Facilitator's Notes on "Integrating Technology and Business Planning in IRI Companies"
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• COPY OF SLIDES FROM VIDEO Enclosed

• ONE COPY OF VIDEO Enclosed
INTRODUCTION

TO THE USER

This video and hard copy represents two years of work, including over eight hours of taping, by the Industrial Research Institute's ROR Subcommittee on the Integration of Technology Planning and Business Planning. The mission of this subcommittee was to create a flexible reference and training module for those who wish to begin, improve on, or just get a sense of what other companies are doing in this Linking Technology and Business Planning.

The video and hard copy are provided so they can be used two ways at the user's discretion.

- Video presentation with accompanying references, notes and commentary by members of the subcommittee. (We recommend this format for awareness.)

- Modular training format which will allow a facilitator to address each video presentation with questions on the key points made and the application to a particular company's situation. The object would be to generate ideas and actions to improve upon one's activities in the integration of technology and business planning. (We recommend this for a workshop format.)

MATERIALS INCLUDED IN THIS PACKAGE ARE:

- 1 video tape
- 1 self assessment matrix
- 1 self assessment matrix with a histogram of responses
- 1 summary of the video presentation with abstracts from Research Technology Management
- 1 set of slides from the video
- 1 set of references on the subject
- 1 Leadership Guide

We hope this package meets your needs.
Integration of Technology and Business Planning

**Self Assessment Matrix**

Name: _______________________ 
Company: _______________________

Type of Research Organization (C=Centralized, H=Hybrid, D=Decentralized)

Total Number of R&D Personnel

An ROR subcommittee has been focusing on the issue of "Integrating the Technology & Business Planning" within IRI companies. The subcommittee has compiled a set of practical "how-to" approaches for improving the integration and quality of technology and business planning. These best practices were identified in part via the attached self-assessment matrix containing what we believe are very important elements in the process.

We would like to expand our data sample to learn more about the practices of member companies and to identify best in practice areas. Your input to the subcommittee on the best practices employed at your company would be greatly appreciated.

Please mark on this sheet for each element (involvement, timing, core competencies, etc.) the number that best represents your overall company practices. Please rate your company based on overall practices even if one part may be a "4" and another a "1".

Please bring your completed assessment to the Monday Afternoon Workshops. Thank you for your time and interest toward improving the integration of technology and business planning within IRI Member companies.

<table>
<thead>
<tr>
<th>Assessment Criteria</th>
<th>(Rate each item 1-4)</th>
<th>Rating</th>
<th>Rating</th>
</tr>
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<tr>
<td>Involvement</td>
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<td>Business Issues</td>
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<td>Content/Documentation Plan</td>
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<td>Nature of the Markets, Customers</td>
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<td>Intellectual Property</td>
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<td>Competitors</td>
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<td></td>
<td>Other Elements of Plan</td>
</tr>
</tbody>
</table>

Industrial Research Institute
# Technology and Business Planning Self-Assessment Matrix

## Elements of the Process

<table>
<thead>
<tr>
<th>Involvement</th>
<th>Business Planning and Technology Planning Are Either Nonexistent or Remain Superficial, and Are Not Used as a Basis for Action</th>
<th>Business Planning and Technology Planning Are Carried Out as Separate Processes with Little or No Involvement of Technology in Business Planning</th>
<th>Technology Function Is Asked for Input into Business Plans, and Business Plans Provide Basis for Technology Plans; Technology Is Often in a Responsive Mode</th>
<th>Technology Function Is an Integral Part of Business Planning, Significantly Impacting the Business Planning Process. Senior Professionals Have Opportunity to Be Involved and Provide Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timing</td>
<td>Technology Planning Is Done Sporadically and Is Not Built Upon Previous Plans</td>
<td>Technology Planning Is Done Periodically, Responding to Organizational Needs (Demands for Planning or for Budget Preparation)</td>
<td>Technology Planning Is Done Regularly on an Annual Basis and Results Reviewed Regularly. Plans Are Iterative — Building on Last Year’s Plan</td>
<td>Technology Plans Are “Evergreen” and Are Used Regularly to Guide Action and Decision Making. They Are Modified Periodically Based on Results and External Events</td>
</tr>
<tr>
<td>External Communications</td>
<td>Little If Any Communications of Needs and Opportunities Outside the Immediate Organization</td>
<td>What Cooperative Efforts and Discussions Take Place with Those Outside the Immediate Organizations Are Not Done Within the Framework of the Technology Plan or Critical Needs of the Business</td>
<td>Members of the Technical Organization Meet Sporadically with Technical Resources Outside Their Organization to Discuss Needs Spelled Out in Their Plan</td>
<td>Members of the Technical Organization Under the Leadership of the Technology Director Interact Regularly with Others Outside the Organization (Other SBUs, Universities, Other External Resource Sources) to Look for the Opportunities to Address the Issues in the Plan. Continuing Relations/Cooperative Efforts Are Built Upon Past Successes. The Technical Unit Is the Formal Technical Gatekeeper for the Company</td>
</tr>
<tr>
<td>Audit of Results</td>
<td>Plan Itself Is Not Used to Measure Results</td>
<td>Plan Commitments Are Followed Only by R&amp;D/Technical—But Not on a Regular Basis</td>
<td>R&amp;D/Technical Regularly Revisit the Plan—At Times With the Business Team</td>
<td>Business Team, Along with R&amp;D/Technology, Periodically Measure Progress vs. the Plan and Update It</td>
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Industrial Research Institute
# Elements of the Plan

## Business Issues

<table>
<thead>
<tr>
<th>1</th>
<th>Technology programs are not explicitly related to key business needs/strategies</th>
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</thead>
<tbody>
<tr>
<td>2</td>
<td>Technology programs are related to business needs in only vague terms</td>
</tr>
<tr>
<td>3</td>
<td>It is clear how results from technology programs contribute to business success; technical strategy (the bridge between business strategy and technical programs) is spelled out clearly</td>
</tr>
<tr>
<td>4</td>
<td>It is clear how results from technology programs not only contribute to business success but how some results can provide a real change in the game</td>
</tr>
</tbody>
</table>

## Nature of the Markets, Customers

| 1 | Little, if any reference to markets and customer needs |
| 2 | A few customer needs are mentioned |
| 3 | The "voice of the customer" is heard in the plan; market structure/environment are well understood |
| 4 | Customer needs are not only spelled out but future needs in the marketplace are anticipated |

## Competitors

| 1 | Little if any reference to competitors |
| 2 | Some competitors and their position in the market are recognized |
| 3 | Competitive intelligence is reflected in the plan with an understanding of most competitive threats, in-kind and not in-kind |
| 4 | Technical program strategies recognize the threats of traditional and potential competitors including their technological strengths, weaknesses and possible end-runs |

## Human Resources

| 1 | People's skills/competencies are not mentioned in the plan—other than number of budget people for individual projects |
| 2 | People needs are addressed—but not in connection with skills and competencies |
| 3 | Skills and competencies needed are mentioned but with no analysis |
| 4 | The skills and competencies needed to carry out the technology plan are addressed in the plan—both near and longer term. Needs to fill gaps are discussed and plan to fill gaps is addressed |

## Contingencies/Alternative Plans

| 1 | No alternatives to the planned programs are presented |
| 2 | Any alternatives or contingency plans are not realistic and offer no real choices |
| 3 | Limited cut-and-dried alternatives are presented |
| 4 | Alternatives and contingencies offer options in the case of changes in resources or major changes in economic or market conditions |

## Core Competency Considerations

| 1 | Core competencies are not identified |
| 2 | Core competencies are identified but are not central to the planning processes |
| 3 | The planning processes define required core competencies and the plan to develop and maintain them |
| 4 | Core competencies are in place, understood, and are an important consideration in the planning processes. Required competencies are clearly defined with a plan of action to acquire the competencies and to prune those not needed |

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Industrial Research Institute
ELEMENTS OF THE PLAN (CONTINUED)

- **TIME FRAME OF BUSINESS PLAN**
  - 1. ESSENTIALLY ONE YEAR
  - 2. 1-3 YEARS
  - 3. 3-7 YEARS
  - 4. 7-10+ YEARS (MAY ALSO BE FRAMED AROUND THE PLANNING CYCLE)

