Actually Doing
(Technology & Product)
Strategy
Outline:

- Why do I need an innovation strategy?
- How will we create value?
- How will we capture value?
- How will we deliver value?
- Doing strategy in practice
Agenda

• Why making choices is so important
  • (and so hard)

• What can be done
Why is it so hard to kill project #26?

- It’s a “good” project!
  - It meets NPV, ROI goals
  - An important customer wants it
  - The CEO/my boss wants it
  - It’s Frank’s project
  - It might be the project that saves my bacon

- Good managers can meet stretch goals (and I’m a good manager)

- Making difficult decisions takes time and eats energy
What can be done?

- Measure capacity, track resources
- Make real decisions with real data
- Use decision tools that allow you to view initiatives in comparison to each other and within the context of your strategic objectives
Measure capacity, track resources
Measure resources

Total FTE Effort (1 Year Period)

Total demand all projects by function (1 Year)

Total capacity by function (1 Year)
Track Resources Over Time

HOURS PER MONTH

11-Sep 1-Jan 23-Apr 13-Aug 3-Dec 24-Mar 14-Jul 3-Nov

- Exploratory projects
- Innovation projects
- Product Support
- Administration

CAPACITY
• An understanding of resource utilization impacts both portfolio planning and project gate keeping.

• Use of funnels and matrices on their own can bring forth an optimized project portfolio. But without adequate attention to innovation capacity, the portfolio’s promise will remain unrealized. In addition to overall resource requirements for the portfolio, it is also important to factor in individual resource constraints. Studies show that the overall productivity for individuals peaks at 2 to 3 projects, and declines rapidly thereafter. For example, when key managers are shown as contributing materially to five or more projects, many of the projects are not happening and the remainder are adversely affected.
The Pre-quip example shows us that many organizations experience capacity over-commitment. One cause of capacity overcommitment can be poor planning. Often, when companies plan resource allocation over time, they do not take into account changes in the level of functional involvement by phase (shown above). Accurate resource allocation planning requires a more robust model because resource consumption requires time and function resolution.
Making real decisions with real data
Technology Strategy in Practice

- Strategies are worthless unless they are linked to real resource allocation decisions
- Decide
  - Who will make the decisions
  - How often
  - By what criteria
An Assignment Given to Small Groups of Managers at XYZ Co.

1. Identify the salient characteristics of your organization’s “innovation funnel”
   1. Where do new ideas come from?
   2. When are decisions made?
   3. Who is involved in these decisions?

2. Draw a diagram of the innovation funnel that captures these characteristics.
10-minute exercise: Funnels You Have Known

What does the innovation funnel at your company look like?
The innovation funnel
The Innovation Funnel:

- Defined separation between stages: Clearly defined criteria: a way to kill “living dead” projects
- Senior managers engaged at the right time
- Capture ideas from everywhere, manage ideas in an organized way so that they turn into products
- A continuous process: Does this fit with our strategy?
- A picture of the business: an overview of the shape of the pipeline
- Give teams the freedom they need between gates
An Innovation Funnel Example

**Idea Generation**
Initial marketing and technical concepts

**Feasibility**
Concept refinement and prototype creation

**Capability**
Product optimization

**Launch & Rollout**
Commercialization Production & Distribution

- **Charter**
  One page description of proposed project including objective, rationale and development routes. Early Commercial Assessment

- **Contract**
  Cross-functional development plan including project plan as contract between team and Gatekeeper.

- **Launch Proposal**
  Launch Plan including CEP approval request.

