How NPD changes
...with Platforms

Penn State University
April 11, 2005
Paul Mugge, BCS Partner
Agenda

- “Attuned to Market Realities”
- “Not Impeded by Cultural Inertia”
- “Holistic and Rigorous”
  
  ✓ Innovation Management Codified\(^1\).
  ✓ Determining Organizational Competence
  ✓ Creating an End-to-end System

- Proof Case: IBM Server business

“IBM determined that the next round of competitive positioning will be based on innovation, and a company's innovation capabilities will determine its future growth potential. **Only innovation increases the size of the pie, which means its mastery is vital to a company's long-term well-being.**”

Product manufacturers must recognize a number of Social, Economic and Technological forces

7 themes:

- “China rising”
- “Retailers = Big Power”
- “Brand is not enough”
- “Technology adoption rates shrinking”
- “Decreasing time for profit”
- “Innovation increasingly complex”
- “Punishment is immediate and severe”
China rising

10 Countries with Most Global 500 Companies 1994

- United States, 151
- Japan, 149
- Germany, 44
- France, 40
- Britain, 33
- Spain, 6
- Netherlands, 8
- Italy, 11
- Switzerland, 14
- S. Korea, 8

Source: The Fortune Global 500, 26, July 2004 Fortune

China Joins 10 Countries with Most Global 500 Companies 2003

- United States, 189
- Japan, 82
- Germany, 34
- France, 37
- Britain, 35
- Switzerland, 12
- China, 15
- Netherlands, 12
- S. Korea, 6
- Italy, 8

Source: The Fortune Global 500, 26, July 2004 Fortune
Retailers = Big Power

Source: Compustat, Data is the average value for the following retailers: Amazon. COM, Best Buy, Carrefour, Costco, Circuit City, eBay, and Wal-Mart

Retailers are generating profits on the backs of Electronics suppliers.
# Brand is not enough

**Survey of Consumers: More people recognize brand than purchase it**

<table>
<thead>
<tr>
<th>Brand</th>
<th>Percent using the brand</th>
<th>Percent recognizing the brand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dell</td>
<td>17%</td>
<td>84%</td>
</tr>
<tr>
<td>Kodak</td>
<td>46%</td>
<td>88%</td>
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<tr>
<td>Apple/Mac</td>
<td>7%</td>
<td>83%</td>
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<tr>
<td>Sony</td>
<td>39%</td>
<td>88%</td>
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<tr>
<td>Canon</td>
<td>19%</td>
<td>83%</td>
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<tr>
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<td>86%</td>
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<tr>
<td>Olympus</td>
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<td>78%</td>
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<tr>
<td>Nikon</td>
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<td>80%</td>
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<td>Pioneer</td>
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<td>80%</td>
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<td>Palm</td>
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<td>Intel</td>
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<tr>
<td>JVC</td>
<td>18%</td>
<td>77%</td>
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<tr>
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<tr>
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<tr>
<td>Nintendo</td>
<td>18%</td>
<td>86%</td>
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<tr>
<td>Motorola</td>
<td>17%</td>
<td>86%</td>
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<tr>
<td>Toshiba</td>
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<td>Sanyo</td>
<td>17%</td>
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<tr>
<td>Hitachi</td>
<td>7%</td>
<td>82%</td>
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<tr>
<td>Samsung</td>
<td>16%</td>
<td>85%</td>
</tr>
<tr>
<td>LG Electronics</td>
<td>2%</td>
<td>29%</td>
</tr>
</tbody>
</table>

Source: Forrester
Technology Adoption Rates Shrinking

For most companies the bulk of the money is made under 20% penetration.
Decreasing “time for profit”

Shrinking market opportunity:
Point at which the adoption rate stagnates or goes negative, when the market is ‘saturated.’
- For TVs, this point was reached in 36 years.
- For VCRs, this point was reached in 27 years.
- For CD players, this point was reached in 18 years.
- For DVD players, this point might be reached in less than 10 years.