- **TIME FRAME OF TECHNOLOGY PLAN**
  - 1. ESSENTIALLY ONE YEAR
  - 2. 1-3 YEARS
  - 3. 3-7 YEARS
  - 4. 7-10+ YEARS (MAY ALSO BE FRAMED AROUND THE PLANNING CYCLE)

- **CONTENT/DOCUMENTATION OF THE PLAN**
  - PLAN COVERS THE RELEVANT DETAILS AND CONSISTS OF PROSE AND DATA. NO EFFORT MADE TO USE VISUAL PLANNING CHARTS
  - PLAN COVERS THE RELEVANT DETAILS WITH BACKUP PROSE AND DATA. VISUAL PLANNING CHARTS ARE INCLUDED IN THE PLAN
  - PLAN COVERS THE RELEVANT DETAILS WITH BACKUP PROSE AND DATA. EXECUTIVE SUMMARY DEFINES CLEARLY THE MOST IMPORTANT ISSUES
  - PLAN COVERS THE RELEVANT DETAILS WITH BACKUP PROSE AND DATA. PLAN IS SUMMARIZED IN LESS THAN 15 SLIDES USING VISUAL PLANNING CHARTS WHICH EASILY AND CLEARLY DEFINE NEEDS AND ACTIONS

- **INTELLECTUAL PROPERTY**
  - NO MENTION OF VALUE AND IMPACT OF INTELLECTUAL PROPERTY
  - BRIEF MENTION OF KEY INTELLECTUAL PROPERTIES CURRENTLY HELD
  - INTELLECTUAL PROPERTY PORTFOLIO IS PRESENTED ALONG WITH KEY INTELLECTUAL PROPERTY OF COMPETITORS
  - VALUE OF PRESENT INTELLECTUAL PROPERTY IS UNDERSTOOD AND ANALYZED ALONG WITH PLAN TO BUILD INTELLECTUAL PROPERTY IN KEY AREAS; KEY INTELLECTUAL PROPERTY OF COMPETITORS ARE ALSO INCLUDED

- **OTHER ELEMENTS OF THE PLAN**
  - NONE OF THE FOLLOWING ARE ADDRESSED TO ANY EXTENT:
    - CAPITAL EQUIPMENT NEEDS
    - PRODUCTIVITY
    - PRODUCT QUALITY
    - OPPORTUNITIES FOR GROWTH IN THE BUSINESS
    - MAINTENANCE/DEVELOPMENT OF (CORE) COMPETENCIES
    - OPPORTUNITIES FOR BREAKTHROUGHS
  - SOME OF THESE ELEMENTS ARE ADDRESSED
  - MOST OF THESE ARE ADDRESSED WHERE THEY ARE IMPORTANT TO THE BUSINESS
  - NONE ARE OVERLOOKED AND IMPACTS ON TECHNOLOGY PROGRAMS ARE SEEN

Industrial Research Institute
ELEMENTS OF THE PROCESS (1 of 3)

1. INVolvEMENT

- Business planning and technology planning are either nonexistent or remain superficial and are not used as a basis for action.

2. Business planning and technology planning are carried out as separate processes with little or no involvement of technology in business planning.

3. Technology function is asked for input into business plans, and business plans provide basis for technology plans; technology is often in a responsive mode.

4. Technology function is an integral part of business planning, significantly impacting the business planning process. Senior professionals have opportunity to be involved and provide input.

TIMING

- Technology planning is done periodically responding to organizational needs (demands for planning or for budget preparation).

- Technology planning is done regularly on an annual basis and results reviewed regularly. Plans are iterative — building on last year’s plan.

- Technology plans are "evergreen" and are used regularly to guide action and decision making. They are modified periodically based on results and external events.
TECHNOLOGY AND BUSINESS PLANNING SELF-ASSESSMENT SURVEY RESULTS

ELEMENTS OF THE PROCESS (2 of 3)

- INTERNAL COMMUNICATIONS
  1. Technology plans are not communicated to the R&D technology organization (non-existent, or incompletely formulated)
  2. Technology plans and related business plans are communicated to and understood by less than half of the technical organization. Some familiarity of the members of the business team
  3. Technology plans and related business plans are communicated to and understood by more than half of the technical organization; members of the organization understand how their programs are supportive
  4. Major parts of the technical organization are integrally involved in the planning process. Communication/understanding/doing are all interrelated

- EXTERNAL COMMUNICATIONS
  1. Little if any communications of needs and opportunities outside the immediate organization
  2. What cooperative efforts and discussions take place with those outside the immediate organizations are not done within the framework of the technology plan or critical needs of the business
  3. Members of the technical organization meet sporadically with technical resources outside their organization to discuss needs spelled out in their plan
  4. Members of the technical organization under the leadership of the technology director interact regularly with others outside the organization (CS&Es, other SBUs, universities, other external resource sources) to look for the opportunities to address the issues in the plan. Continuing relations/cooperative efforts are built upon past successes. The technical unit is the formal technical gatekeeper for the company
ELEMENTS OF THE PROCESS (3 of 3)

1. Plan itself is not used to measure results
2. Plan commitments are followed only by R&D/Technical—but not on a regular basis
3. R&D/Technical regularly revisit the plan—at times with the Business team
4. Business team, along with R&D/Technology, periodically measure progress vs. the plan and update it
ELEMENTS OF THE PLAN (1 of 5)

**BUSINESS ISSUES**

1. Technology programs are not explicitly related to key business needs/strategies
2. Technology programs are related to business needs in only vague terms
3. It is clear how results from technology programs contribute to business success; technical strategy (the bridge between business strategy and technical programs) is spelled out clearly
4. It is clear how results from technology programs not only contribute to business success but how some results can provide a real change in the game

**NATURE OF THE MARKETS, CUSTOMERS**

- Little, if any reference to markets and customer needs
- A few customer needs are mentioned
- The "voice of the customer" is heard in the plan; market structure/environment are well understood
- Customer needs are not only spelled out but future needs in the marketplace are anticipated

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Industrial Research Institute
ELEMENTS OF THE PLAN (2 of 5)

COMPETITORS
1. LITTLE IF ANY REFERENCE TO COMPETITORS
2. SOME COMPETITORS AND THEIR POSITION IN THE MARKET ARE RECOGNIZED
3. COMPETITIVE INTELLIGENCE IS REFLECTED IN THE PLAN WITH AN UNDERSTANDING OF MOST COMPETITIVE THREATS, IN-KIND AND NCT IN-KIND
4. TECHNICAL PROGRAM STRATEGIES RECOGNIZE THE THRUSTS OF TRADITIONAL AND POTENTIAL COMPETITORS INCLUDING THEIR TECHNOLOGICAL STRENGTHS, WEAKNESSES AND POSSIBLE END-RUNS

HUMAN RESOURCES
PEOPLE'S SKILLS/COMPETENCIES ARE NOT MENTIONED IN THE PLAN—OTHER THAN NUMBER OF BUDGET PEOPLE FOR INDIVIDUAL PROJECTS
PEOPLE NEEDS ARE Addressed—but NOT IN CONNECTION WITH SKILLS AND COMPETENCIES
SKILLS AND COMPETENCIES NEEDED ARE MENTIONED BUT WITH NO ANALYSIS
THE SKILLS AND COMPETENCIES NEEDED TO CARRY OUT THE TECHNOLOGY PLAN ARE ADDRESSED IN THE PLAN—BOTH NEAR AND LONGER TERM. NEEDS TO FILL GAPS ARE DISCUSSED AND PLAN TO FILL GAPS IS ADDRESSED
ELEMENTS OF THE PLAN (3 of 5)

1. CONTINGENCIES/ALTERNATIVE PLANS
   - No alternatives to the planned programs are presented

2. ANY ALTERNATIVES OR CONTINGENCY PLANS ARE NOT REALISTIC AND OFFER NO REAL CHOICES
   - 10%
   - 35%

3. LIMITED CUT-AND-DRIED ALTERNATIVES ARE PRESENTED
   - 55%

4. ALTERNATIVES AND CONTINGENCIES OFFER OPTIONS IN THE CASE OF CHANGES IN RESOURCES OR MAJOR CHANGES IN ECONOMIC OR MARKET CONDITIONS
   - 0%

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CORE COMPETENCY CONSIDERATIONS