- **Post Launch Review**
  Tracks success of and key learnings from launched products

**Gatekeeper**

**KEY**
- = GATE
- = DOCUMENT
Gates:

- are major milestones
- are intended to allow passage of the projects *more likely to succeed* by sacrificing projects *more likely to fail* as early as possible
- focus decision-making. At a gate, a decision is made to either:
  - Continue working on the project, moving it along to the next stage in the funnel; or
  - Stop working on the project, shelving it or canceling it; or
  - Get additional information and reconsider the project for passage through the same gate once that information becomes available
Example: The Key Questions Answered By Each Phase

Phase 1: Concept Investigation
- Does the idea fit roughly with our strategy and resource availability?
  If yes, then concept document approved & sub-team allocated

Phase 2: Feasibility
- Does the product make sense from marketing, technical & financial perspectives?
  If yes, then concept approved & full team allocated
- What is the product spec?
- Can we develop it within budget and schedule?
- Can we produce it at the required cost & volume?
  If yes, then prototype approved & full team allocated

Phase 3: Development
- Has the product been fully verified and validated?
  If yes, then full manufacturing approved & sub-team allocated
- Have production objectives been met?
  If yes, then closeout approved & handoff to product support

Phase 4: Post Release
- Is the product meeting safety, efficacy and business targets in the market?
  If yes, then closeout approved & handoff to product support

Portfolio Review
Phase Review 1
Phase Review 2
Phase Review 3
Phase Review 4

Idea Generation
Current Product Support
Example: Pipeline View by Stage and Project Focus

Non-Resourced
Pre-Segment Review, But Resourced
Recurrent activities

Concept Exploration
Gate 1

Concept Development
Gate 2

Business Case Development
Gate 3

Execution
Post-launch review

Peak-Year Project GSV:
- Less than $xM
- Between $xM and $xM
- Between $xM and $xM
- Greater than $xM

Note: Cross hatching indicates non-resourced concept exploration projects
Of course, effective pipelines must be embedded in a broader strategic context.
The Reality?
Making a funnel work:

- Formally:
  - Pacing the funnel to the needs of the business, not the other way around
  - Involving key decision makers early

- Informally:
  - Leadership: tolerating “high respect, high conflict” debate
  - Trust: “but this would only work if we told the truth…”
  - Consistency
BUT....

- By what criteria do we make decisions at the gates?
Using decision tools that allow you to compare initiatives against each other

(and the degree to which they fit your strategy)
Analytical (?) Tools for Making Choices

- **Financial Tools:**
  - IRR & NPV
  - Risk vs Return
  - Options

- **Portfolio Concepts:**
  - The Aggregate Project Plan

- **Scenario Analysis**
IRR and NPV:

A great place to begin but a terrible place to finish?

**Strengths**
- A focus on the quantifiable costs and benefits of the project
- Allows for easy ranking and comparison

**Weaknesses**
- Forces a focus on “the numbers”
- Neglects the role of uncertainty
- Neglects strategic considerations
- Ignores interdependency between projects
The Risk vs. Return Matrix
Decision Tree analysis

-500

50/50

-1,000

50/50

-2,000

50/50

3,000

50/50

25,000

3,000

3,000

0
Why is an option valuable?

- Thinking of investments as options values uncertainty more appropriately
- Delaying investment until there is more information can be very valuable
When is thinking of a project as an “option” likely to be fruitful?

- When the future is very uncertain
- When investing now will create unique opportunities for the firm
- When failing to invest now means that it will be very expensive to invest later
How much is an option worth?

- See “Investment Opportunities as Real Options: Getting Started on the Numbers” (and references therein)
  - by Timothy Luerhrman

In the back of your binders
# A Range of Tools

## Risk adjusted NPV

**Pros**
- Established methodology widely accepted and understood
- Relatively easy and quick to implement
- A building block for more complicated valuation methods

**Cons**
- Does not allow for contingent decisions
- Collapses many decisions and outcomes down to a single scenario
- Does not account for managerial ability to react to information.

## Decision Trees

**Pros**
- Incorporates decision making and uncertainty
- Determines optimal decisions
- Transparent and easy to understand.
- Building block for other more complicated valuation methods.

**Cons**
- Trees can become complicated with many decisions and uncertainties.
- Essentially limited to discrete decisions and discrete characterization of uncertainties.

