



15.905 Technology Strategy

Toyota and the Prius
Michael A M Davies
7 May 2007



Agenda for today, Wednesday 2 May 2007

- ~12:45 • Toyota and the Prius
- ~13:45 • Decision-making



Toyota Motor Corporation: Launching Prius

- How has the car industry evolved and changed?
- How do you anticipate that it will evolve over the medium to long-term, the next two or three product and platform generations?
- As a result, what are the worthwhile demand opportunities that may emerge?
- How has Toyota made the decision to invest in full hybrid electric vehicles?
- What are the key decisions so far that have shaped the Prius program, and how do they differ from typical programs?
- How does Toyota go about making decisions?
- So, what do you think Toyota should do about the Prius launch decision?

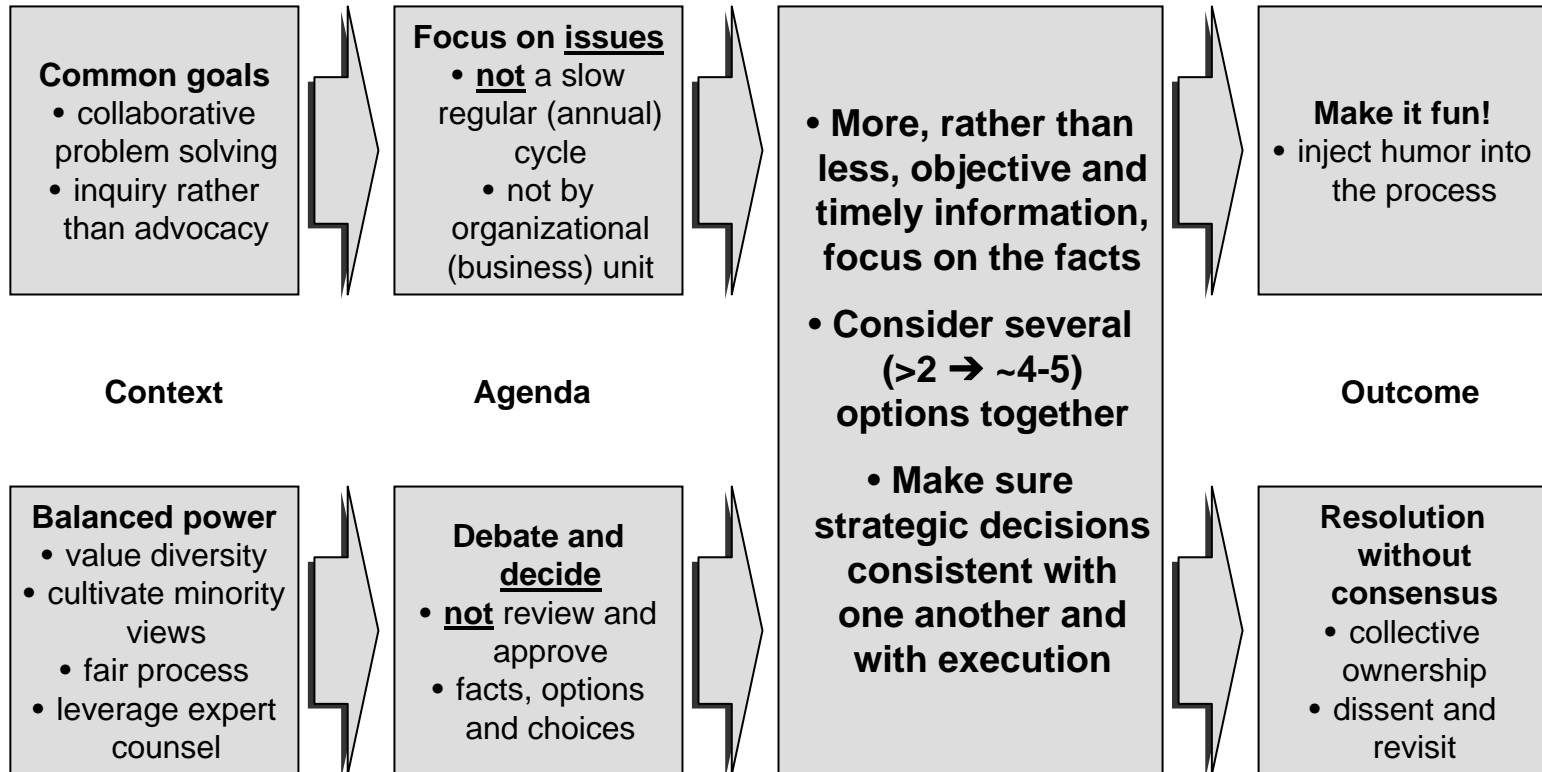


Effective decision-making involves conflict - challenging leads to better decisions