1. Core competencies are not identified
   - 5%

2. Core competencies are identified but are not central to the planning processes
   - 45%

3. The planning processes define required core competencies and the plan to develop and maintain them
   - 45%

4. Core competencies are in place, understood, and are an important consideration in the planning processes. Required competencies are clearly defined with a plan of action to acquire the competencies and to prune those not needed
   - 5%
ELEMENTS OF THE PLAN (4 of 5)

- **TIME FRAME OF BUSINESS PLAN**
  - 1: Essentially One Year
  - 2: 1-3 Years
  - 3: 3-7 Years
  - 4: 7-10+ Years (MAY ALSO BE FRAMED AROUND THE PLANNING CYCLE)

- **TIME FRAME OF TECHNOLOGY PLAN**
  - 1: Essentially One Year
  - 2: 1-3 Years
  - 3: 3-7 Years
  - 4: 7-10+ Years (MAY ALSO BE FRAMED AROUND THE PLANNING CYCLE)

- **CONTENT/DOCUMENTATION OF THE PLAN**
  - PLAN COVERS THE RELEVANT DETAILS AND CONSISTS OF PROSE AND DATA, NO EFFORT MADE TO USE VISUAL PLANNING CHARTS
  - PLAN COVERS THE RELEVANT DETAILS WITH BACKUP PROSE AND DATA. VISUAL PLANNING CHARTS ARE INCLUDED IN THE PLAN
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  - PLAN COVERS THE RELEVANT DETAILS WITH BACKUP PROSE AND DATA. PLAN IS SUMMARIZED IN LESS THAN 15 SLIDES USING VISUAL PLANNING CHARTS WHICH EASILY AND CLEARLY DEFINE NEEDS AND ACTIONS
**Elements of the Plan (5 of 5)**

**1. Intellectual Property**
- No mention of value and impact of intellectual property

**2. Brief Mention of Key Intellectual Properties Currently Held**
- 31%

- 47%
- 11%

**4. Value of Present Intellectual Property Is Understood and Analyzed Along With Plan to Build Intellectual Property in Key Areas; Key Intellectual Property of Competitors Are Also Included**
- 11%

**Other Elements of the Plan**
- None of the following are addressed to any extent:
  - Capital equipment needs
  - Productivity
  - Product quality
  - Opportunities for growth in the business
  - Maintenance/development of (core) competencies
  - Opportunities for breakthroughs

- Some of these elements are addressed
- Most of these are addressed where they are important to the business
- None are overlooked and impacts on technology programs are seen

**Indicators**
- 100%
- 50%
- 0%
ELEMENTS OF THE PROCESS

● TECHNOLOGY PLANNING IS OFTEN (60%) IN A RESPONSIVE MODE TO THE BUSINESS PLANNING PROCESS, I.E., NOT AN EQUAL PARTNER

● TECHNOLOGY PLANS ARE UPDATED ON AN ANNUAL BASIS (85%) BUT ARE NOT USED REGULARLY TO GUIDE ACTIONS THROUGHOUT THE YEAR

● TECHNOLOGY PLANS AND BUSINESS PLANS ARE COMMUNICATED REASONABLY WELL INTERNALLY, BUT THE BROAD TECHNICAL COMMUNITY IS NOT AS INTEGRALLY INVOLVED IN THE PLANNING PROCESS AS THEY SHOULD BE

● THE TECHNICAL ORGANIZATIONS MEET ONLY SPORADICALLY (55%) WITH TECHNICAL RESOURCES OUTSIDE THEIR ORGANIZATIONS TO DISCUSS WAYS TO SATISFY NEEDS CALLED OUT IN THE PLAN

● THE TECHNICAL TEAM REGULARLY MEETS WITH THE BUSINESS TEAM THROUGHOUT THE YEAR TO REVIEW PROGRESS TOWARD THE PLAN
CONCLUSIONS FROM THE SURVEY (2 of 2)

ELEMENTS OF THE PLAN ITSELF

- Plans are clear on how technology results contribute to business success (65%)

- The "voice of the customer" is heard (80%) in the plan but future needs of the customer are not heard (only 10%)

- Competitive intelligence is not as strongly addressed as it perhaps should be

- Human resource needs are only superficially addressed in the plans

- Contingency/alternative planning is limited

- Core competencies are identified but action plans to acquire/maintain them are lacking

- Timeframe of the typical business plan is 1–7 years (50% 1–3 years, 40% 3–7 years)

- Timeframe of the typical technology plan is 3–7 years

- The plans are adequately documented with visual charts and executive summaries

- Intellectual property is inadequately covered in the plans

- Other elements are addressed when important to the business
SUMMARY OF VIDEO PRESENTATIONS
The Self Assessment Matrix

The self assessment matrix was the first activity in which the subcommittee engaged. Initially developed in DuPont by Parry Norling, it was designed to assess where companies perceived they were on various resourcement or aspects of the Technology Planning Process and the resourcing plan itself. Its other intent was to offer a basis upon which to improve continually.

There are two copies of this matrix in the folder. One is a master for a company's use in beginning the process. The other copy provides a distribution of responses from a select group of companies (approximately 25) as to where they assess themselves on the matrix. It is our intent to accumulate a more statistically meaningful response so that this form can be used for benchmarking. However, the histograms do provide a sense of where companies appear to be in this important activity. (A good review article on a survey of Technology/Business Linkage can be found in reference 1.)

A summary of key findings of this limited survey is attached. It is the basis of Joe Reagan's talk on the video.

Our recommendation for the use of the matrix is as follows:

- A person responsible for the technology planning process should complete the matrix.

- A person responsible for the business planning process should complete the matrix.

- Compare notes and look for gaps real or perceived.

- Analyze the gaps through clarification of definition of terms and come to consensus on a position.

There may be a need to complete this matrix at two levels in the organization. (Corporate and Divisional.) In many of our discussions with companies there was a different position expected if one answered at the corporate level or at the division. It is important that this organizational difference be understood and resolved before proceeding.

Once you have positioned your company on the matrix you can then study the rest of the package to find how select companies have used certain tools and techniques to improve. We have also provided reference material with each video section for your review and further study.

In the video and in the matrix there are some terms used which we will define here for consistency.
• Core capabilities, core technologies and core competencies - The term core is meant to define those assets or skills which you believe are required to give you a sustainable competitive advantage. In short, you must be better than, not equal to, the other guy.

• Critical competency - In reviewing the literature on the subject there has been a distinction made about critical competency versus core competency. We define a critical competency as a skill set where one must be equal to the competition, but need not be better.

• Platforms - A platform is a combination of competencies, capabilities and technologies which is the basis upon which a product or services is supplied to the customer. It also implies a family of technologies or products.

Finally, we do not pretend that the self assessment matrix is complete. There were many topics that were collected into the 'other' category which should be amplified. There are some that should be added to suit your company's situation. In fact, an important part of this effort is to add topics. We do recommend that when you use the package that you begin your process by completing the self assessment matrix and then again when you complete any improvement activity you embark upon.

The following is our recommendation on how to relate the video presentation in the package to a planning or plan element you wish to improve.
<table>
<thead>
<tr>
<th>If you want to learn how to improve...</th>
<th>Then refer to section discussion of...</th>
<th>And examine/discuss these key concepts:</th>
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</thead>
<tbody>
<tr>
<td>Involvement</td>
<td>Metz</td>
<td>• Workshops</td>
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<td></td>
<td>Germeraad</td>
<td>• Crossfunctional Team</td>
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<td></td>
<td>Deneka</td>
<td>• Two Day Planning Sessions</td>
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<td></td>
<td>McGraw</td>
<td>• Dual Reports</td>
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<td></td>
<td>Garfinkel</td>
<td>• Planners and Doers</td>
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<tr>
<td></td>
<td>Cassidy</td>
<td>• Liaison Manager</td>
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<td>• Core Competency Matrix</td>
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<td>If you want to learn how to improve...</td>
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<td>And examine/discuss these key concepts:</td>
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<tr>
<td></td>
<td>Metz</td>
<td>Annual planning Quarterly review for trends</td>
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<td>Germeraad</td>
<td>Annual Review/Quarterly updates</td>
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<td>Internal Communications (to technology function)</td>
<td>Metz</td>
<td>Concept of transparency</td>
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<td>Houghton</td>
<td>Vision statement</td>
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<td>Deneka</td>
<td>Strategic financial patience</td>
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<td></td>
<td>Garfinkel</td>
<td>Core value-innovation</td>
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<td>R&amp;D vision statement</td>
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<td>Quality model</td>
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<td>Scientists as Heroes</td>
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<td>Garfinkel</td>
<td>Crises as opportunities</td>
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<td>Business/Technology Accountability</td>
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<td></td>
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**IMPROVING THE PLAN ITSELF**