## Simulations

**Pros**
- Allows for complicated and multiple uncertainties spanning both discrete and continuous outcomes.
- Easier to model non-standard uncertainties

**Cons**
- Methods do not determine optimal policies.
- Programming becomes complicated with many decisions and uncertainties.
- Less transparent than trees

## Closed Formulas

**Pros**
- Elegant, easy to implement with formula in hand

**Cons**
- Limited to relatively simple decisions and uncertainties.
- Many simplifying assumptions usually have to be made to obtain closed form solutions.
- Less transparent than trees

## Differential Equations

**Pros**
- A numerical solution incorporating optimal decisions and (possibly) both continuous and discrete uncertainties.

**Cons**
- Extremely difficult, if not impossible, to implement in realistic situations.
- Time Consuming
- Does not allow for many different uncertainties.
Portfolio Concepts:
Aggregate Planning Tools
The Aggregate Project Plan (1)

Marketing Impact

Entirely new benefit

Improvement

No change

Technology

Radical

Breakthrough

Platform

Derivative

Off the shelf

Product Support
Platform projects lay the groundwork for later extensions
An Example

Consumer Value Perception

Enabling Technology

- Radical
- Next Generation
- Incremental
- Base

New Core Product

New Benefits

Improvement

Variant

No Change

Low Resource

Moderate Resource

High Resource

Breakthrough

Platform

Derivative

Product Support
An Example

**Consumer Value Perception**

- **Enabling Technology**
  - Radical
  - Next Generation
  - Incremental
  - Base

- **New Core Product**
- **New Benefits**
  - Improvement
  - Variant
  - No Change

**Low Resource**
**Moderate Resource**
**High Resource**

**Breakthrough**

**Platform**

**Derivative**

**Product Support**
An Example

Consumer Value Perception

Enabling Technology

Radical
Next Generation
Incremental
Base

New Core Product
New Benefits
Improvement
Variant
No Change

Low Resource
Moderate Resource
High Resource

Breakthrough
Platform
The Aggregate Project Plan (2)

Process Impact

<table>
<thead>
<tr>
<th>Entirely new process</th>
<th>Improvement</th>
<th>No change</th>
</tr>
</thead>
</table>

Radical

Breakthrough

Platform

Derivative

Product Support

Product

Reach

Off the shelf
Before: Medical Products Co.

Product Changes

New Core Product
Next generation of Core Product
Addition to Product Family
Add-Ons and Enhancements
No Change

Process Changes

New Core Process
Next Generation Process
Single Dept. Upgrade
Tuning and Incremental Improvement
No Change

B-THROUGH / PLATFORM
DERIVATIVE / CPS

ALPHA
WATER
EARTH
FIRE
CALIFORNIA
NEW YORK

SPARROW
OWL
ROMES
SUMMER
GEMINI 1-10 (10 PROJECTS)
SPARROW
OWL
SOLSTACE
SPRING
WINTER
FALL
DELTA O
HAWK
SANTA FE
FLAGSTAFF
ROLAND
CLEO
OAK
CEDAR
PINE
• Company makes an automated diagnostic system that contains three components - **electro optical hardware**, **software** and a **disposable panel for bio material**.

• A lot of derivatives - all small, on all three system components.

• Derivatives character was aimed at increased functionality and features, which was counter to what the customer wanted. They were giving them “more bells and whistles”.

• Not a single new platform in 7 to 8 years.

• Had four very small efforts designed to explore “next generation” 21st Century technologies - while competitors were investing 100s of millions of dollars.

**Transition to Next Slide:**

• Within one year of implementing, the company’s product development restructuring process had the following effects...
After: Medical Products Co.

**Product Changes**
- New Core Product
- Next generation of Core Product
- Addition to Product Family
- Add-Ons and Enhancements
- No Change

**Process Changes**
- New Core Process
- Next Generation Process
- Single Dept. Upgrade
- Tuning and Incremental Improvement
- No Change

**Graph:**
- Advanced Development
- B-Through / Platform
- Derivative / CPS

**Models:**
- DELTA
- GAMMA
- BETA
- DELTA II
- DELTA I
- MARS
- ZEUS
- DELPHI
- CLEO
- OAK
- CEDAR
- PINE
- ATLANTIS
- DELTA II
- SIGMA
- DELTA
- LEo
- ROME I
- ROME II
- ROME III
- ROME IV
- ROME V
- ROLAND
• Eliminated all but one of the breakthrough projects, and subsequently eliminated all breakthroughs.
• Joint ventures between corporate parent to share development resources.
• Part of a joint corporate effort to think about next generation technologies.
• Eliminated a lot of derivatives and feature enhancements that weren’t adding value to customers.