Source: CE.org; “Maximizing Silicon ROI: The Cost of Failure and Success,” nassda, 20 May 02

Making any product delay untenable.
Innovation increasingly complex

Makes getting the “right” platform design point an imperative.
And any “miss” in execution is punished severely

Sony stock price (1999 – current)

- Dec, 20, 2000: 50% reduction in shipments of PlayStation2 announced creating concerns Sony would miss US holiday demand
- April 24, 2003: Quarterly losses of $927M reported, reflecting global uncertainty around SARS and the war
- June, 7, 2000: Parts shortages and ad costs reduce earnings
- Dec, 31, 2001: Operating income down 48% from prior year

Motorola and Nokia (FY02 – current)

- Motorola is unable to deliver their new clamshell phones for the 2002 holiday season due to part shortages
- Nokia misses the 2003 clamshell holiday market and loses brand loyalty
- Motorola misses the picture phone market in 2003

Source: Compustat
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- Proof Case” IBM Server Business
Culture isn’t one aspect of the game, it is the game

“Until I came to IBM, I probably would have told you that culture was just one among several important elements in any organization's makeup and success — along with vision, strategy, marketing, financials and the like. I came to see, in my decade at IBM, that culture isn't just one aspect of the game, it is the game…

…In the end, an organization is nothing more than the collective capacity of its people to create value.” LVG
Individual fiefdoms carry the weight of years of independence

Manifestation: “Sub-optimization”
- Chronic Inefficiency
- Led to one of everything
- Selfish -- no concept of sharing

After years of ceding powers to their business units, companies find these units, and the organization as a whole, are now uncompetitive.
Resulting in each business unit having its own:

1. R&D Center
2. Production Facility
3. Design System
4. Parts Inventory
5. Distribution Network, etc., etc.

In response to more nimble competitors, these companies are slow to market; ironically the very thing they were originally set up to overcome.
Inside the fiefdoms functional management ruled supreme

Manifestation:
“Uninformed and slow”

• Blind to market shifts and what customers really value
• Ignorant of total product life cycle -- and costs
• Slavish to status quo

Making change harder - these behaviors can be reinforced by years of success.
Typical IBM functional manager circa 1993…
What IBM Leadership did about it

“*Heavyweight cross-functional teams*”

- All stakeholders at the table
  - Best structure to make risk/cost tradeoffs
  - Able to resolve resource conflicts
  - Execution is immediate
- Accountable -- changed how the money flows
- Biased to action

Flipping the power from the functions to the cross-functional teams enabled IBM to work faster and smarter.
Rose-colored glasses prevented IBM from “seeing” the truth about itself

Manifestation:

“Almost always wrong”

• Markets?
• Competition?
• Products?
• Internal Capabilities?

“IBM’s business model had fallen wildly out of step with marketplace realities.” LVG
What IBM Leadership did about it

“Fact-based decisions”

- Formation of cross-disciplined *market-facing* “Platform” Teams -- “Module” teams work under their direction and within a “reference” architecture.

- Heavy emphasis put on front-end planning -- easy-to-use and standard Market Analysis Tools issued to all Platform Teams

- Rigorous portfolio analysis -- to ensure strategic “fit” and maximize value -- CFO reviewed all platform business cases

*This new behavior became a “principle” of operations for IBM.*
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Effective innovation requires integration and mastery of four capabilities

Source: IBM BCS Research
By themselves each capability has value; in combination they create sustainable competitive advantage.
Platform Management leverages commonality to address a set of related market applications

**Platform Management**
- The dynamic decisioning capability whereby the organization establishes the platform strategy, architecture, common building blocks, and development plan for a product family.
- Platforms exploit the benefits of commonality, compatibility, standardization, or modularization among different products and product lines.
- A product platform design approach provides cumulative efficiencies from which a host of derivative products could be effectively and efficiently created.

**Includes:**
- Part/product rationalization
- Part catalogues and content management
- Management councils
- Platform architecture and process
- Design for reuse/preferred parts
- Early design decision support tools
- Integrated design/sourcing

**Why is it important for innovation?**
- Lowers total costs (R&D, production, maintenance) due to fewer part numbers and higher part reuse
- Reduces product development schedule risk and complexity through proven building blocks and modular architecture
- Increases market share through reduced time to market

Source: IBM Innovation Management Business Competency Model, U.S. Patent Pending
Existing product development models focus on only one of the two fundamental success factors of innovation.

**Doing the right projects**

- Market Planning
- Portfolio Management
- Platform Management
- Pipeline Management

**Doing projects right**

Success depends on both.

Source: IBM Innovation Management Business Competency Model, U.S. Patent Pending
Strategy, Organization, Process, and Technology are the "DNA" of a capability

An effective Capability is a consistent set of four Domains that together, as a system, create economic value.

