



Procurement Risk Management at HP: Applying financial engineering to manage risks in the supply chain

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Agenda

1. About HP
2. Motivation for risk mgmt in high-tech industries
3. Challenges in applying conventional risk management techniques
4. Procurement Risk Management at HP
5. Implementing the uncertainty management culture

About HP

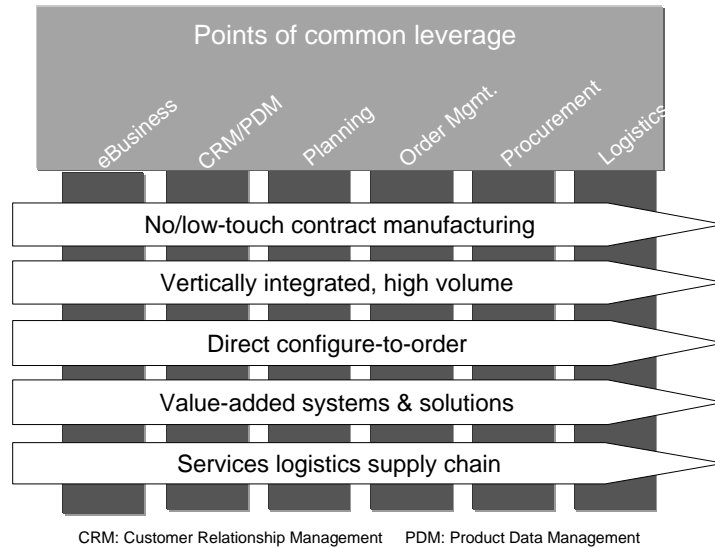
HP is a leading provider of product, technologies, solutions & services to consumers & businesses.

Personal Systems Group <ul style="list-style-type: none">• Desktops• Workstations• Notebooks• Emerging technologies	Imaging & Printing Group <ul style="list-style-type: none">• Consumer printing• Business printing• Digital imaging• Digital publishing
Enterprise Systems Group <ul style="list-style-type: none">• Servers• Storage• Software• Solutions	HP Services <ul style="list-style-type: none">• Customer support• Managed services• Consulting & integration• Solutions expertise

HP market leadership today

- #1 globally in inkjet, all-in-one, and single-function printers, mono and color laser printers, large-format printing, scanners, print servers, and ink and laser supplies
- #1 globally in total server revenue and shipments
- #1 globally in total disk storage systems, total external disk storage systems and open storage area networks
- #1 globally in network and system management software
- #2 globally in notebook PCs
- #1 globally in Pocket PCs
- #2 globally in PCs
- #2 globally in handhelds
- #3 globally in IT services

Supply chain competitive differentiation



Direct procurement, leading the industry

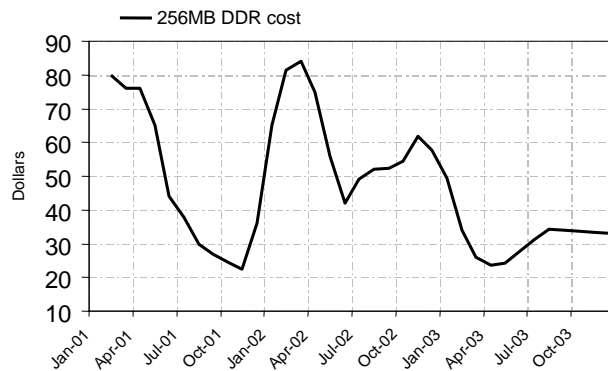


- We are the largest buyer in the world for most commodities in the electronics industry.
- Our procurement influence is significant.