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1. Benchmarking the strategic management of technology
Roberts, Edward B.
Research - Technology Management v38n1 PP: 44-56 Jan/Feb 1995

ABSTRACT: Extensive data collected from the largest R&D-performing companies in the US, Western Europe, and Japan reveal that top management linkages and resource leverages are the keys to effective technology strategy. In terms of linkage, Japanese chief executive officers are more heavily involved in integrating technology with overall corporate strategy. Chief technology officers of Japanese companies have stronger board-level participation and greater influence on overall company strategy. US firms are rapidly decentralizing control of R&D activities to their business units, while Japanese companies are moving in the opposite direction. In search of resource leverage, companies worldwide are experiencing major shifts to acquiring technology from outside sources, relying increasingly on universities for research and on joint ventures and alliances for development. These and other findings on strategic management of technology arise from a global benchmarking study of the 244 companies that account for approximately 80% of the R&D expenditures in Europe, Japan, and the US.
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Arthur D. Little
Dr. Phil Metz

Best Practices for Effective Integration of Technology and Business Planning

Dr. Phil Metz is one of the leading consultants in the field of assisting companies to leverage their technology for business advantage. A key element of this strategy is the effective integration of technology planning and business planning.

His presentation revolves around the five best practices he has observed and facilitated while working in the field. Those practices are:

I. Establish a structured process for technology planning
II. Foster active involvement and partnership between R&D and other functions
III. Get top management commitment
IV. Organize to foster effective technology planning and 'buy-in' by all functions
V. Hold the business units and R&D accountable for measurable results

The attached matrix shows how the elements of the self assessment matrix relate to Metz's five points. We have found that one can take the five points and classify all of the key ideas into the talks within these five points. We have chosen to classify key ideas within the talks according to these five points.
James Houghton
Chairman and Chief Executive Officer
Coming Glass Incorporated

III. Get top management commitment.

The cornerstone of James Houghton's presentation is the commitment of the Chief Executive to make Technology pay off for organization through application of TQM to their innovation process. Houghton emphasizes that TQM is the Process which fosters integration of technology and business. It is the integration which is essential to the Innovation Process.

Houghton explains that the role of Coming is to translate ideas into dollars. The role of the CEO is to lead and provide the top management commitment to ensure that all of the functions link together into a single unit to make this process happen.

The six elements of the Coming TQM approach to innovation are:

- Empowered people → Delegation of authority
- Teams → Diversity of skills and people
- Framework → Innovation Model
- Customer → The external company: "who pays the money"
- Evaluation → Measure progress
- Continuous improvement → Hone the program and the framework

Some key phrases that hit home are:

Customer - The line of sight is the customer.
Continuous Improvement - Reward positive change.

Finally, all of the efforts of the CEO to see that effective linkage "makes something happen".

An interesting point in the video is to see how Skip Deneka's talk correlates with Houghton, even down to both using the same visual of linking their hands to describe key points of the innovation process (for reference, the Deneka and Houghton talks were independent.)
The Role of Technology in Restructuring a Company
*Houghton, James R.*
Research Management v26n6 PP: 9-16 Nov/Dec 1983

ABSTRACT: The mission of *Corning* Glass Works is to market technology profitably. In 1930, research and development (R&D) spending nearly doubled that of 1929. In looking at the corporate profile and achievements in increments of 20 years, the changes can be traced to the company's laboratory work. By 1960, *Corning* was involved in television and silicones. By 1980, the electronics and medical businesses were part of the corporate profile. The medical business' origins can be traced to laboratory work in the 1930's and experiments with silica. These led to the development of a glass material trademark Vycor. In 1983 *Corning* restructured into three groups: 1. Electronics and Telecommunications, 2. Health and Science and, 3. Consumer and Industry. These categories reflect the potential mix for the year 2000.
I. Foster Active Involvement and Partnerships Between R&D and Other Functions

As its mechanism for fostering involvement between R&D and business functions, Corning uses a five stage innovation process. (A diagram of this process can be found in the notes for the talk). The process involves defined roles and responsibilities for Marketing, Technology and Manufacturing and also is a stage-gate model for technology development project management. The defined roles and responsibilities of this five stage innovation model make for excellent accountability of both business and technology units for ultimate project progress. The five stage innovation model at Corning has top down sponsorship backing it throughout the Corporation.

II. Get Top Management Commitment

While the five stage innovation model has top down commitment throughout the organization, Corning is renowned for greater top management commitment to the integration of technology and business planning. The current Chief Technology Officer at Corning is also the Vice Chairman of the Corporation as well as a member of the Board of Directors. This gives technology a presence at the top levels of the company and makes it a key issue discussed in every business situation. Further evidence of this top management commitment as active involvement between the R&D and business groups is the concept of "strategic financial patience". Such a practice requires clear and frequent communication between top management, technology management, and business management and is unusual in most US companies. The fourteen year commitment alluded to by Dr. Deneka in his talk refers to Corning having invested for fourteen years before successfully developing and commercializing optical communication fiber. This example unequivocally defines "strategic financial patience".

III. Organize to Foster Effective Technology Planning and Buy-In by all Functions.

At Corning, innovation is a core value that permeates the entire corporation. One reflection of this value is a unique dual reporting structure. Each technologist has a reporting relationship not just to the usual technology management side but also to the business management side. This obviously emphasizes to the technologist as well as to the business the importance of both functions in the ultimate commercial success of technological innovations. Corning also highly values teamwork as a mechanism for commercializing products. While effective teamwork is known to be a critical success factor, Corning also clearly values the individual contribution of key business and technology people.
I. Establish a Structured Process for Technology Planning

The Avery Dennison process described in this talk is clearly one that has evolved over time to be highly structured. A key point is the development of a common language for different R&D project types which provide a clear understanding of expectations, risk-reward, completion time and project tracking techniques. A second key element in the structured process is the use of a variety of portfolio tools to assess the value of proposed projects to the business.

II. Foster Active Involvement and Partnerships Between R&D and Other Functions

This principle is well illustrated at Avery Dennison by the use of cross-functional teams from the various business divisions to evaluate, prioritize and select the ultimate portfolio of long and short term R&D projects. More importantly, these cross-functional teams provide broad business and technical input from R&D, Marketing and Manufacturing in the project selection process.

Another key element of this process is the upfront identification of either a single or multiple project champion(s) from technology, marketing or operations. These project champions facilitate communication and bear ultimate responsibility for the project.
I. Establish a Structured Process for Technology Planning

Over the past five years Eastman Chemical has undergone a renaissance in its thinking about technology and business planning. Spurred on by the desire to become more productive, they had instituted a total quality management process and used its teachings to better link their technology and business planning processes. The details of these processes are outlined in several papers published over the last year in Research Technology Management. (See references 1 and 2.) As a winner of the Baldrige Award, Eastman has clearly been able to reinvent itself and serve as a model from which other companies can learn. In a recent talk presented to the Industrial Research Institute Semiannual Meeting in the Fall of 1994, Dr. McGraw further reported on a two fold improvement in productivity in their R&D and Business process by the use of these techniques. Eastman Chemical is one of a growing number of US R&D companies that is using the analysis of its core competencies both to drive its current businesses as well as to serve as platforms for its future businesses.

It is important to note that core competencies have been the subject of a number of publications in Research Technology Management. (See "Improving the Implementation" miscellaneous references 2, 3 and 4.)

Among the key features of Eastman's approach are the following:

- There is a competitive focus in Eastman's planning, both regarding competitors' technology developments and competitive responses to Eastman's technology developments.

- Eastman chooses a timeframe for strategic planning as "the longest period relevant to the business". Rather than adopting arbitrary time periods, this
forces a dialog on product life cycles and other issues specific to individual businesses.

- Segmentation is an important element in Eastman's planning. Base Businesses, Core Competencies, Technologies, and New Business Growth are separately considered in the identification of Strategic Options from which a Strategy Portfolio is eventually decided upon through an analysis and prioritization process.

