



DayJet & Complexity Science

Complexity in Action Conference 2007

Northwestern University

October 8, 2007

Bruce Sawhill

Jim Herriot

Oct 8, 2007

Sawhill & Herriot – DayJet & Complexity Science

DayJet

“Top gun meets top geek”



- **First *per seat on demand* airline**
- **Raised >\$200M in private equity and debt**
- **>1000 jets on order, next 5 years**
- **Flying Very Light Jets – VLJs**
- **Built and powered by Complexity Science**
- **First all-digital commercial air carrier**
- **Founded 5 years ago by Ed Iacobucci, et. al**
- **Service launch Oct 3, 2007**

Bruce & Jim



- **Complexity Scientists**
- **Worked together at Bios Group, SFI spin-off**
- **Consulted for NASDAQ, P&G, United Air, SWA, Gov't, etc.**
- **Built agent-based models for economics, orgs, finance, ..**
- **Founding members of DayJet**

DayJet – Big Ideas

new genre of airline, business, management

- **No schedules**
- **Adaptive to customers**
- **Mass customization**
- **‘Pull’ marketing model**
- **Internet for atoms**
- **Quantum metaphor for resource allocation**
- **Management specifies What, not How**
- **Self-aware – computational models of itself**

Made possible through

- **VLJ aircraft**
- **Complexity Science**



Complexity Science

Science of the unique



- **Mathematics of living systems**
- **Not a science, rather ‘glue’ between sciences**
- **Spectrum between probable and improbable**
- **Math – part II (non-elephant zoology)**
- **Computational mathematics**
- **Agent-based modeling – stories**
- **Generative bottom-up statistics**
- **Gedankenexperiments – “abduction”**
- **Combinatorics (99% of computation in 2050)**
- **Scaling principles, power laws**

Evolution of Systemic Thinking

Echoed by industrial process

- Few unique things
- Many similar things
- Many unique things
- Craft
- Mass production
- Mass customization

Long ago **Last century** **Now**

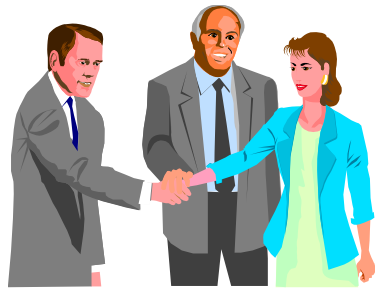
Medium
Technology
Limitation
Focus

minds	pencil & paper	fast computers
intuition	statistical mechanics	agent-based modeling
small scale	interaction of parts	compute speed
few <u>parts</u>	averages & variance	many <u>parts</u>

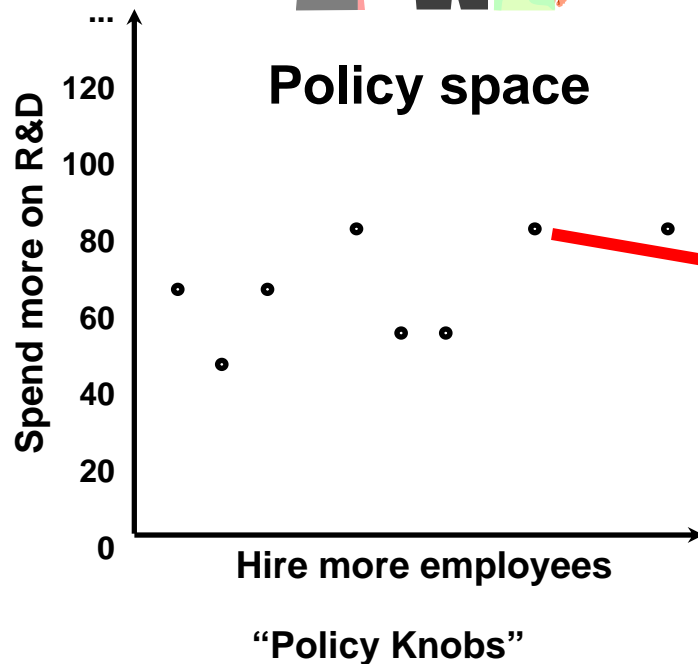
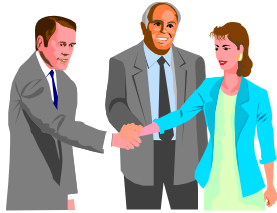
Applied Complexity Science