Agenda

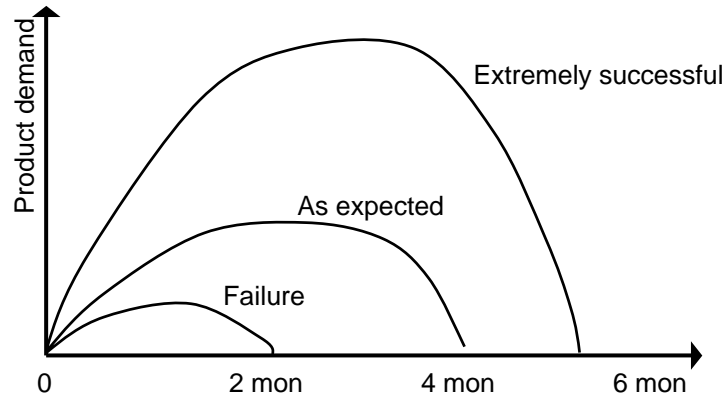
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High-tech components can exhibit significant cost volatility



DRAM memory & TFT panels high cost volatility

... coupled demand volatility of high-tech products

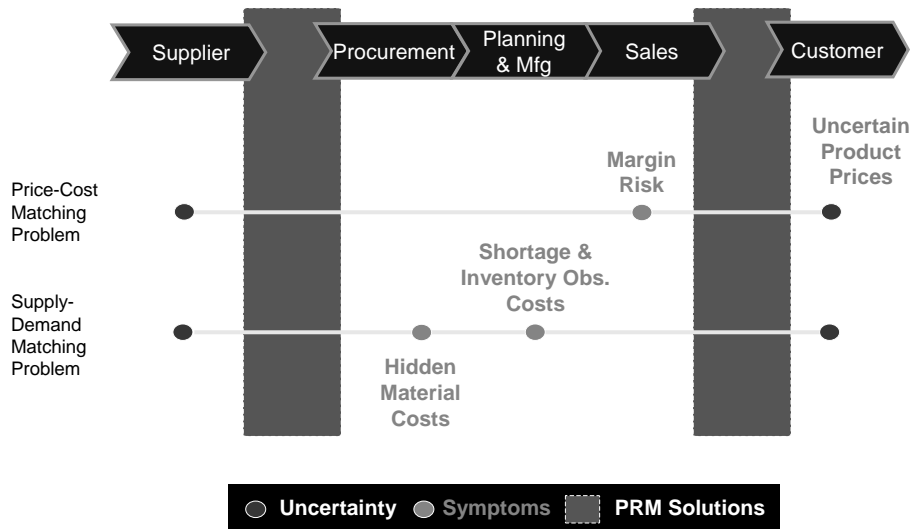


High-tech products exhibit very short life-cycles & extreme demand volatility

Lack of risk mgmt processes has resulted in billions of dollars in losses

<p>Dell Computer</p> <p><i>May 14, 2004:</i> Stock drops 3% as earnings are held back by memory prices <i>Oct 18, 1999:</i> Stock drops 13% as higher memory prices result in a \$470M earnings shortfall</p>	<p>Price risk</p>
<p>Cisco Systems</p> <p><i>April 2001:</i> \$2.5B inventory write-off due to rapidly weakening demand coupled with locked-in supply agreements</p>	<p>Demand risk</p>
<p>Ford Motor Company</p> <p><i>December 2001:</i> Ford posted \$1B loss on palladium & other precious metals contracts. Shareholder files suit alleging mistake in company's hedging</p>	<p>Price risk</p>
<p>Agilent Technologies</p> <p><i>July 1999:</i> Stock price drops 26% after an inability to obtain key components cause revenue shortfall</p>	<p>Availability risk</p>

Objectives of PRM @ HP: Measure & Manage Procurement Uncertainties



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Conventional risk management techniques are difficult to implement for high-tech components

Conventional risk management techniques	Challenges in applying these to high-tech components
<ul style="list-style-type: none"> • Applicable for mostly for managing price uncertainty; rarely for demand uncertainty • Hedging using mainly traded instruments with standard contract structures • Certain other bi-lateral structured contracts which are derivatives of traded instruments. 	<ul style="list-style-type: none"> • Price, demand and availability uncertainty are equally important • No traded instruments • Currently procured mostly from “unstructured” contracts which have non-binding quantity and pricing terms supported by forecasts of future demand and pricing.

Lack of traded markets hinders price discovery

Conventional risk management techniques	Challenges in applying these to high-tech components
<ul style="list-style-type: none"> • Traded markets set prices for a range of contract types such as spot, futures and options. • These markets are typically “efficient” and have numerous buyers and sellers. 	<ul style="list-style-type: none"> • Few traded markets to set prices. • Even if traded markets are available, liquidity is very limited. • Number of suppliers & buyers for a particular commodity are limited; large suppliers and buyers hold significant market power to influence prices and availability.