- The Strategic Plan is evergreen, updated annually through the planning process.
1. White water ahead: Eastman Prepares for turbulent times
*Holmes, Jerry D.*; McGraw, Gary E.

ABSTRACT: As the chemical industry headed for consolidation in the early 1990's, Eastman Chemical Company recognized that it had to grow if it was to remain competitive. And to grow it had to change - immediately, before "white water" engulfed it. Choosing to manage change rather than allow change to manage it, the company decided upon a strategy that involved shifting from a functional organization to a matrixed one, while preserving its traditional strengths. Eastman chose to become a company that is market-focused, pursues global expansion, seeks faster growth, maintains functional excellence, and leverages its core competencies as never before. Eastman intends to continue reassessing and redefining itself, using the total quality management process. When it sees a turn in the river or a change in the current, it fully expects to be ready.

2. Improving the innovation process at Eastman Chemical
*Holmes, Jerry D.*; Nelson, Gregory O.; Stump, David C.

ABSTRACT: As Eastman Chemical Company faced an increasingly competitive global environment and stronger demand for new products, it was recognized that an improvement in the company's innovation process was necessary. Throughout the company, innovation was generally thought of as a research and development (R&D) process with poor linkage to marketing and business functions. On the other hand, the innovation process for incremental improvement of products worked very well. A systematic quality management process approach was used to redefine innovation as a company-wide system in which many functions play a critical role. As a result of this effort, the
identification of the right things to work on was recognized as a major opportunity for improvement. Improvements in this area are being obtained by using multifunctional needs-identification teams and by clearly defining the role of the business as owners of innovation, with R&D a facilitator.


General Electric
Dr. Marv Garfinkel, Director of Planning for the GE Corporate Research Center
Comment:

Marv's talk is somewhat different from the others on this tape. He has chosen to evaluate General Electric's Corporate R&D Center on the basis of the self evaluation questionnaire that was discussed earlier in this video.

Key Points:

I. Establish a Structured Process for Technology Planning

It is clear from Marv's discussion that there is a highly structured process already installed to link technology and business planning at General Electric. A key distinction for GE is the use of multi-generational product designs as a way of addressing the challenging issue of long term and short term project balance. As Marv indicated, the multi-generational approach means that while GE is developing the first generation product, they are also working on the second, and in some cases, even the third generation. This second and third generation effort may also improve the first generation product as well.

II. Foster Active Involvement in Partnerships between R&D and the other Functions

Again, Marv has described his lab as working in a boundaryless corporate culture (seamless, cross-functional teams between R&D and the business units). However, he also indicates that because of the diverse technical and business approaches used at GE, there are still some communication issues that need to be improved. The development of a common language and management of expectations across business units has been somewhat of a problem. GE has addressed this issue by assigning a person to be a liaison or "account manager" between the business and technology groups. Another key point of the active involvement between R&D and the businesses, is GE's attempts to exploit
synergies of single technologies across multiple businesses or multiple
generations of the same product. GE’s shift from a highly structured corporate
culture to a fast-moving interdependent, teamwork culture has been recognized
in the literature (GE reference #5).

III. Get Top Management Commitment

The linkage between top management in business and technology is clear since
the senior VP of R&D at the GE Research Center also sits on the Corporate
Business Council which makes all decisions regarding the fate and progress of
the various businesses. This once again gives technology a clear voice at the
highest levels of the corporation.

IV. Organize to Foster Effective Technology Planning and Buy-In in all Functions

One of the goals of the General Electric labs was to eliminate any boundaries
between themselves and the business units. One of the key techniques which
GE found useful was the appointment of a business interface person. This
person is the moral equivalent of an account manager which is a concept
familiar to most business people. A high level, business-oriented technologist is
generally found to be the kind of person needed to make this type of process
work.
Dr. Marv Garfinkel, Director of Planning for the GE Corporate Research Center

Key Points:

V. Hold the Business Units in R&D Accountable for Measurable Results

General Electric places value and importance on technology plans delivering speedy, cost-effective technical innovations. In fact, General Electric employs the severest level of accountability known to the civilized world. Basically the businesses vote with their dollars and hold the labs accountable for spending them in their best interests against mutually agreed upon plans. Marv stresses this point with a simple but very effective message, "If you've done the job, you get the dollars. If you haven't, you don't".
1. Managing the externalities - Another responsibility of the R&D manager
*Robb, Walter L.*
Research-Technology Management v37n6 PP: 46-47+ Nov/Dec 1994

ABSTRACT: R&D managers should pay attention to external issues. At the top of the list of externalities is the agency that regulates one's product or process. In many companies, perhaps the most important externalities are its customers and suppliers. Seven recommendations on how to react to externalities are provided. Although the externalities can sometimes help the R&D manager, they can just as often be a minefield, slowing down a product introduction, costing lots of money, taking up lots of time and even costing the R&D manager his job.

2. Selling technology to your CEO
*Robb, Walter L.*
Research-Technology Management v37n5 PP: 43-45 Sep/Oct 1994

ABSTRACT: In an era of severe global competition, slowing growth and short-term expectations, chief executives tend to favor those business functions that can show measurable impact on the bottom line. In this environment, the chief technical officer (CTO) must defend technology against zealous proposals from the other business functions, in order to preserve the long-term growth and profitability of the business. This role for the CTO requires establishing a high degree of credibility, gained by excellent performance coupled with teamwork, plus the willingness and courage to take the right degree of risk.
3. How Good Is Our Research?
*Robb, Walter L.*
Research-Technology Management v34n2 PP:16-21 Mar/Apr 1991

ABSTRACT: General Electric Co.'s (GE) Research and Development Center (R&D Center) has a dual emphasis: 1. Internally, to increase the freedom and initiative of researchers to come up with more new ideas and do more exploratory research and, 2. Externally, to put an increased emphasis on effectively marketing R&D to the company's business. Four measurements help the GE R&D Center determine whether its research is as productive as it should be. These are: 1. Estimating where the company would be without the laboratory, in terms of entire business foregone, 2. Counting things, such as patents, patent citations, and licensing, 3. Analyzing technology transitions - technology advances that originated in the R&D Center and moved to a business operation and, 4. Measuring the free market - making the level of support for the laboratory directly reflect the decisions of business that will make and sell the resulting technology. Taken together, these 4 measurements provide a positive story of productivity and contribution to GE's performance.

4. Don't Change the Engineers - Change the Process
*Robb, Walter L.*
Research-Technology Management v35n2 PP:8-9 Mar/Apr 1992

ABSTRACT: Engineers should not be held responsible for the inability of the US to compete internationally. The problems are in the areas of product definition and teamwork among marketing, sales, engineering, manufacturing, and service. Spending a little extra time achieving a committed consensus on the part of all functions - sales, marketing, engineering, manufacturing, and service - can save perhaps as much as 50% in the total product development cycle. A detailed comparison of how one US-based organization and its Japanese joint venture developed comparable improved products revealed the
problems with the US product development cycle. The primary reason it takes so long for the US to get products to market is that the original design is changed too many times on its way to production. In Japan, a product development team consisting of sales, marketing, engineering, manufacturing, and service work together from day one to decide what product can be made with a minimum of new manufacturing capabilities. The team’s decision is final. By contrast, US companies may alter their plans many times.

5. Closing the Motivation Gap
Maccoby, Michael
"Research-Technology Management" v34n1 PP: 50-51 Jan-Feb 1991

ABSTRACT: A survey of senior managers in large US and European companies on characteristics of leadership shows that the ability to motivate employees and develop teamwork are both rated as extremely important for the success of the company. Senior managers have been motivated to win at a game that no longer exists. As a result, their motivation causes maladaptive behavior. The old corporate culture was highly interdependent. Boundaries have become permeable, and teamwork is essential. Jack Weich, chief executive officer (CEO) of "General Electric", said the ideal corporate structure is the boundaryless organization. Closing the motivation gap requires recognizing the changing role of management. Devising roles and responsibilities as clearly as possible and revising measurement and reward systems are also effective ways to support teamwork. Jim Carlinson, CEO of SAS, said fear undermines corporate teamwork. Instead, respect, care, and support should be the methods of management.