New partnered platform project:
  • Outside companies are doing the hardware and software components.
  • The client company is doing the bio components.
  • Sufficient amount of resources have been allocated to ensure that the project is adequately staffed to meet all project requirements.

• Focus Development efforts to be in line with core competencies and establish alliances to do all other tasks outside their own business.

Results:
• Cut R&D spending from $65mm to $35mm.
By focusing their innovation efforts they saw more product launches in 1993 than 1992, even though they had fewer projects and fewer dollars.

Transition to Next Slide:
The same situation was also evident in a Scientific Instruments Manufacturer.
### Project Reach Across Growth Areas

<table>
<thead>
<tr>
<th>Project Reach</th>
<th>Core</th>
<th>Target 1</th>
<th>Growth Target 2</th>
<th>Target 3</th>
<th>Target 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Platform</td>
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<tr>
<td>Line Extension</td>
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<tr>
<td>Maintenance/Enhancement</td>
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</table>

- **Peak-Year Project GSV:**
  - Less than $xM
  - Between $xM and $xM
  - Between $xM and $xM
  - Greater than $xM

- **Note:** Cross hatching indicates non-resourced concept exploration projects.
Degree of internal difficulty

Marketing/Sales Capability Challenge

<table>
<thead>
<tr>
<th>Builds on existing skills</th>
<th>Requires entirely New skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Significant</td>
<td></td>
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<tr>
<td>Generally accessible</td>
<td></td>
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<tr>
<td>Resident capabilities</td>
<td></td>
</tr>
</tbody>
</table>

Significant Challenge
Degree of Internal Difficulty

Marketing/Sales Capability Challenge

- Existing Brand AND No New Capabilities Required
- Existing Brand AND New Capabilities Required
- New Brand AND No New Capabilities Required
- New Brand AND New Capabilities Required

Technical/Operational Challenge

- Significant
- Generally accessible
- Resident capabilities

Peak-Year Project GSV:
- Less than $xM
- Between $xM and $xM
- Between $xM and $xM
- Greater than $xM

Note: Cross hatching indicates non-resourced concept exploration projects
External impact & internal skills

Strength Of Entrenched Competition

Leverages Current Advantage
Degree of External Impact

Consumer Value Perception

Improvement

Somewhat Important  Very Important  Critical

New Usage Occasion  New Benefit

Note: Cross hatching indicates non-resourced concept exploration projects

Peak-Year Project GSV:

Less than $xM  Between $xM and $xM  Between $xM and $xM  Greater than $xM

High risk  Medium risk  Low risk
Benefits of an Aggregate Project Plan:

- Explicit choice of projects balances the long and short term, allows for the explicit discussion of the match to strategy.
- Match between project type and organizational form allows for a focus on the generation of competence.
- Focus builds speed and productivity for the individual and the organization.
Strategy and Scenario Analysis
Strategy and Scenario Analysis

- Formulating a strategy requires judgment about the future
- But the future is complex & hard to predict
- Scenarios provide a way to manage this complexity
Basics of Scenario Analysis

● **What it is:**
  - A way of mapping the future, of focusing attention on critical uncertainties
  - A way of building “robust” strategies
  - A means of generating a common language

● **How it is done:**
  - Generate a list of critical uncertainties
  - Choose the two most critical
  - Draw a “map”
  - Iterate and explore
Predicting the future of the Pharmaceutical Industry
The Roots of Turmoil

- Dramatically declining research productivity
- Major technological shifts
- Fundamental environmental challenges
- Significant new entry
The Productivity Crisis
Time Lines (Tufts data, months)

- Discovery
- Phase I: 21.6 months
- Phase II: 25.7 months
- Phase III: 30.5 months

Total: ~6.5 years
Cumulative probability of becoming a successful drug contingent on success in the previous stages.