Maturing from
rule-of-thumb to
systemic thinking

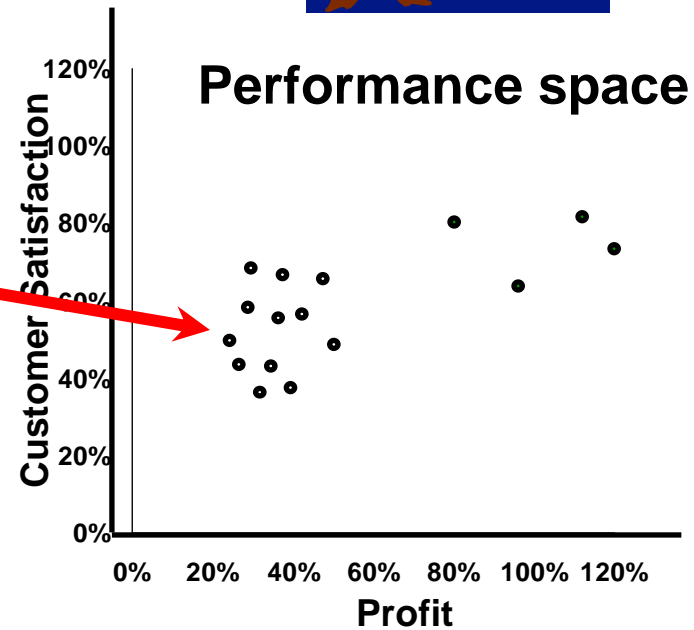
- **constructing buildings**
- **constructing organizations**



Running a Company – What is



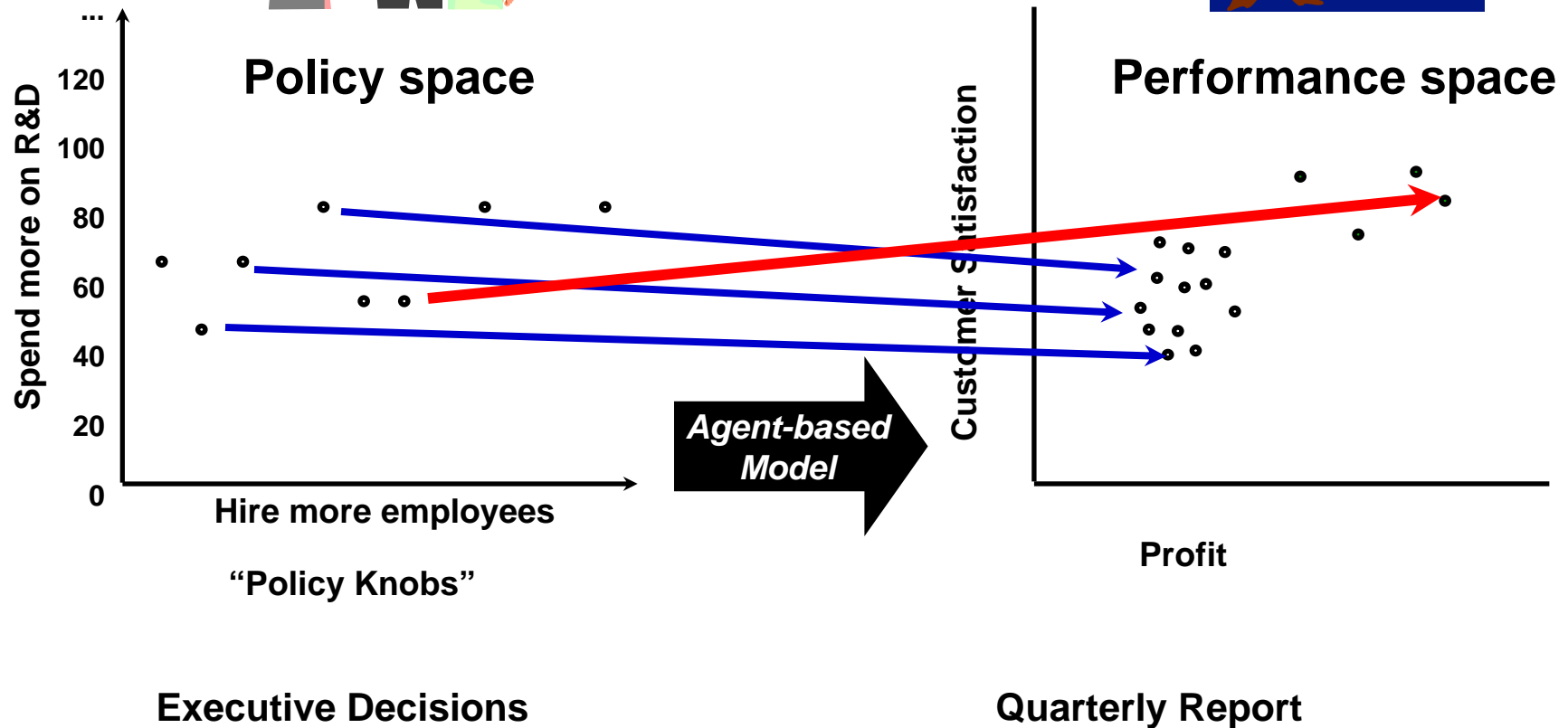
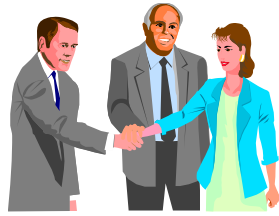
Executive Decisions