- Incomplete and ambiguous information
- Uncertainty
 - how customers will respond
 - innovation trajectories
 - how co-opetition will play out
- Limited time
- Wide range of options
- *“Management teams whose members challenge one another’s thinking develop a more complete understanding of the choices, create a richer range of options, and ultimately make the kinds of effective decisions necessary in today’s competitive environments”*

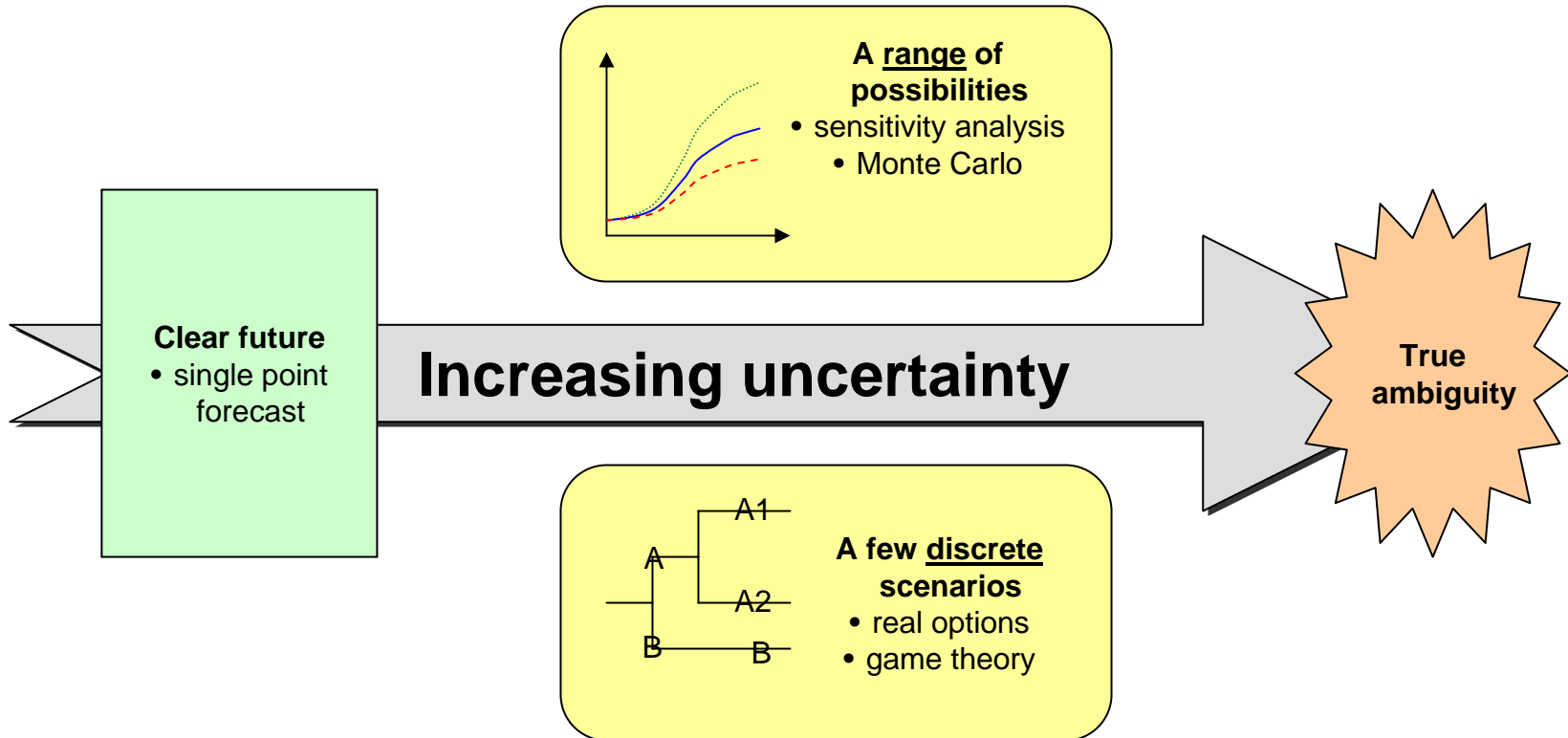


How can you make good decisions, when conflict is likely?