Phase III
Phase II
Phase I
Discovery
Cumulative Probabilities

Discovery Phase I Phase II Phase III

Tufts

Ind
Trends in Pharmaceutical Productivity

Graph showing trends in R&D spending and NDAs approved over time from 1965 to 2005.
Big Pharma’s Problem

- Revenues/Company (avg.) $10 billion
- Required Growth 10%/year (> $1B/year)
- Average pharma product $300-400M/year
- Product needs ~ 3 to 4 per year
- Average Product Launches/year .5

With thanks to Tony Sinsky
Major Technological Shifts

- **From “rational” drug discovery**
  - Small molecules, hypothesis driven research

- **To the “omics” and “systems biology”**
  - Understanding the “deep structure” of disease and the functioning of the genome and the cell
Pharmacogenetics/genomics

- Establishing the link between an individual’s drug response and their genetic (specific genes) or genomic (all genes) profile

- Tools may include:
  - Sequence analysis
  - Expression analysis
  - Genome mapping
  - Family studies or Population studies

- Personalized medicine - involves treating specific patient subpopulations based on diagnostic tests that differentiate them as likely responders to a treatment.

With thanks to Tony Sinskey
Environmental Challenges
Heightened visibility
A broad erosion in social/cultural support

- The pharmaceutical industry claims to be innovative, but only a small fraction of its drugs are truly new: most are simply variations on older drugs.
- Contrary to popular belief, big drug companies spend far less on research and development than on marketing.
- The pharmaceutical industry has an iron grip on Congress and the White House. It has the largest lobby in Washington … and contributes heavily to political campaigns.
- Drug companies promote diseases to match their drugs. Millions of normal Americans have to come to believe that they have dubious or exaggerated ailments like “generalized anxiety disorder”.
- Drug companies have enormous influence over what doctors are taught about drugs and what they prescribe.
- Drug companies have substantial control over clinical trials of their drugs. There is good reason to believe that much of the company supported research on prescription drugs is biased as a result.
Very significant pressure on prices

- If Sam's Club can negotiate for lower pharmaceutical prices, why can't Uncle Sam? Because the approval by the Congress of a new pharmaceutical benefit for Medicare was saddled with a legal provision that prohibits the U.S. government from using its considerable consumer market power to negotiate for lower prices on medicines.

- Our country already is spending more than 2 percent of GDP on pharmaceutical purchases, and these outlays skyrocketed, long before the Medicare bill was passed. Because the U.S. government is obligated to provide some coverage for pharmaceutical drugs under the new bill, one would think it would seek to at least have the flexibility to restrain corporate patent owners from charging excessive prices for their medicines. In the absence of even the possibility to negotiate lower prices, there will be no price restraints and therefore less money for medicine.

From The Nader Page
http://www.nader.org/interest/112803.html
Significant new entry

- **Indian Pharmaceutical Industry**

- **Companies Mentioned in this report include:**
  - Aarti Drugs
  - Abbott India
  - Ajanta Pharma
  - Alembic
  - Astrazeneca Pharma
  - Aurobindo Pharma
  - Aventis Pharma
  - Cadila Health
  - Cipla
  - Dr. Reddy
  - Elder Pharma
  - German Remedies
  - Glaxo Smithkline
  - Ind Swift Lab
  - Ipca Laboratories
  - J B Chemical
  - Jagson Pharma
  - K D L Biotech
  - Kopran
  - Krebs Biochem
  - Lupin
  - Lyka Labs
  - Medicorp Tech
  - Merck
  - Natco Pharma
  - Nicholas Piramal
  - Novartis
  - Orchid Chemicals
  - Organon
  - Panacea Bio
  - Pfizer
  - Pharmacia
  - Ranbaxy
  - R P G Life Sciences
  - Shasun Chemicals
  - Siris Limited
  - Sterling Biotech
  - Strides Arcolab
  - Sun Pharma
  - Suven Life Sciences
  - Torrent Pharma
  - Unichem Lab
  - Wockhardt
  - Wyeth Ltd
  - Zandu Pharma

- **Chinese Pharmaceutical Industry estimated at U.S. $19.4 Billion in 2002**
Exercise:

- Generate a list of the major uncertainties facing the pharmaceutical and/or the medical device industry today
- Choose two, and draw a “map”
- What kinds of worlds have you defined?
- Can you name them?
- Iterate until you’re comfortable you have found four worlds that are both plausible and strategically important
- Be prepared to present your results to the group
Why may scenario analysis be useful?