Quarterly Report

What ifs

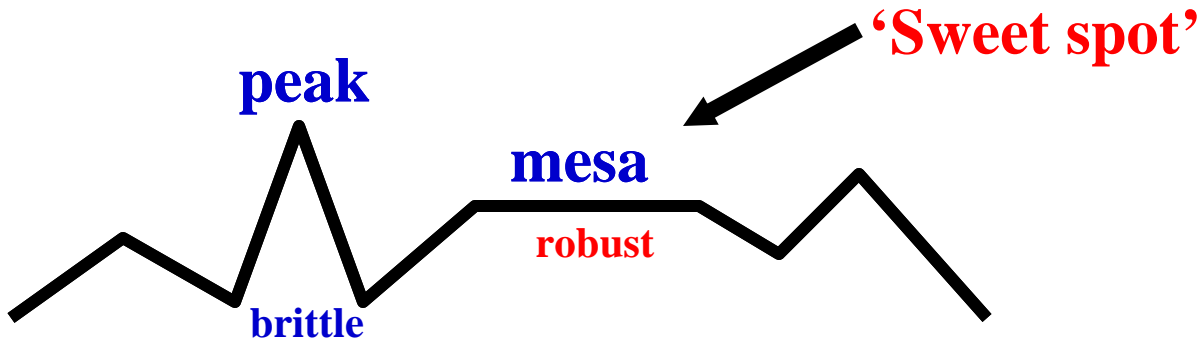
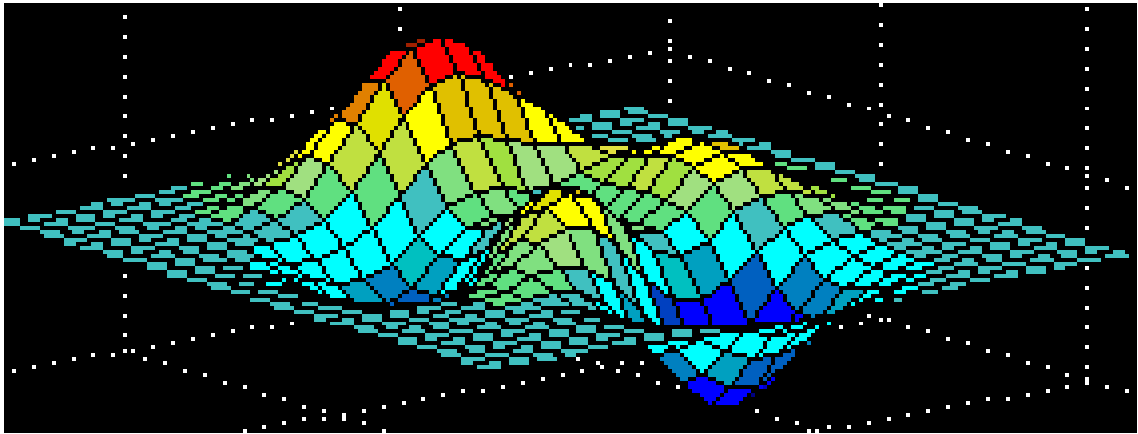
Systematic “Gedankenexperiments” – “abduction”





