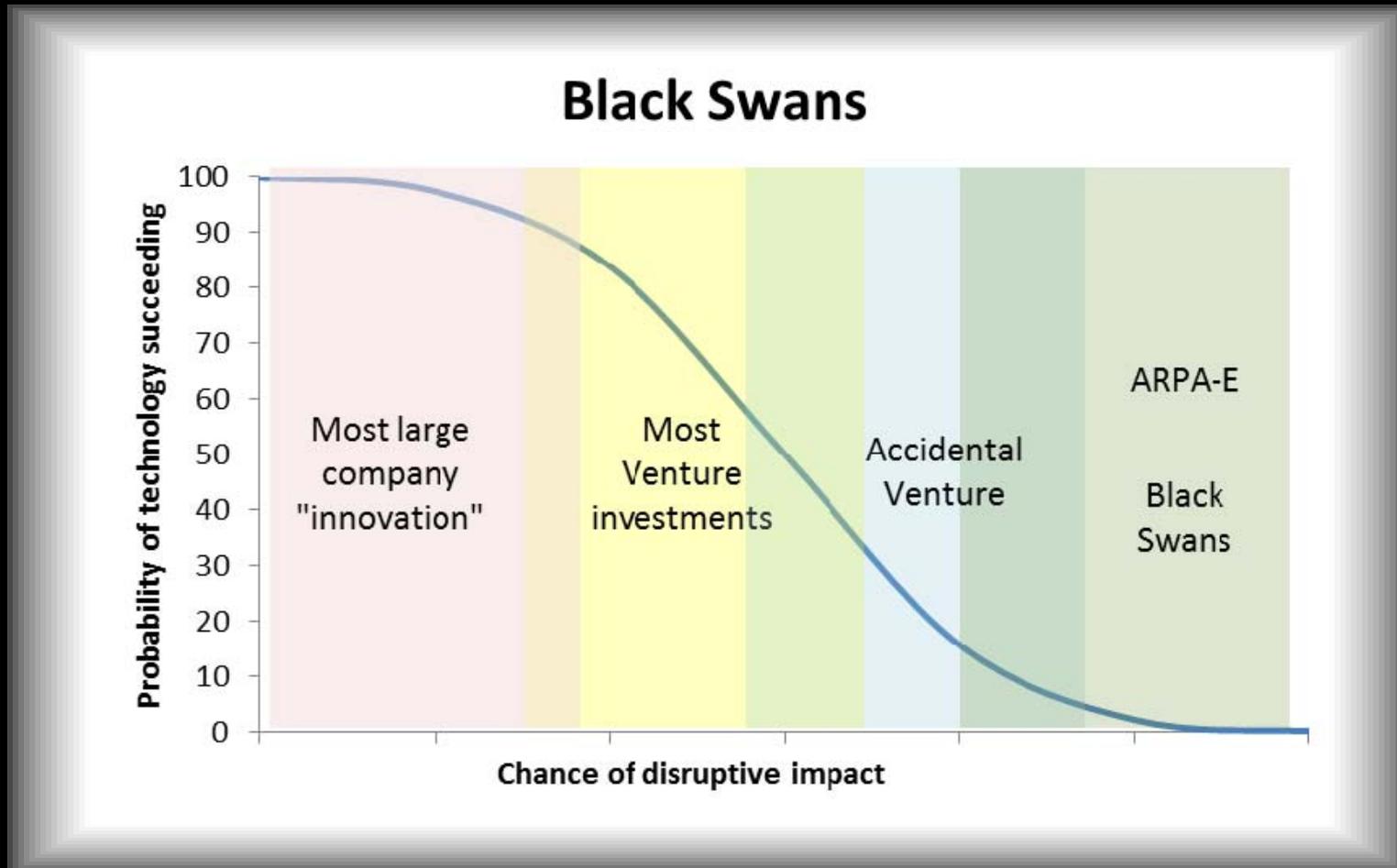
- *Maya Angelou*

# “black swans”



...rarity, extreme impact,  
and retrospective  
(though not  
prospective)  
predictability