6. Managing R&D in Diversified Companies
Ireland, R. Duane; Hitt, Michael A.; Skivington, James
"Research-Technology Management" v33n4 PP: 37-42 Jul/Aug 1990

ABSTRACT: The connection between research and development (R&D) and competitive success and the difficulty of successfully managing R&D suggest the
need to determine the degree to which R&D should be emphasized at a point in
time and the R&D type - product or process - that is most critical situationally.
In related diversified firms, R&D executives should: 1. Encourage significant
investments in R&D, 2. Ensure that horizontal linkage between and among the
company's different units are built and maintained and, 3. Channel a major
portion of available R&D resources to process research activities in relatively
stable environments. In unrelated diversified firms, R&D executives should: 1.
Encourage moderate investments in R&D but make significant investments in
carefully targeted businesses, 2. Ensure that vertical linkages between R&D
units and senior-level management are built and maintained and, 3. Channel a
major relatively stable environments.

7. Market Fall / Technology Push: Ultem Resin
Gross, Philip M.
*Research-Technology Management* v32n2 PP: 30-31 Mar/Apr 1989

ABSTRACT: Work on *General Electric's* (GE) Ultem resin began in the late
1960's, based on an intuition that there would be a market for a good high-
temperature thermoplastic resin. A $20-million pilot plant was constructed in the
early 1980's to improve the process and validate the market demand for this
material. Ultem resin was found to be better than other plastics - stronger and
cheaper - and it worked. In 1984, GE approved a $75-million major commercial
facility. GE's direct participation in a forward integration business enabled
market development to occur in the following area: 1. The injection molded
circuit board and, 2. The multilayered food package capable of being cooked
to conventionally or in a microwave oven. GE formed a venture with the product.
The GEPAX operation was designed to develop and market multi-layered
packages.
The theme of John Cassidy's presentation deals with the partnership between corporate R&D and the divisional businesses. UTC creates this partnership through integrating core technologies into individual divisional business plans. The cornerstone of the integration is the program group/core capability matrix. The intersection of core capability with the group is how the integration of technology and business is managed.

Key Points

I. Foster active involvement and partnerships between R&D and other functions.

The clear use of the matrix intersection as a management tool at UTC is the best example of focused management to foster integration. Though not discussed in John Cassidy's video presentation, there was much discussion of the 'partnership' role between business and technology and the 'tensions' that arise at that intersection. The business as the customer requiring solutions from the R&D supplier on a business opportunity and the R&D organization requiring enough support from the customer to maintain core competency excellence. John makes the point, as does Marv Garfinkel of GE, that response to crises builds credibility.

II. Establish a structured process for technology planning.

The program group/core capability matrix is the cornerstone of UTC's integration. The process, however, requires a multi-year plan spread over a ten year horizon. The model requires review annually by senior management to ensure that technology plans are consistent with business goals and sufficient flexibility exists to change within the ten year framework.
V. Audit of results.

In addition to senior management review the CTO requires of the customers a report card. These key measures are:

- Impact of R&D on the business
- How well was R&D part of the team
- How well did R&D respond to crisis
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RESEARCH TECHNOLOGY MANAGEMENT
1. Aligning technology with business strategy
Chester, Arthur N.
Research-Technology Management v37n1 PP: 25-32 Jan/Feb 1994

ABSTRACT: Approaches being used by large high-technology companies to align technology strategy with business strategy are described. Comparative data are given that were obtained through benchmarking interviews with senior technology executives at 16 corporations. Following a discussion of how R&D processes depend on local organization, history and climate, four processes for technical and business strategy integration are described: 1. The specialty rather than according to market addressed, 2. Core competencies described in several contexts, 3. Technical networks for nourishing technical core competencies and, 4. The use of research account executives to provide direct interface from the central lab to the business units. These concepts are then related to an evolving global culture of technology business management.

2. Integrating R&D and Business Strategy
Klimstra, Paul D.; Raphael, Ann T.
Research-Technology Management v35n1 PP: 22-28 Jan/Feb 1992

ABSTRACT: For research-intensive companies, integrating research and development (R&D) and business strategy is an important element of success. The integration of R&D and business strategy can be seen in the pharmaceutical industry. Following its acquisition by Monsanto in 1985, G. D. Searle and Co. established a product-flow goal average of one major new product introduction per year, a target company size of about $3 billion in sales, and a ranking in the top 15 in earnings by the mid-1990's. A strategy of three parallel and independently resources and managed pathways was established to generate new products to achieve these goals. Searle R&D and Market Planning and Development established a process to guide interactions between these groups.
Since the time frame for success from pharmaceutical R&D is measured in terms of at least a decade, another 3-4 years will be required to demonstrate the positive impact of these changes. At this point, there is evidence that Searle is on the right track.

3. Tighten the Linkage Between Research, Business Strategy and Marketing
Smith, Philip L.
Research-Technology Management v31n2 PP: 6-8 Mar/Apr 1988

ABSTRACT: A set of seven principles is suggested to help keep the linkage between research, business strategy, and marketing strong. The first principle states that linkage must start with an overall corporate vision, and should include a description of the company and its characteristics and the work that is to be done. The second principle indicates that direction for research is both a top-down and a bottom-up process, stressing the need for 2-way communication throughout the organization. According to the third principle, interaction between research, business planning, and marketing must be forced, and the fourth principle recognizes that different businesses inherently have different levels of technical intensity. The fifth principle advises a company to look beyond its own walls for new ideas. For large companies, it is essential to survey small research firms, universities, and the marketplace for new ideas. The sixth principle stresses the necessity of enough flexibility in a research budget to allow some amount of scientific dabbling. The last principle directs companies to check research spending periodically. If this is not done, mature technologies and old successes can consume resources, and new programs are left starved for funding.

4. Improving R&D decisions and execution
Meneke, Michael M.

ABSTRACT: Decision quality and execution quality in R&D are very different, but both can be improved by using a common set of quality tools. These tools,
including strategy tables, influence diagrams, sensitivity analysis, decision trees, and portfolio grids, have evolved from the decision quality movement and complement the quality tools from TQM. These tools are especially useful for companies that want to manage R&D explicitly to create shareholder value.

5. The changing role of U.S. corporate research labs
Corcoran, Elizabeth
"Research-Technology Management" v37n4 PP: 14-20 Jul/Aug 1994

ABSTRACT: Throughout the US, central research laboratories are facing greater challenges than ever before. As budgets for research laboratories continue to shrink, corporations are demanding more, and faster, tangible results from their laboratories. As a result, research managers are looking for new ways to organize and motivate their programs. Almost every company is pursuing a different strategy. Nevertheless, across the board, managers are trying to pull research into tighter relationships with other divisions of the company. Some worry that a tighter focus on short-term efforts will eventually impair their company's long-term ability to turn out innovations. Others argue that real innovations will come about as research programs become more sensitive to their corporate parent's contemporary problems.

6. Radical innovation and corporate regeneration
Utterback, James M
"Research-Technology Management" v37n4 PP: 10 Jul/Aug 1994

ABSTRACT: Looking back over the descriptions of industry evolution and of individual firms that have mastered generations of technological change, the idea of developing and balancing core competencies as the key to success seems more credible than many current management philosophies.
7. The role of core competencies in the corporation
Prahalad, CK
*Research-Technology Management* v35n6 PP: 40-47 Nov/Dec 1993

ABSTRACT: The debate about the competitiveness of Western firms in a wide variety of industries inevitably triggers debates about technology policy and investment levels in technology. The scorecard of Western firms - be it performance along dimensions such as quality, cycle time and cost, or growth and new business creation - has been less than satisfactory. A new approach is needed to evaluate the value added by senior management. This management scorecard must be seen as "stretch" and the critical role of senior management as creating the capacity to leverage corporate resources. A strategic architecture allows managers to identify the core competencies that exist and those that are needed. Core competencies are an important link in the process of leverage. A core competency can be identified by applying three simple tests: 1. Is it a significant source of competitive differentiation? 2. Does it transcend a single business? 3. Is it hard for competitors to imitate? Growth will take place when business focus on the organization, with technology as a part of it.


9. The Strategic Measure of R&D
Schmitt, Roland W.

ABSTRACT: A strategy to measure research and development (R&D) must look for measures in the context of the signs that will tell the skilled observer about the health of the enterprise. In the process of judging R&D, the most obvious
fact is that R&D must fit the strategic vision of the business. R&D must get onto
the business' critical path into the future. The second major thing to look at is
whether the execution of the R&D has the earmarks of a successful enterprise.
The design review should be not only be a rigorous snapshot of the engineering
design but also a systems-oriented review. Another indicator of a healthy
innovative process is self-confident probing of potential failure mechanisms.
Immersion in the execution process, right up to the marketing stage, is an
important and measurable part of R&D's effort to make itself indispensable.