Fitness Landscapes

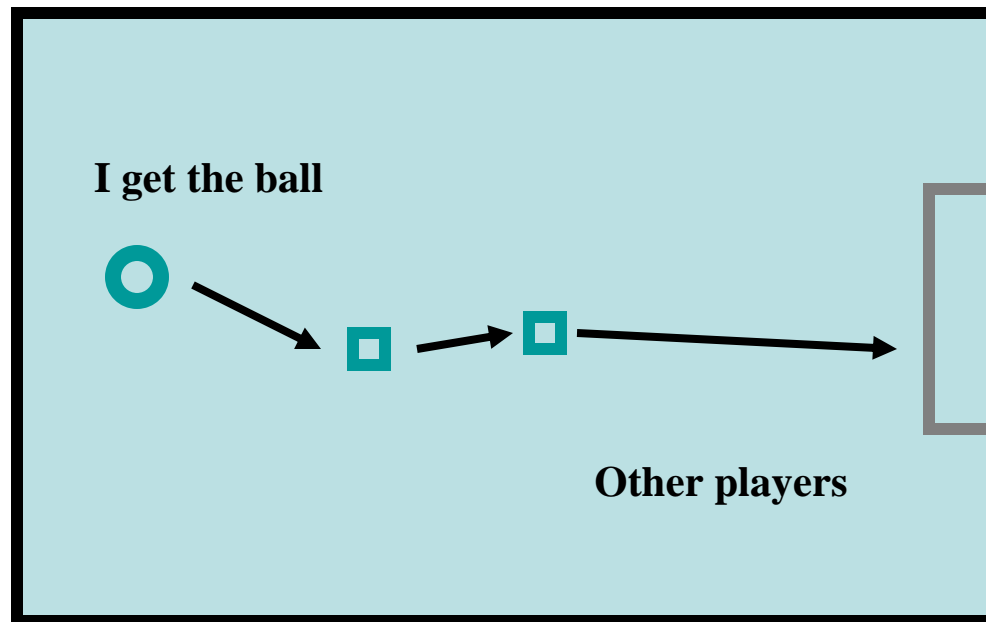
Best = Robust





Soccer

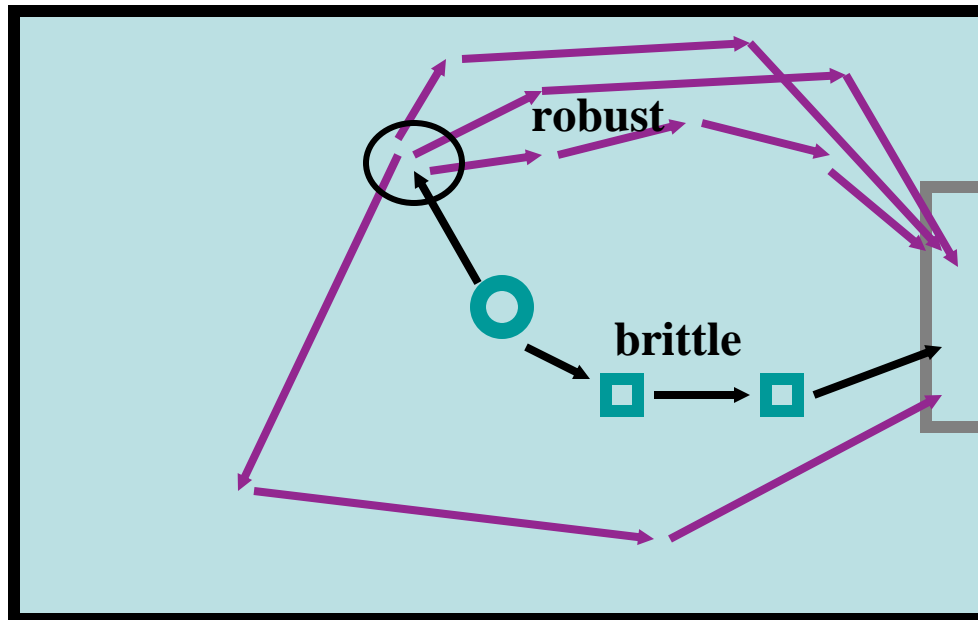
brittle solution





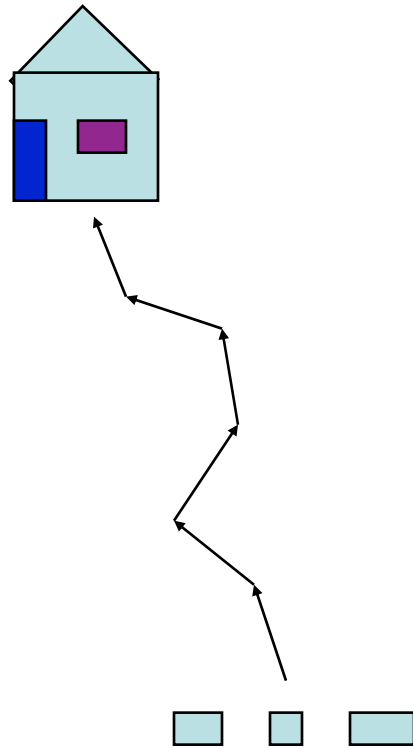
Total Soccer

robust solution