Modeling of uncertainties & risks becomes difficult

Conventional risk management techniques	Challenges in applying these to high-tech components
<ul style="list-style-type: none"> • Since most risk management instruments are derivatives, a replication approach is appropriate. • Replication approach results in a risk-neutral valuation. • Standard Markovian stochastic processes used to model price uncertainty 	<ul style="list-style-type: none"> • Replication approach to valuation is not valid due to the lack of traded instruments • Demand, Price and Availability uncertainties are correlated with one another. • Pricing for certain manufactured goods exhibit non-Markovian behavior

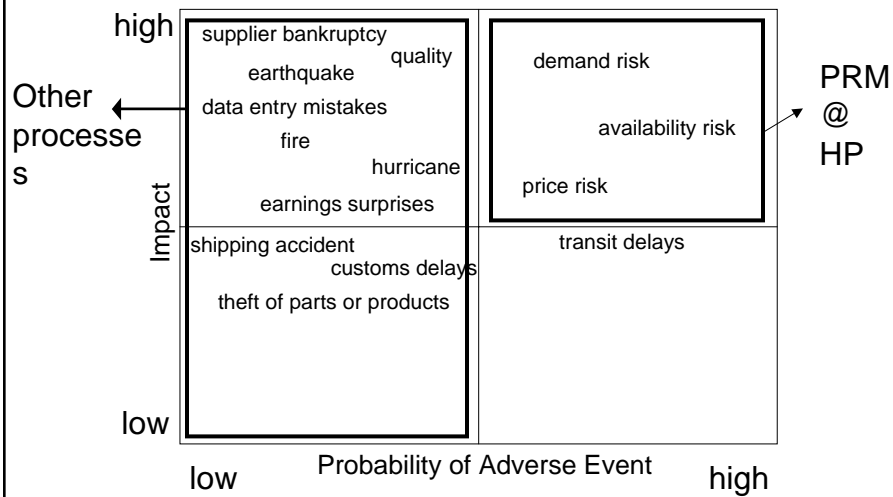
Lack of risk mgmt biz processes further exacerbate the challenge

Conventional risk management techniques	Challenges in applying these to high-tech components
<ul style="list-style-type: none"> • Robust business processes for risk management exist in companies that participate in such traded markets. • Metrics such as value-at-risk and earnings-at-risk are used to measure the risk in a portfolio. • Dedicate risk management organizations in place. 	<ul style="list-style-type: none"> • Business processes and metrics to pro-actively measure and manage risks in procurement are lacking at most companies. • The supply chain and procurement organizations manage availability risk through the use of inventory buffers.

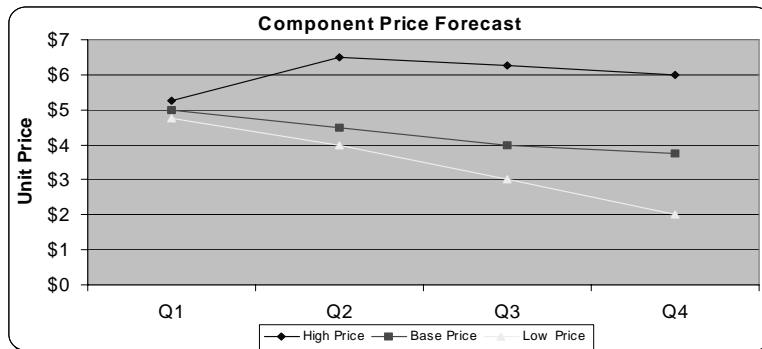
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PRM at HP addresses risks due to high probability events