10. Needed: New paradigms for R&D
Steele, Lowell W.

ABSTRACT: Major changes in the competitive environment and in management
learning are having a marked effect on research and development (R&D).
Differentiated paradigms that recognize the stage of maturity will affect internal
R&D management. Increasingly, success will depend on early and creative
reliance on market information. The goal of a major breakthrough as the
ultimate achievement should be reconsidered; R&D's role may need to change
from one putting a premium on creating major discontinuities to one ensuring
timely access to the diverse technology required to implement major
discontinuities. A glaring omission in the traditional paradigm is that it does not
include provision for disciplined monitoring of performance. Industrial R&D
organizations may not need to become more rigorous in evaluating performance
and more active in career planning. An agent of change must play a leading
role in developing paradigms that both guide and invigorate the process. R&D,
as perhaps the principal agent of change, must itself be part of the process if it
is to remain viable.
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   Collier, Donald W.
   Planning Review v13n5 PP: 28-34, 44 Sep 1985

3. Linking R&D with Business Needs: Integrative Planning and Communication of Research
   Cannon, Peter
   Research Management v27n3 PP: 20-22 May/Jun 1984

   Thomas, Leo J.
   Research Management v27n3 PP: 15-19 May/Jun 1984

ABSTRACT: To turn innovative ideas into marketable products, a firm’s research and development operation (R&D) must develop links with the management, marketing, and manufacturing operations. Although modern product complexity and time-scale differences make it difficult to couple R&D with other functions, technical innovation must be combined with creativity. R&D operations can overcome barriers to links with other functions by supporting the company's existing business and by acting as agents for change. It is important to establish research's credibility and ability to contribute to company profitability. R&D must create an interrelationship with manufacturing operations, because new manufacturing processes may have to be designed to support innovation.
Coupling with market functions is vital for R&D because some innovative ideas need a champion to get to the marketplace, but coupling with management is the most important. Eastman Kodak Co.'s disc camera program is a good example of effective linkage. The program called for new technologies and new film and the R&D staff worked with all of Kodak's operating units.

5. Linking R&D with Business Needs: R&D Choices and Technology Transfer
   Frosch, Robert A.
   Research management v27n3 PP: 11-14 May/Jun 1984

   Frohman, Alan L.; Bitondo, Domenic

7. Linking Technological and Business Planning
   Bitondo, Domenic; Frohman, Alan
   Research Management v24n6 PP: 19-23 Nov 1981

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   Hoch, Stanley H.
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   Brownlie, D.T.
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Brownlie, Douglas T.  
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12. A Study of the Factors Which Affect Technology Transfer in a Multilocation Multibusiness Unit Corporation  
Ounjian, Moira L.; Carne, E. Bryan  

13. New Product Processes at Leading Industrial Firms  
Cooper, Robert G.; Kleinschmidt, Elko J.  
Industrial Marketing Management v20n2 PP: 137-147 May 1991

ABSTRACT: Faced with increasing competition, especially from foreign firms, the heightened pace of technological change, and increasing demands from their own customers, more industrial firms are looking to product innovation to help them achieve a sustainable competitive advantage. The strategic importance of product development coupled with high risks and failure rates has led many companies to reconsider the way they go about conceiving, developing, and launching new products. Some firms have adopted a formal new product process, or stage-gate system, for moving new product projects from idea to launch. The performance results of new product game plans for IBM, 3M General Motors, Northern Telecom, and Emerson Electric are examined.
14. Overall Corporate Strategies for New Product Programs
Cooper, Robert G.

ABSTRACT: The strategy an industrial firm adopts for its product development program increasingly is regarded as a critical element of the total corporate strategy. New product development and technology have an integral relationship to the strategic direction of an industrial company in that they help define the range of the company's possibilities. This review reports the results of an empirical study that was undertaken to identify the major types of innovation strategies (strategy scenarios) firms pursue. Strategies are: 1. The technologically driven strategy, 2. The balanced focused strategy, 3. The technologically deficient strategy, 4. The low-budget, conservative strategy and, 5. The high-budget diverse strategy. Results indicated that a balanced, focused strategy yields the best new product program performance. The new product strategy a firm adopts is clearly linked to the performance of the new product program.

15. Industrial Firm's New Product Strategies
Cooper, Robert G.
Journal of Business Research v13n2 PP: 107-121 Apr 1985

ABSTRACT: A study was conducted to examine the relationship between product innovation strategies and firm performance. Based on data gathered from 122 Canadian firms, 19 dimensions of new product strategy were identified along with 3 independent performance dimensions. Multiple regression analysis and canonical correlations were used to relate the performance criteria to the strategy dimensions. Overall performance was measured in terms of how new product programs fare relative to performance objectives, competitors, and profitability. Overall performance was then related to such strategy dimensions
as technological sophistication, product customness, marketing orientation, and marketing synergy. Program performance in terms of the success rates of new products was linked to conservative strategies based on avoidance of new markets, focus on specific product types, new product fit with existing products, differential product advantage, and production/technology synergy. Finally, program performance in terms of profit and sales effects was dependent on heavy research and development orientation and spending, technological aggressiveness, program concentration on particular production and development technologies, and differential product advantages.

Cooper, Robert G.
European Journal of Marketing v18n5 PP: 5-54 1984

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18. The Strategy Performance Link in Product Innovation
Cooper, Robert G.
R&D Management v14n4 PP: 247-259 Oct 1984

ABSTRACT: The strategy a firm adopts for its new product program is a crucial element of the firm's corporate strategy. However, little research has investigated the performance results of firms' new product programs and the strategy-performance link. The results of an empirical study of 122 firms are reported that attempt to identify the levels of new product performance achieved and the strategies leading to different types of performance. The research findings support the underlying hypothesis that the new product strategies firms
adopt are closely tied to the performance results achieved. Eight different performance gauges yield three independent dimensions of new product performance. The fact that these dimensions are constructed to be independent of each other indicates that a firm can aim for a number of different types of new product performance. Five different clusters of performers are identified, and the strategies and characteristics shared by the top performers are described.

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LEADER'S GUIDE
Workshop Leader's Support Materials

The goal of this Leader's Delivery Kit is to provide you, the Workshop Leader, with the support materials required to conduct the workshop and make the outcome meaningful and relevant to your organization.

This Leader's Delivery Kit Provides

Section 1: Leader's Introduction to the Workshop

This section explains how this Workshop has been designed, and answers these questions:

- What is in the Leader's Delivery Kit and how do I use it?
- What are the objectives and desired outcomes of this Workshop?
- What are the keys to successfully leading this Workshop?
- How do I make this Workshop more directly relevant to my organization?

Section 2: Getting Ready

This section helps you to set up the Workshop session and answers these questions:
• How should I plan and prepare for the Workshop?
• What is the Workshop agenda?
• What materials and equipment will I need to conduct the session?

Section 3: Running the Workshop

This section explains how to run the session and provides a Leader’s sample script for your review and use. This is included to give you a suggested way to present each section of the agenda. How you actually run the workshop is up to you.

Overhead Transparencies

The black & white masters for overhead transparencies placed in the back of this kit are provided for you to use during the Workshop. You may choose to use some or all of them; to add your own; or to rely instead on a flip chart or white board for jotting down key points. The approach that best fits your style is the one you should use.

Workshop Exercise

With each question you will find suggestions, explanations, and additional prompts to help you and your group make the most effective use of the exercise.
Section 1: Leader’s Introduction to the Workshop

What This Kit Contains (Parts List)

- 1 Copy of the Video Presentation
- 1 Copy of the Leader’s Delivery Kit
- 1 Set of Black & White Masters for Overhead Transparencies from the Video
- 1 Set of Written Descriptions of the Video Messages
- 1 List of References
- 1 Self Assessment Matrix (Blank)
- 1 Self Assessment Matrix with Histogram Data from Other Company Responses
Workshop Group Size

Natural Work Groups

The preferred way to run this workshop is with natural work groups. This will mean peer level members of technology, business management and other function management as may be appropriate for your organization. Best results for a meeting of this type occur when the senior executive managing the participants requests the workshop.