Source: IBM Innovation Management Business Competency Model, U.S. Patent Pending
Disciplines are the "atoms" of capability domains

Leading companies “go to school” on the Key Discipline Areas.
Platform Management Key Discipline Areas

Strategy
- Product Platforms
- Reference Architecture Standards
- Platform Modularity
- Common Building Block Optimization
- Business Technology Management

Process
- Product Family Planning
- Platform/Module Development Planning
- Process Definition
- Process Performance
- Risk Management
- Project Planning
- Project Monitoring & Control

Organization
- Team Based Management
- Organizational Training
- Resource Planning & Management

Technology
- Optimized Capability Architecture
- Capability Digitization

Legend:
- Specific KDA

Learning and innovation occurs at two levels – platform and module.
KDAs identify the essential domain issues that must be addressed in order to achieve a level of proficiency.

Source: IBM Innovation Management Business Competency Model, U.S. Patent Pending
Benchmarking KDAs provides a baseline "snapshot" of the organization's IM competence.

It is then possible to chart a course from where the firm is to where it wants to be, i.e. the IM strategic "end state".

Source: IBM Innovation Management Business Competency Model, U.S. Patent Pending
Platform Management does not stand alone – it is driven by Market Planning

Market Segments 1 ... N

Profit Tiers
1...N

Derivative Products/Services

Offering Platform Architecture

Common Design Rules and Tools

Module A

Interface_1 ... N

Module B

Module C

At the top of the framework are the Global Brand Team’s chosen markets, expressed as a market segmentation grid. The purpose of which is to help management focus on specific markets.

Cross-disciplined Platform Architecture Team’s gather market intelligence, determine users needs, perform competitive assessments and conceive of new offerings and channels.

The team specifies the collection of derivative products, and the common and unique modules, over time, that are encompassed by the architecture for all targeted markets.

At the bottom of the framework are the company's assets – these are the “piece parts” that comprise a platform architecture.

Organizational Assets

Market & Customer Insights

Module Technologies & Know-How

Production/ Delivery Processes

Organizational Competencies & Infrastructure

Modular Design Framework
Companies that excel at these capabilities consistently outgrow their peers

**Capability Score vs. Revenue Growth**

- **The Research**
  - Looked at over 20 companies, representing 7 subcategories within the Electronics Industry
  - Interviewed GMs and development executives
  - Performed extensive secondary research (financial statements, market studies, etc.)
  - Assessed the maturity of these companies’ innovation capabilities and correlated with their growth results

**Source:** IBM Institute for Business Value - Survey of Leading Electronics Companies, 2002
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20th Century IBM Server Development...

“Brand Dedicated”

- S/390
- AS/400
- RS/6000
- Netfinity
IBM’s Server business suffered from an appalling lack of reuse

1996 MODELS

Note: All three BU’s served the same general markets

“Any reuse was accidental.”
21st Century “eServer” Development ...

“Brand Shared”

Processor

Memory

I/O

Integration / Test

Service Facility

Hypervisor

Completely restructured Development Engineering.

Proof case: IBM Servers
IBM built a complete ‘system’ for ensuring the right balance between commonality and differentiation
The leverage on downstream costs in manufacturing and service is considerable

- **Part Number Reduction**
  
  **3% BMC reduction for 50% reduction in P/Ns**
  
  -- Volume Purchase Agreements (higher volume)
  -- Manufacturing Operational Efficiency (inventory, scrap ...)

- **Industry Standard Content vs. Unique Requirements**
  
  **15% BMC reduction over unique parts**
  
  -- Custom Part Prices (qualification, mfg. process, test)
  -- Procurement Efficiencies (volume, internal costs)
  -- Manufacturing Operational Efficiency (inventory, scrap ...)

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*This knowledge quickly changed engineering’s view of what is important.*
The bottom line…

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<td>$250M</td>
<td>$180M</td>
<td>$205M</td>
<td>$140M</td>
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</table>

$775M taken out of IBM’s cost structure in 4 years
2001: A greatly expanded view of what is the platform?

**eServer Reference Architecture:**

- **Z Series**
- **P Series**
- **I Series**
- **X Series**

*A cross-business unit platform*

**Partition Hypervisor**

- **Processors & L1/L2 Caches**
- **Memory Controller**
  - L3/L4 Caches
  - SMP Fabric
- **Main Memory**
- **Power, Packaging, Cooling**
- **I/O Subsystem**
  - Hubs and bridges
  - Drawers
  - Adapters
  - IOPs
  - I/O-Cluster Fabric
  - Legacy I/O
- **HW Console / Service Facility**

**Shared Hardware Elements**

**Proof case: IBM Servers**

2001: A greatly expanded view of what is the platform?
Proof case: IBM Servers

Supports an array of pluggable processing modules and memory control modules

<table>
<thead>
<tr>
<th>Applications</th>
<th>Middleware</th>
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<tbody>
<tr>
<td></td>
<td>Systems Mgmt. and Automation</td>
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<tr>
<td></td>
<td>Availability/Service Management</td>
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<td>Physical Resource Management</td>
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<tr>
<td>OS</td>
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Partition Hypervisor