- It focuses attention away from “the official future” and allows the robustness of a strategy to be evaluated.
- It focuses attention on critical uncertainties, allowing the organization to track them over time.
- It may spark creativity, imagination and a rethinking of core strategy.
Making choices using analytical tools: Summary

- Financial tools are critically important, but should not substitute for strategic thinking.
- Choices must be made as a portfolio, so that different projects are explicitly traded off against each other.
- It may be important to consider the robustness of a strategy: what will happen if the world looks very, very different?
Summary
Effective strategies answer three key questions:

- How will we Create value?
- How will we Deliver value?
- How will we Capture value?
Understanding the life cycle is critical:

- Takeoff
- Ferment
- Maturity

- Technology
- Markets
- Competition
- Organization
Technology strategy on one slide:

Create

Capture

Deliver
What happens on Monday morning?

Or: Getting there from here
Acting as a strategic catalyst requires mastering many roles

- **Information gatherer**
  - What are the problems and opportunities?

- **Analyst**
  - What are the key choices? What should we do?

- **Advocate and teacher**
  - Presentation of information and analysis in ways that stimulate debate about the key issues

- **Leader**
  - Modeling the use of time and attention
  - Supporting the team in making real decisions
Two case studies

- Medtronics
- Kirkham Instruments
Successful Implementation: Common Lessons

- Senior management commitment & involvement
  - Senior steering committee
  - Empowered champion

- Diagnostic phase
  - Aligned with the market
  - As well as with the existing culture and organization

- A designed implementation plan
  - Up front
  - With appropriate expectations

- Allocating resources to match the design.
## Typical Execution Times

<table>
<thead>
<tr>
<th>Phase Duration</th>
<th>Diagnosis</th>
<th>Design and Pilot</th>
<th>Organization Wide Roll-out &amp; Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Phase Duration</strong></td>
<td>0.5-3 months</td>
<td>4-6 months</td>
<td>6-12 months</td>
</tr>
<tr>
<td><strong>Core Project Team (FTEs)</strong></td>
<td>2-6</td>
<td>4-8</td>
<td>4-8</td>
</tr>
<tr>
<td><strong>Who’s Involved</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Key stakeholders</td>
<td></td>
<td></td>
<td>• Dedicated project team shifts members</td>
</tr>
<tr>
<td>• Senior management sponsor</td>
<td></td>
<td></td>
<td>• Whole organization</td>
</tr>
<tr>
<td>• Senior management sponsor</td>
<td></td>
<td></td>
<td>• Key stakeholders</td>
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<tr>
<td>• Key stakeholders</td>
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<td></td>
<td>• Senior management sponsor</td>
</tr>
<tr>
<td>• Senior management sponsor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Interviews w/key stakeholders</td>
<td></td>
<td></td>
<td>• Training of new tools / processes</td>
</tr>
<tr>
<td>• Process mapping</td>
<td></td>
<td></td>
<td>• Documentation of process</td>
</tr>
<tr>
<td>• Assessment of key issues</td>
<td></td>
<td></td>
<td>• Automation of process</td>
</tr>
<tr>
<td>• Create steering team</td>
<td></td>
<td></td>
<td>• Organizational change and cultural</td>
</tr>
<tr>
<td>• Customize and create process and tools</td>
<td></td>
<td></td>
<td>alignment</td>
</tr>
<tr>
<td>• Pilot and test tools/process in “real time”</td>
<td></td>
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<td></td>
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<tr>
<td>• Refine and enhance tools</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>• On-going review and assessment with senior management</td>
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</tbody>
</table>
Good Luck!