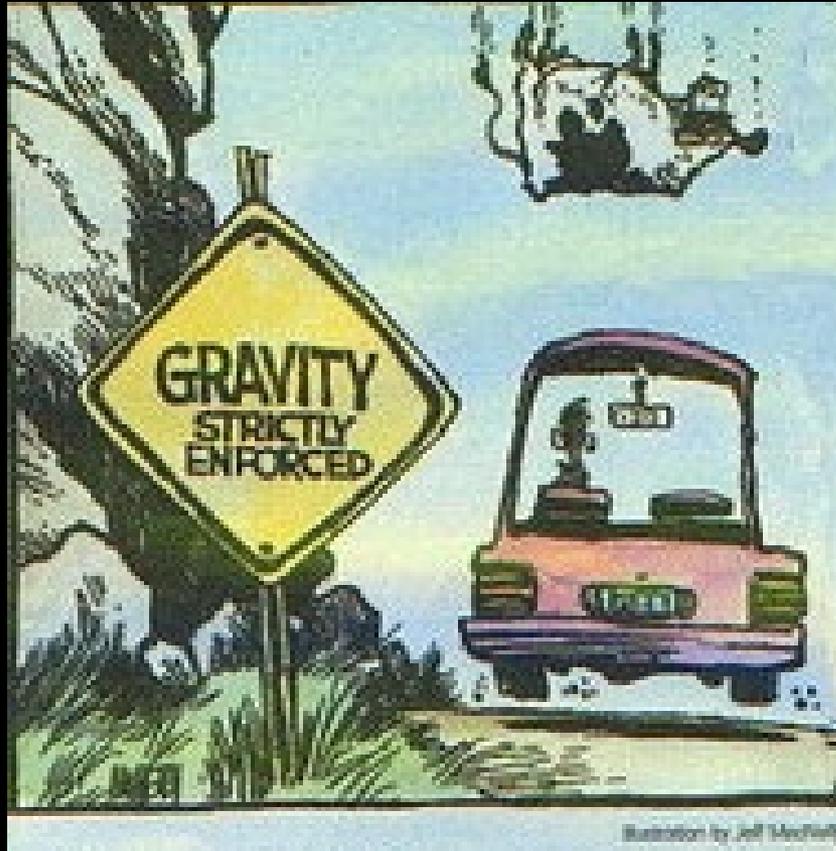
# Success vs. Impact



10,000 intelligent Shots.... 10 Googles or more!

*it's ok to fail as long as it is worth succeeding*

# ...economics matter



***NOTHING*** that defies the law of economic gravity can scale

# ...the sources of innovation

- Google, Facebook, Twitter : Fox, NBC, CBS
- Amazon : Walmart
- First Solar : Shell & BP Solar
- Cree : GE
- DNA Sequencing

# disruptive vs. incremental

**“the clean dozen”**

*What if oil was a 100% renewable and cheaper than fossil crude oil and we used 50% less of it?*

# kior

“a million year crude production cycle reduced to minutes  
and market competitive?”

# ecomotors

“Engine that delivers 50%+ vehicle efficiency for lower cost?”

*What if coal based electricity could be 75% cleaner and we used 75% less of it for lighting and cooling?*

# ciris

“ ... clean coal without ever taking it out of the ground”

# calera

“ ... turning problem carbon dioxide into a  
feedstock for building materials”

# Soraa/epowersoft

“no-compromise 80% more efficient pay-for-itself lighting  
& power electronics”

# Silicium/caitin

“new thermodynamic cycles and thermoelectrics”

*...electricity storage was low cost for both stationary & mobile applications*

# lightsail

“ 5x cheaper grid scale energy storage, using only air”

# Quantumscape/Pellion

Quantumnanothingamijigit/magnesium

...we applied unconventional technology to large problems like steel, sugars & agriculture?

