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?

Common goals
- collaborative problem solving
- inquiry rather than advocacy

Focus on issues
- **not** a slow regular (annual) cycle
- **not** by organizational (business) unit

Balanced power
- value diversity
- cultivate minority views
- fair process
- leverage expert counsel

Debate and decide
- **not** review and approve
- facts, options and choices

More, rather than less, objective and timely information, focus on the facts
- Consider several (>2 ~ 4-5) options together
- Make sure strategic decisions consistent with one another and with execution

Make it fun!
- inject humor into the process

Resolution without consensus
- collective ownership
- dissent and revisit

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

- **Clear future**
  - single point forecast

- **Increasing uncertainty**
  - A range of possibilities
    - sensitivity analysis
    - Monte Carlo

- **A few discrete scenarios**
  - real options
  - game theory

**True ambiguity**
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

(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

Increasing risk

Increasing investment and commitment
What you do about real options, and when depends on value to cost, and on volatility.

Net present value, taking into account time value of being able to postpone the decision.

How much things can change:
- variance
- time horizon

Active management

Value to cost:
- >1: Likely now
- 1.0: Likely later
- <1: Maybe later
- Never: Likely never
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

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

Toyota’s Principles of Set-Based Concurrent Engineering
Durward K Sobek II, Allen C Ward and Jeffrey K Liker

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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