<table>
<thead>
<tr>
<th>Shared Hardware Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processors &amp; L1/L2 Caches</td>
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<tr>
<td>Memory Controller</td>
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<tr>
<td>Power, Packaging, Cooling</td>
</tr>
<tr>
<td>I/O Subsystem</td>
</tr>
<tr>
<td>I/O Console / Service Facility</td>
</tr>
</tbody>
</table>

2. Different plug-in versions

Shared Hardware Elements
Even the virtualization engine module shares common components

3. One hypervisor per processor architecture
Shared technology

- Systems Mgmt. and Automation
- Availability/Service Management
- Logical Resource Management
- Physical Resource Management
- Workload and Performance Mgmt
- Security
- Clustering Services
- Connectivity Management

- Applications

- Middleware

- Partition Hypervisor

- Processes & L1/L2 Caches
- Memory Controller
- Main Memory
- I/O Subsystem
- HW Console / Service Facility

- Power, Packaging, Cooling

- OS

- Different plug-in versions

- Shared Hardware Elements

Even the virtualization engine module shares common components.
Operating Systems are treated as modules...

4. Multiple Operating Systems

- Different plug-in versions
- One hypervisor per processor architecture
- Shared technology

Shared Hardware Elements

Applications

| Middleware | | | |
|------------|-------------|
| Systems Mgmt. and Automation | Workload and Performance Mgmt |
| Availability/Service Management | Security |
| Logical Resource Management | Clustering Services |
| Physical Resource Management | Connectivity Management |

Partition Hypervisor

- OS
- OS
- OS

Shared Hardware Elements

- Processors & L1/L2 Caches
- Memory Controller
  - L3/L4 Caches
  - SMP Fabric
- Main Memory
- I/O Subsystem
  - Hubs and bridges
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  - IOPs
  - I/O-Cluster Fabric
  - Legacy I/O
- HW Console / Service Facility
- Power, Packaging, Cooling

Proof case: IBM Servers

Operating Systems are treated as modules...
...as are a number of software services common to the entire series

Multiple Operating Systems

Different plug-in versions

One hypervisor per processor architecture

Shared Hardware Elements

Shared Software Elements

Same APIs and services provided across eServer

Applications

Middleware

Systems Mgmt. and Automation

Workload and Performance Mgmt

Availability/Service Management

Security

Logical Resource Management

Clustering Services

Physical Resource Management

Connectivity Management

5.

Partition Hypervisor

Processors & L1/L2 Caches

Memory Controller

- L3/L4 Caches
- SMP Fabric

Main Memory

I/O Subsystem

- Hubs and bridges
- Drawers
- Adapters
- IOPs
- I/O-Cluster Fabric
- Legacy I/O

HW Console / Service Facility

Power, Packaging, Cooling

OS

OS

OS

Proof case: IBM Servers

…as are a number of software services common to the entire series
The latest major product line off this architecture – the IBM BladeCenter…

Typical Datacenter Configuration

1. Ten x86 1U 2-way servers
2. RISC-based 2-way server
3. HPQ 4-way server
4. Alteon L7 E’net switches
5. FC SAN switches / Cables
6. Layer 2 GbE switches
7. KVM switches
8. Ethernet cables
9. KVM cables
10. Power cables

Bladed Datacenter Configuration

IBM eServer BladeCenter
…is a triumph of modular design!

- Simpler -- easier to manufacture, more reliable
- Scalable -- processing power, storage, and interconnect capability
- Improved serviceability -- ease of installation and upgrade
- Protects customers initial investment
Ruggedized Telco “derivative”

Leverages common blades, switches to lower cost

Integrated Platform for Telecommunications (IPT)
- BladeCenter, BladeCenter T
- Carrier Grade Linux
- High availability software
- WebSphere for Telecom
- Activation services

Unique “modules”
BladeCenter supports an innovation “ecosystem”

A wide range of companies convinced that BladeCenter architecture adds value to their customers’ solutions…

...yielding more choices for customers
**Bottom-line:** Modular designs improve R&D productivity and create real economic value

Source: IBM X Series Program Office
IBM today...

Focused
Resilient
Responsive

Result:
“#1 or #2 in chosen markets”
How NPD changes
...with Platforms

Thank You!

Presentation to Atlanta P.D.M.A. Conference
November 29, 2004
Paul Mugge, BCS Partner