# Advanced Agriculture

“massively cutting fertilizer & pesticide use and increasing yields”

# New metals

“reinvent materials science”

“approach theoretical perfection at large scale”

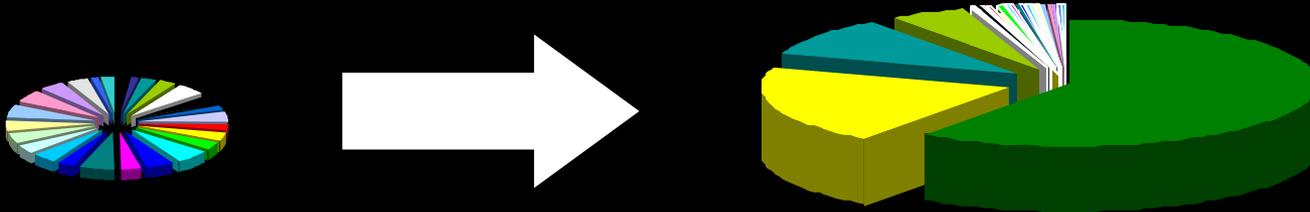
# HCL

“food-grade sugars from any biomass”

# winners take (almost) all =investment viability

5 years out, the group's  
market cap has grown...

Starting Industry Structure



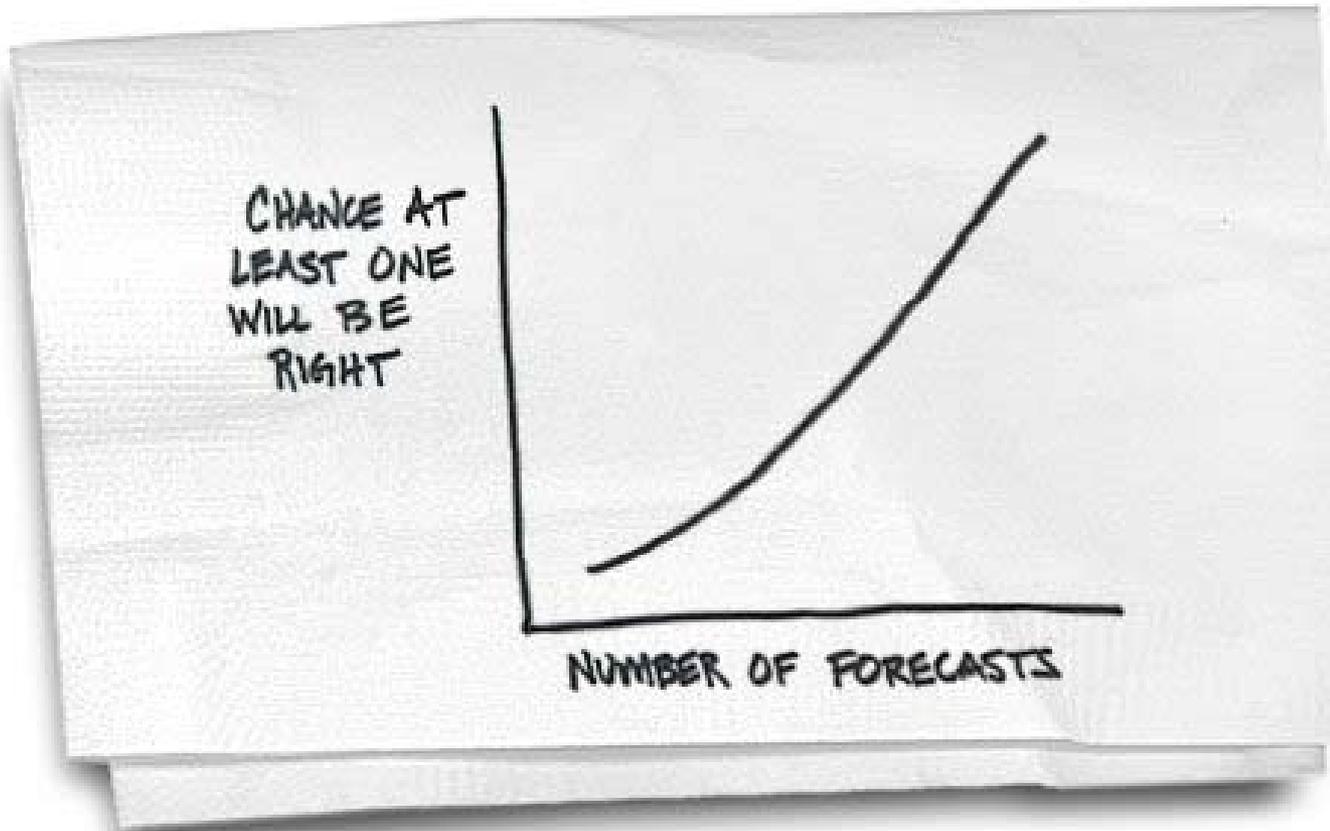
But leaders far exceed the also-rans

**The illusion of knowing ...**

**vs.**

**... knowing that we don't know**

# The reliability of forecasting



“Heavier-than-air flying machines are impossible”