multiple pathways, optionality

Lego World constructing solutions

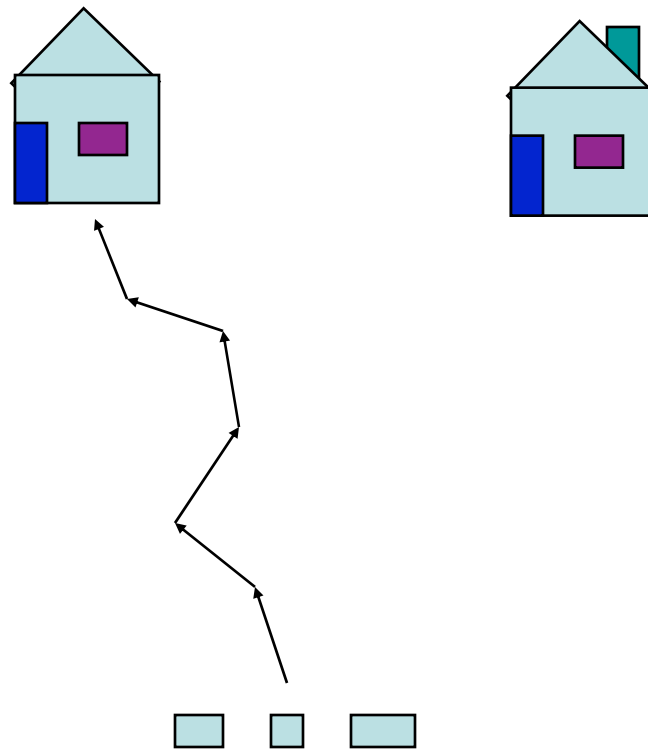


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Sawhill & Herriot – DayJet & Complexity Science