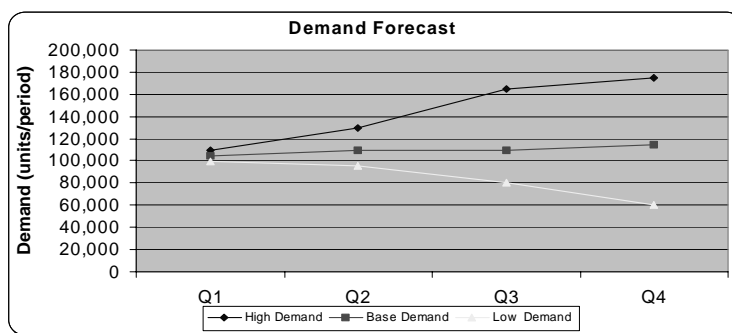


Price uncertainty modeled using econometric models



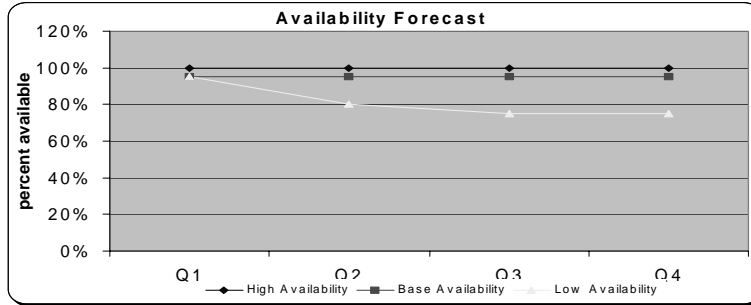
- Cost uncertainty modeled using econometric models
- Customized to account for unique industry dynamics of each high-tech component like DRAM and TFT-panel

Demand uncertainty scenarios



- Demand uncertainty quantified using a combination of historical data analysis & marketing inputs
- Currently “point” forecasts for demand estimated using ERP tools

Availability uncertainty scenarios



- Pricing does not adjust enough to match supply and demand at all times. Instead under conditions of short-supply, suppliers “allocate” available supply among several buyers – thus resulting in availability uncertainties.
- Lack of adequate historical data implies that availability uncertainties are quantified using interviews

PRM manages risk using bi-lateral structured contracts with suppliers

Supplier



i n v e n t

Uncertainties to manage

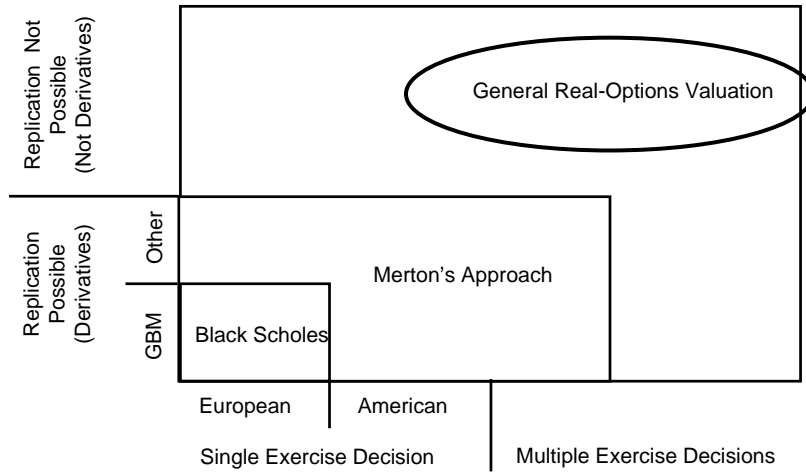
- 1) Demand, cost and availability uncertainties
- 2) These uncertainties are strongly correlated