- Lord Kelvin, President, Royal Society, 1895

“There is no reason for any individuals to  
have a computer in their home”

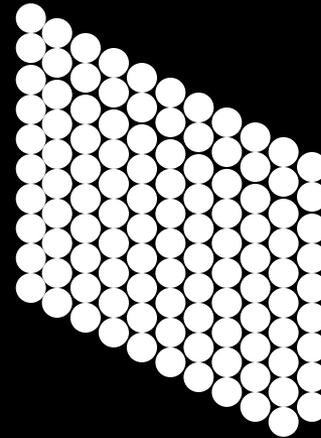
- Ken Olsen, President, Chairman and Founder of DEC, 1977

# Mckinsey : US mobile subscribers

1980 forecast for 2000



forecast



actual

# yesterday's technology, tomorrow's forecast

1980's phone:



year 2000 phone:



Could McKinsey or an analyst  
have predicted :

...Twitter?

...India's cellphone to toilet ratio?

...pharma, computer, telecom, media changes

...China's rise, Berlin wall, Egypt, USSR?

# quantitative modeling **flaws**

**models with given inputs are precise but inaccurate**

- **chasing “false precision”; chasing 3<sup>rd</sup> order effects**
- **input the measurable, ignore the immeasurable**
- **obscured embedded assumptions**

# the folly of predictions: tetlock study

**hundreds of experts.**

**80,000+ “expert” forecasts & 20+ years**

**results: experts are poorer forecasters than dart-  
throwing monkeys**

# why?

“.... experts were much tougher in assessing the validity of information that undercut their theory than they were in crediting information that supported it.”

- Tetlock

# ... experts were asked to predict about

- **Soviet Union (in 1988) - by 1992, Communist Party control will**
  - strengthen
  - weaken
  - remain unchanged
  
- **EU Monetary Union (in 1991) - by 1996, the plan for a common currency**
  - abandoned
  - seriously delayed
  - on schedule
  
- **South Africa (In 1989) - by 1994 there will be**
  - more repressive white control
  - continuation of the status quo
  - less repressive minority rule but no serious power-sharing with blacks
  - major movement toward black majority rule
  - formal establishment of black majority rule

**... with unexpected results**

**No relation between experience and accuracy!**

A robust finding – based on thousands of forecasts made by hundreds of experts.

DCF, EPS, IRR, sunk costs...

Who would've done search in 1998???



# What's the problem?

Process

Development funnel

Business plans

Existing markets

Big Profits from existing products

Failure aversion

Inadequate incentives

All or nothing entry strategy

*“any sufficiently complex mixture of elements will make many if not every possible reaction ‘auto-catalyzed’ by some other element in the mixture”*

Stuart Kauffman

ecosystem, culture and mindsets....

Attitude, clusters and density non-linearly  
increase odds of auto-catalysis

# Engineering your company's genes...



Undetermined planning

*and*

A culture of experimentation

Try frugally and fail fast

More “tail risk” is a good thing!

# Failed strategies vs. Failed tactics....

Facebook vs. friendster

Ipod vs. mp3 players

Google vs. Altavista

...

insurance, option value and risk reduction

“Venture assist to succeed”



*not for the faint of heart:*

the vision to imagine the possible  
to embrace and nurture the improbable

but with the discrimination to eliminate the  
impossible, and to prioritize the best improbables

# “relevant scale” solutions for

... oil

... coal

... materials

... (efficiency of oil & coal use)

*“The best way to predict the future is to invent it”*

*Alan Kay*

comments?

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