As a key part of focusing on the facts, recognize and embrace uncertainty





Banana

Discrete scenarios

- Does it work?
- Does anyone buy it?
- Competitor entry
- Collaborator partnership
- Patent litigation
- Standards battles

A range of possibilities

- Innovation trajectories
 - performance
 - cost
 - timing
- Pricing
- Adoption rates and ultimate penetration



Three basic types of decision, with increasing risks and levels of commitment

No-regrets moves

- worth doing anyway
- positive payoffs in most scenarios

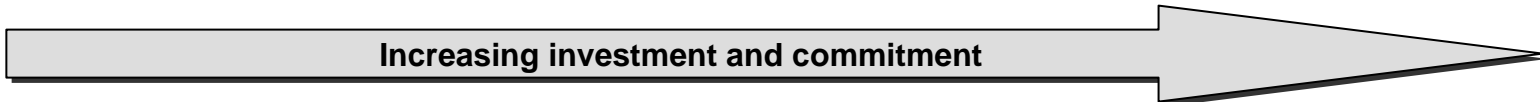
	X	Y
A1	✓✓	✓
A2	✓	✓
B	✓	✓✓

(Real) options

- positive payoff in some outcomes
- otherwise, small cost to play
- parallel or sequential

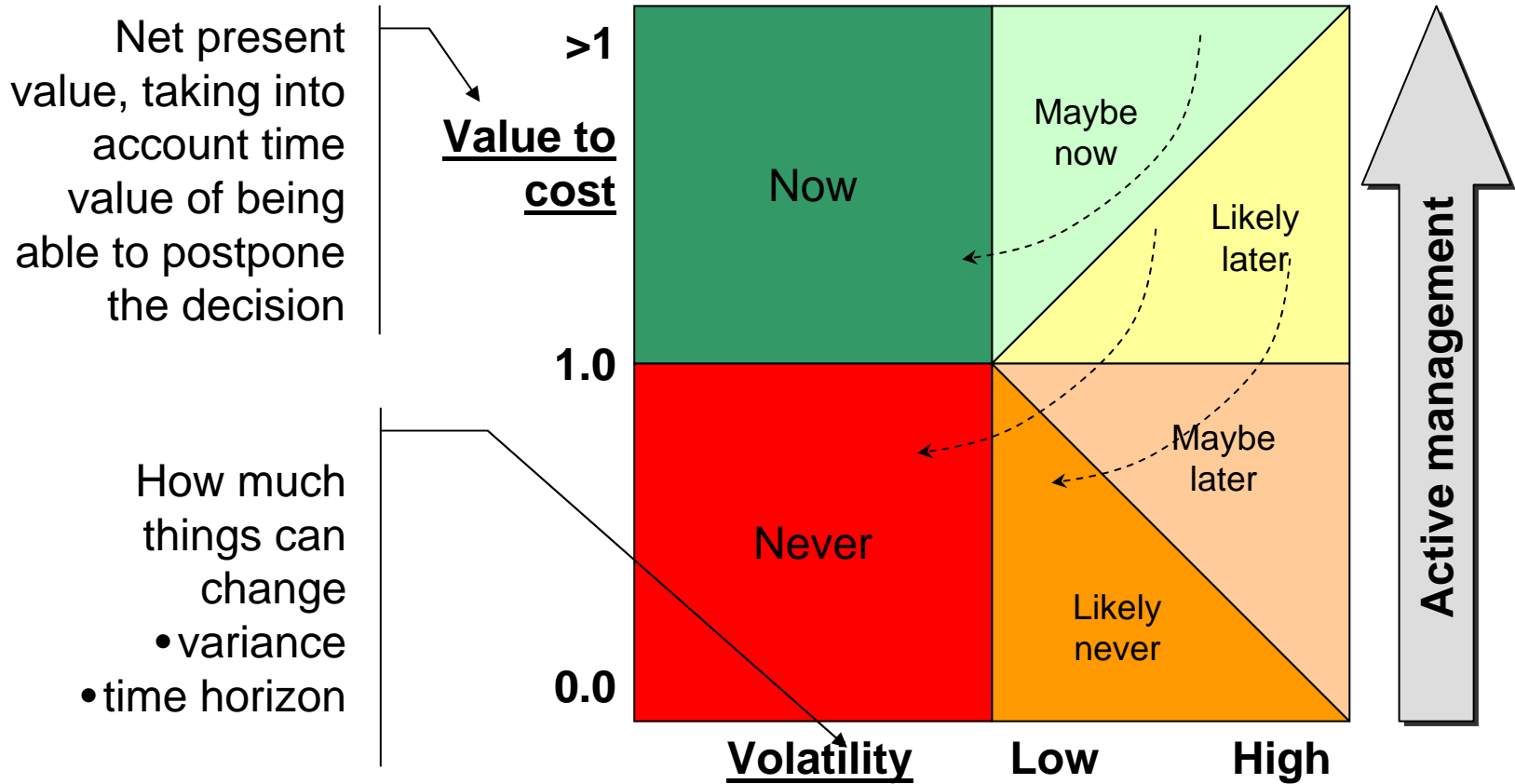
Big bets

- work in some scenarios
- high cost, negative effects in other cases






What you do about real options, and when depends on *value to cost*, and on *volatility*