Structured contracts that are combinations of qty & pricing terms

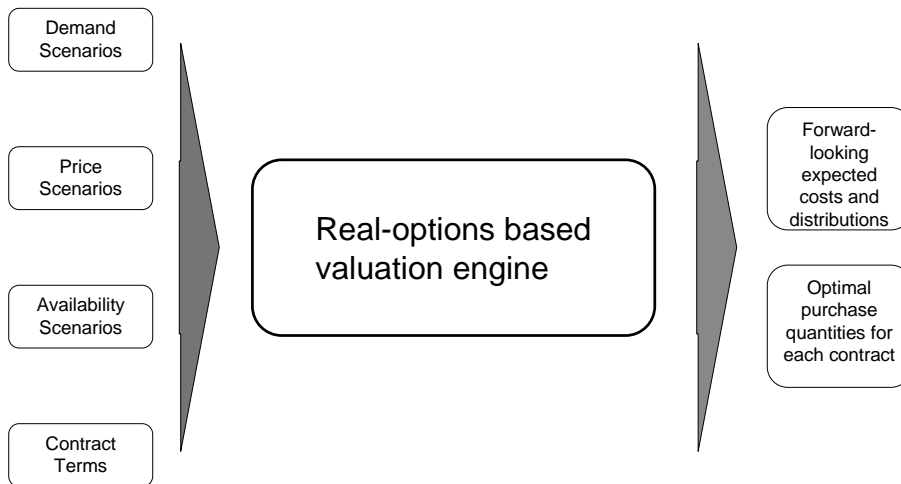
- 1) Quantity Terms:
Fixed Quantity; Minimum and/or maximum quantity; Fixed and flexible % of TAM
- 2) Pricing Terms:
Market-based with specified discounts; Fixed price; Price caps and floors

PRM valuation methodology: Based on a general real-options valuation



Source: B. Johnson, V. Nagali and B.R. Romine, "Real Options Theory & the Valuation of Generating Assets", The New Power Markets, Risk Books, 1999.

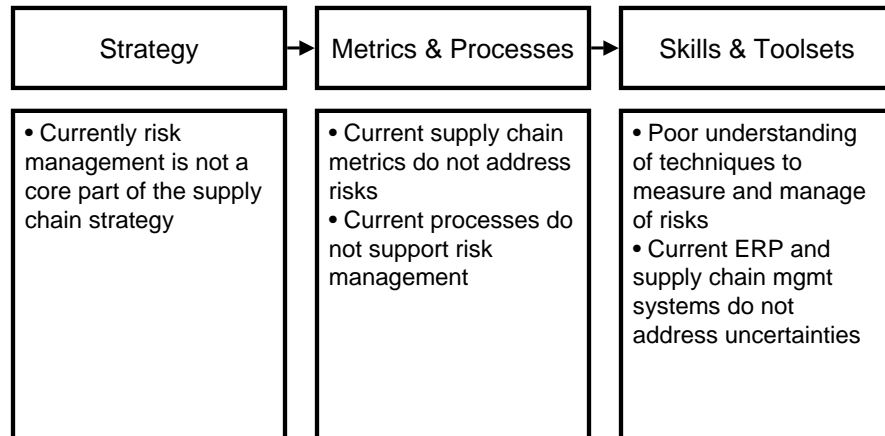
PRM Analytics Software Schematic



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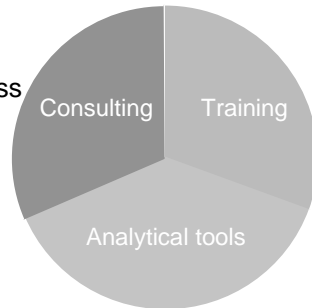
Organizational challenges in implementing PRM



PRM solutions and services

Consulting

- Commodity-specific
- Business process
- Deal structuring and valuation
- Change management



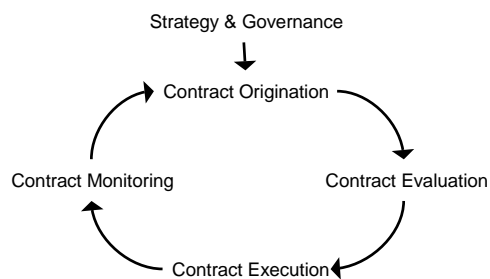
Training

- Core concepts
- Forecast scenario generation

Suite of Analytical tools

- HPRisk desktop contract valuation
- HPHorizon demand forecast scenario Tool
- Price forecast Tools
- Inventory buffer calibration tool

Re-engineering business processes to implement PRM



1. New metrics put in place to track supply chain risks
2. Risk mgmt is now a core part of commodity strategy

PRM results

1	2	3	4
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Training: >500 people trained

Development:

- 4 Analytical tools
- 5 patents filed

Implementation FY04:

- >30 executed contracts
- \$40M realized saving reported by BUs and commodities,
- \$3B realized spend reported by BUs and commodities,
- Implemented with 14 component families
- Improved by a factor of 2 the quality of DRAM cost forecast