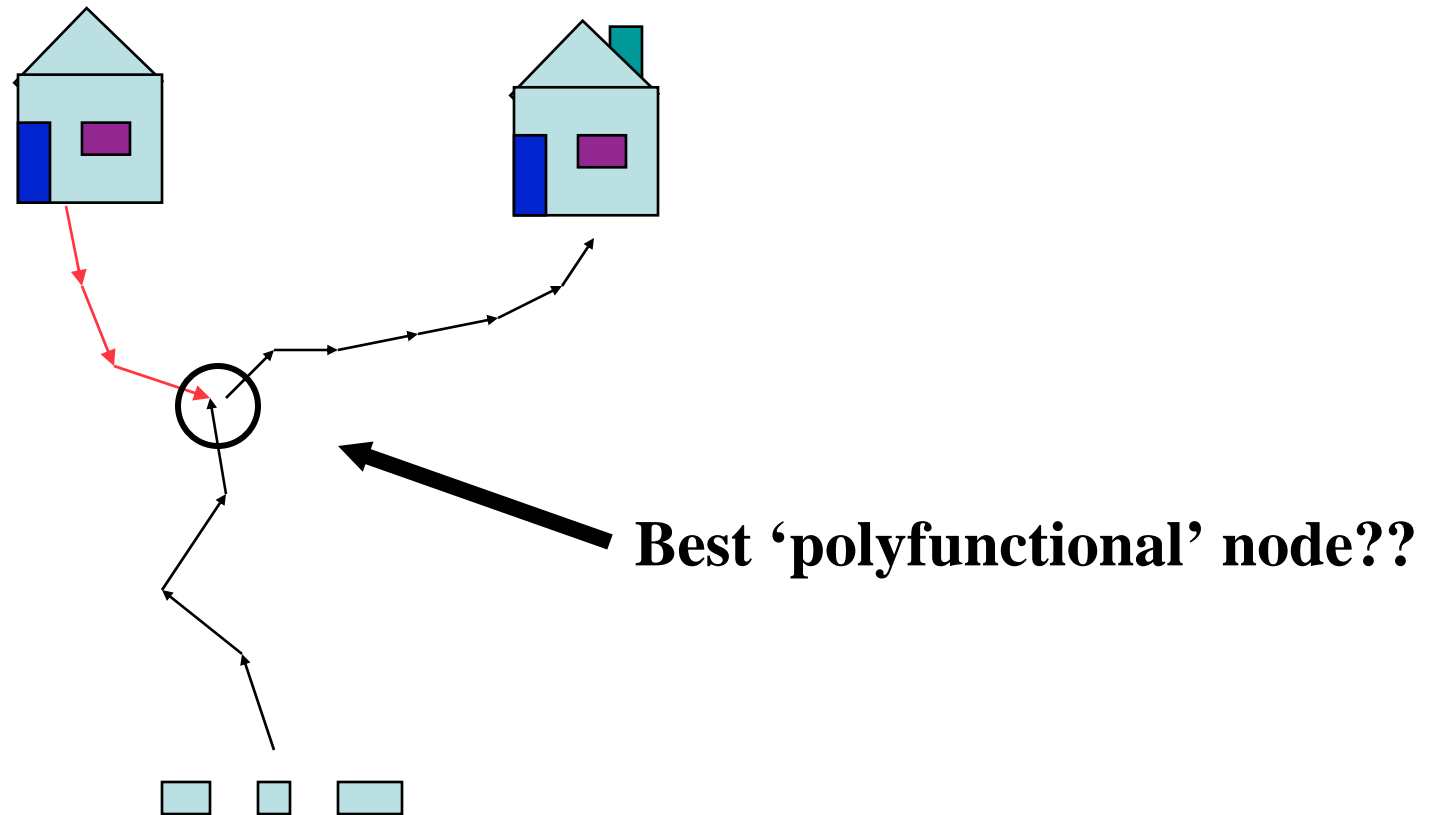
Disruptions

Oops, I really wanted a house with a chimney



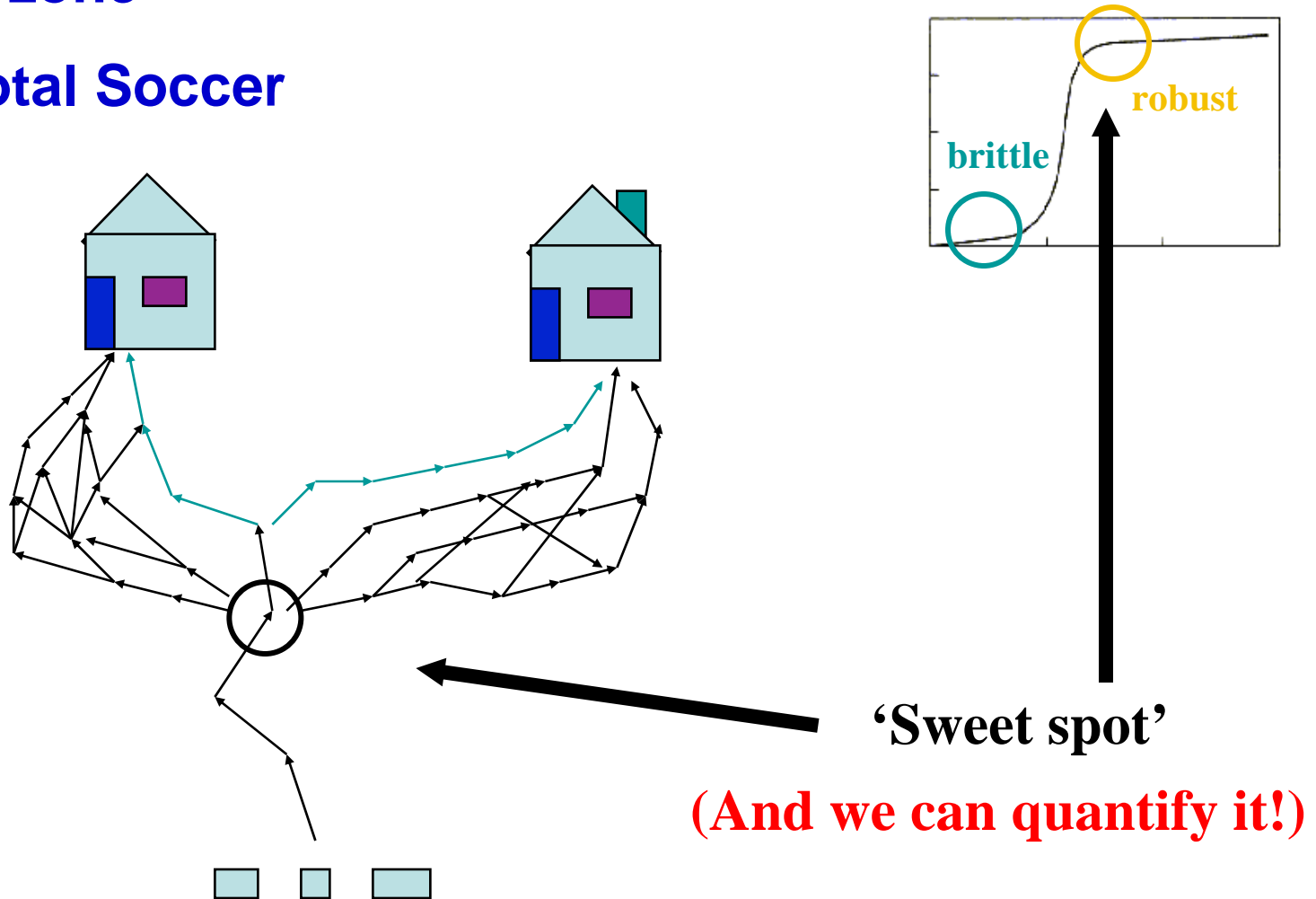
Brittle strategy

Build subassembly leading to both houses



Robust strategy

- Adaptable, agile
- In the “zone”
- Like Total Soccer



DayJet



DayJet – ABM

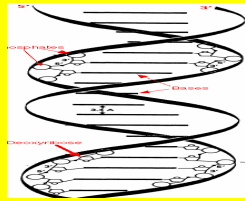
1. Agents

Mapping to people



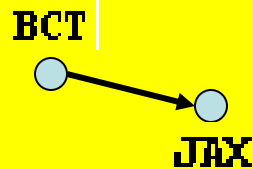
2. Genomes

Agent content



3. Itineraries

Demand generation



4. Supply

Airline service



5. Decisions

Agents choose airline



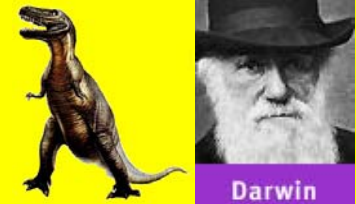
6. Verification

Model fidelity



7. Evolution

Improving model



8. Utilization

What ifs, etc.