For high-tech businesses, timing - and hence (active) waiting - is critical to success

- High-tech involves volatility
 - innovation
 - diffusion
 - co-evolution
 - Steady stream of small and medium-size opportunities
 - A few *golden opportunities* or *life-and-death threats*
- 
- Anticipate
 - analyze
 - reconnoiter
 - Prepare
 - build resources
 - create options
 - Commit
 - make the big bet

Interestingly, one of the key facets of Toyota's product creation is postponing design decisions

- Acknowledged leadership in manufacturing
- Apparent leadership in product creation
 - shorter lead-times in design
 - higher productivity
 - superior designs
- Albeit slowly evolving demand opportunity, stable technical architecture and business ecosystem
- Focus of recent study by National Center for Manufacturing Sciences
 - different paradigm
- Five articles in Harvard Business Review and MIT Sloan Management Review

A Second Look at Japanese Product Development
Rajan R Kamath and Jeffrey K Liker
Harvard Business Review, November-December 1994

The Second Toyota Paradox: How Delaying Decisions Can Make Better Cars Faster
Allen C Ward, Jeffrey K Liker, John J Cristiano and Durward K Sobek II
Sloan Management Review, Spring 1995

Another Look at How Toyota Integrates Product Development
Durward K Sobek II, Jeffrey K Liker and Allen C Ward
Harvard Business Review, July-August 1998

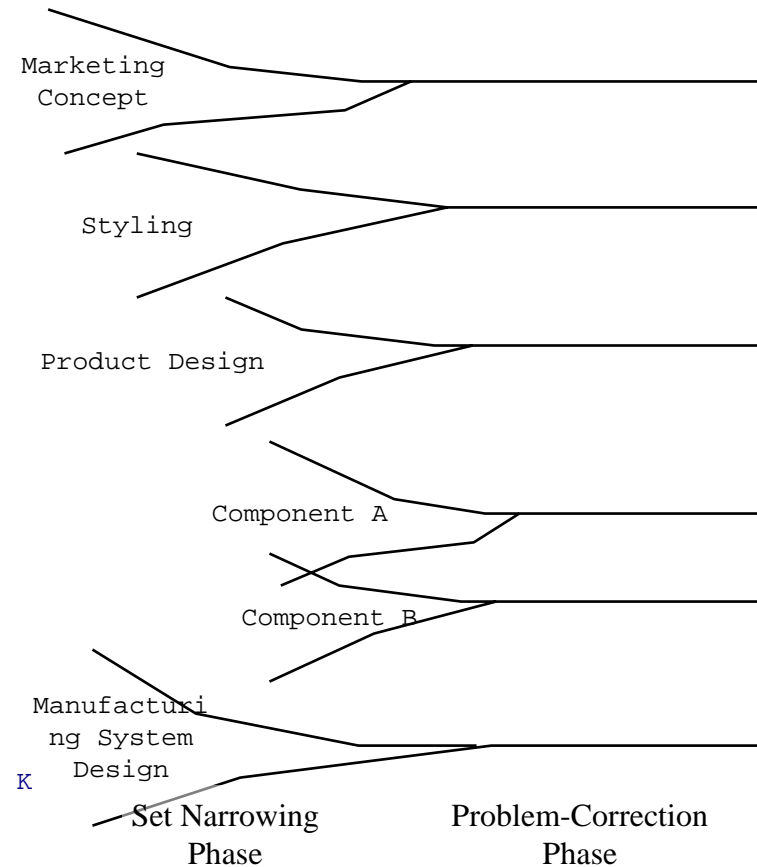
Toyota's Principles of Set-Based Concurrent Engineering
Durward K Sobek II, Allen C Ward and Jeffrey K Liker
Sloan Management Review, Winter 1999

Comments on the Second Toyota Paradox
Steven J Spear
Harvard Business School Teaching Note 9-602-035
(5 March 2003)



Three key facets: deadline-driven optimization; set-based development; rapid low-cost iterations

- 1 The team defines a set of solutions at the system level, rather than a single solution
- 2 It defines sets of possible solutions for various sub-systems
- 3 It explores these possible sub-systems in parallel, using analysis, design rules and experiments to characterize a set of possible solutions
- 4 It uses the analysis to gradually narrow the set of solutions, converging slowly towards a single solution
- 5 Once the team establishes the single solution for any part of the design, it does not change it unless absolutely necessary



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 Allen C Ward, Jeffrey K Liker, John J Cristiano and Durward K Sobek II
Sloan Management Review, Spring 1995