Ideally, this workshop will be "cascaded" throughout the organization, level by level with each manager acting as leader. However, if this is not happening in your organization, do not wait - demonstrate leadership by holding this workshop right away.

Small to Mid-Sized Groups

Workshops can be conducted in a small group setting. In these situations, the recommended size for a successful round table discussion of the issues is up to 12 people. This workshop size promotes free discussion and allows for maximum interaction.

Larger Workshops

Those who wish to conduct larger workshops may do so in a classroom setting. While it may be more difficult for each participant to fully contribute to the discussion and exercise, a moderate size of about 25 people is quite manageable. In the larger context, leaders will have to work diligently to stimulate discussion. It is through this sharing of ideas and experiences that a significant portion of the understanding and opportunities surface.

In the larger workshop, large screen TV or projector systems are recommended; or multiple monitors can be linked together and distributed throughout the room.
Keys to Leading a Successful Workshop

The keys to successfully leading this workshop include the following:

- Promote open discussion and brainstorming among all participants.

  People are the most important resource you have. Draw on their ideas and experiences. One of the most valuable services you can provide is creating an open forum where people can talk freely without fear of reprisal or ridicule. In the new system, all ideas are welcomed.

  Do not allow one or two individuals to dominate the meeting. A good way to keep everyone involved is to ask each participant in turn for comments and input before any individual speaks for a second time.

- Be well prepared.

  Before delivering the workshop for the first time, complete the checklist of things to do.

  Think of ways to keep the discussion going. Come up with suggestions to stimulate ideas. Ask questions specific to your organization to reinforce points and draw out the thoughts of others. The key purpose of the workshop is to get people to think about how much they do contributes to the waste in our business processes.

- Make the workshop relevant to your organization and work processes.

  Consider ways to tailor the information presented to your organization's problems, processes and challenges.
Section 2: Getting Ready

To lead this workshop, the following steps are recommended:

1) Read through this Leader's Delivery Kit.

2) Watch the videotape presentation. Take notes. Use the written summary of points from the video. You will want to be thoroughly familiar with the information conveyed.

3) Work through the workshop questions, making your own notes. Think of examples you can use and other ways to generate discussion and elicit opinions from the participants.

4) Familiarize yourself with the overhead transparencies that you may want to use. Be sure to determine where in the video you want to interrupt to begin discussion. Use the information provided in whatever manner you feel suits your style.

5) Reserve the right meeting room. One of the most important elements of leading a successful meeting is a comfortable environment. Participants should be at ease and free from distraction. Set the room up in advance to make sure everyone will be able to see the TV monitor and interact easily. For a small group, one option would be setting the room up U-shape with the leader, flipchart and TV monitor at the open end.

6) Reserve all needed equipment. See the "Checklist of Required Materials and Equipment."

7) Notify workshop participants. Include information about when, where, why, and for how long the workshop is scheduled. Ask the participants to make sure that they set aside enough time. Emphasize that the workshop is viewed as essential by your organization, and is too important for people to arrive late or leave early. Select a schedule and location that will greatly reduce or eliminate regular business day interruptions.

8) About one hour before the start of the meeting, make sure that the equipment you need is installed in the room and in proper working order. Test it before the Workshop begins. Remember to disconnect the telephone in the meeting room just before the Workshop begins.
Checklist of Required Materials and Equipment

You will need the following:

- A video tape player and TV monitor(s)
- Overhead projector
- Overhead marking pens (if you plan to use them)
- Extra pencils/pens and self-stick notes or index cards
- Chalk, white board markers or flipchart and water-based markers
- This Leader's Delivery Kit
- A roll of tape, or other fastener, to post flipchart sheets on the wall or board
- Coffee, soda, juice and other refreshments for participants
Notes on Using the Equipment

- Set up and test all equipment before the workshop begins. This includes adjustments to the TV, monitor or projector including color, tint and volume.

- Check all connections: power, video and audio.

- Test adjust the VCR picture tracking.

- Make sure the video is rewound to just before the picture.

- Test the position of the TV's to maximize visibility for participants.

- Check the overhead projector bulb - keep a spare handy.

- Check focus and adjustments to the overhead projector image.

- Keep phone numbers of Audio/Visual support people handy. Any delays caused by equipment problems represent wasted time for the people in the room, and significant expense for the organization.

- Make sure the video equipment matches the format of the tape in your workshop.
Section 3: Running the Workshop

Step 1: Introduce the workshop.

Step 2: Review the purpose and desired outcomes of the workshop.

Step 3: Review the Agenda for the workshop. Ask for comments and questions.

Step 4: Play the videotape.

Step 5: Set the groundrules for discussion.

Step 6: Ask someone to act as "scribe" to record the thoughts and ideas of the group on the flip chart as the discussion proceeds.

Step 7: Hold the discussion answering the workshop questions.

Step 8: Summarize and close the workshop.

Step 9: Create the follow-up memo.

Step 10: Run a follow-up meeting, create a prioritized action list, and form teams to attack the problems identified.
Section 3: Running the Workshop

We recommend the conduct of the workshop to be as follows:

- Examine your company's position on the self assessment matrix and identify where in the process and/or content you rank your company (get agreement from all.)

- Identify from the matrix what characteristics your company needs to improve upon:

- Add characteristics while your company wishes to establish to consider themselves "best in class"

- Play those sections of the tape which appear to offer the best discussion on the topic

- Stop the tape and amplify or add to previous characteristics

- Develop an action plan to improve

We have attached questions which we believe are a good basis for discussion around each video presentation. These follow in subsequent pages.
LEADER'S GUIDE (Questions)

To structure your improvement process we recommend that you review Metz's five points and examine your company's position and check back to the self assessment matrix to confirm where you are.

We suggested in the self assessment matrix discussion section that you can refer to those areas where you particularly want to improve and suggested those sections in the presentation where there are key ideas that may be of value in the improvement process.

What follows are some questions that should be answered by the organization for each of the presentations.
Key questions to discuss and answer in order to:

I. Establish a structured process for technology planning.
   • What is your technology and business planning process?
   • What techniques do you use to address key relationships between technology and the business?

II. Foster active involvement and partnership.
   • How is your planning process conducted?
   • Do you use workshop teams and other techniques?
   • What does partnership mean to you?

III. Get top management commitment.
   • Is your CEO or COO involved in the process?
   • Do you have clarity of direction from senior management in terms of mission, vision and values?
   • Are the mission, vision and values of the technology function congruent with the mission, vision and values function of the business?

IV. Organize to get effective technology buy in.
   • What is the relationship between technology function and business function?

V. Hold the business units and R&D accountable for measurable results.
   • What are the measurement systems in your company for results of the business and technology plans?
Discussion questions:

- Do you have clarity of direction from your CEO on the issue of effective integration of technology and business planning?
- Is your CEO involved in the process?
- Do you see value in applying the principles of TQM to the integration process?
- Has your company used TQM in the planning process?
- What have you seen in the video which could help you improve the level of CEO involvement in your organization?
Discussion Questions

- How is technology valued in your company?
- What is the role of your CTO in the business decision making process?
- Is your CTO a member of your Board? Why or why not?
- Does your company have a formal innovation management process? Describe it.
Eastman Chemical Company
Gary McGraw, Vice President, Development

Discussion Questions

- What is your company’s business planning process? Does R&D play an active role in it? Why or why not?

- How is the productivity of R&D measured and how does it impact the performance of your businesses?

- Does your company have a quality management process? How does this impact your planning process?
Discussion Questions:

• Is there a common language between R&D and the business units which describes projects clearly and unambiguously?

• Does your company use portfolio management techniques as part of your R&D planning process?

• Who makes the final decision in your company concerning which R&D programs will be funded? The business unit? A team from R&D and the business unit? The business unit head? Consider the ramifications of each of these alternatives.
General Electric

Marv Garfinkel, Director of Planning for the GE Corporate Research Center

Discussion Questions:

- What does "boundaryless" mean in your company?

- How does your company manage the relationship between R&D and the business unit? Is this interface managed? By an individual or a team?

- How could your company improve the "seamlessness" of its planning process?
John Cassidy  
Vice President, United Technologies Corp.

Discussion Questions

- What are the company's core competencies?
- How is time to market considered in your planning?
- What type of matrix of skills and business need would you use in the company?
- What is the time frame of the company's plan?