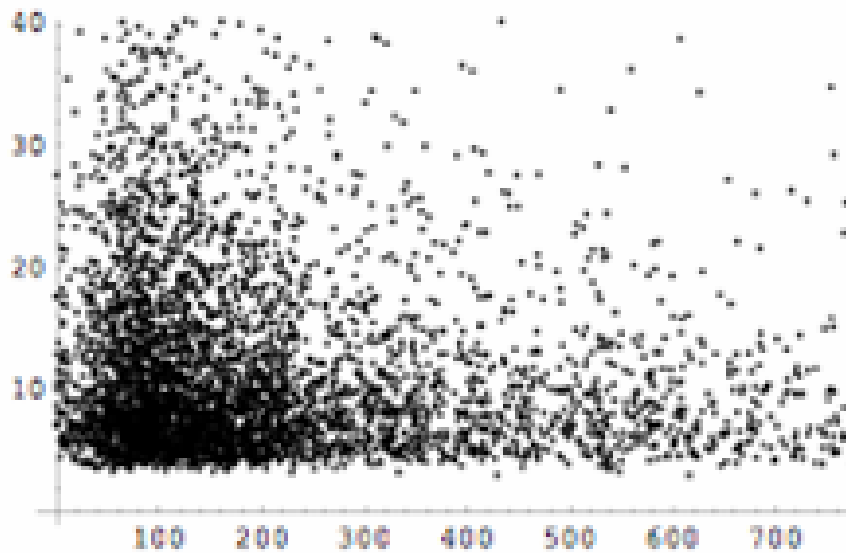


Data

DayJet Market

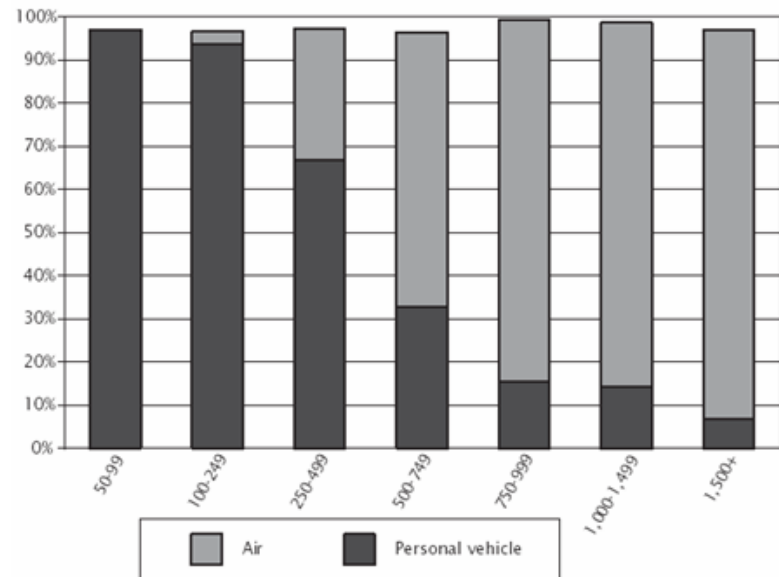
most business trips are...

short



by car

Long-Distance Personal Vehicle and Long-Distance Air Trips by Miles Traveled One Way



Findings from the National Household Travel Survey U.S. Business Travel

DayJet

Applying Complexity Science



- Impossible 10 years ago (VLJs, computation, etc.)
- Agent-based modeling – pitching machine
- Quantum-style routing – batting machine
- Everything is a “disruption”
- Total soccer – plan Bs and plan Cs
- People do the Whats, Robots do the Hows

Thank You

- **Questions**
- **Discussion**
- **Fast Company article**



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