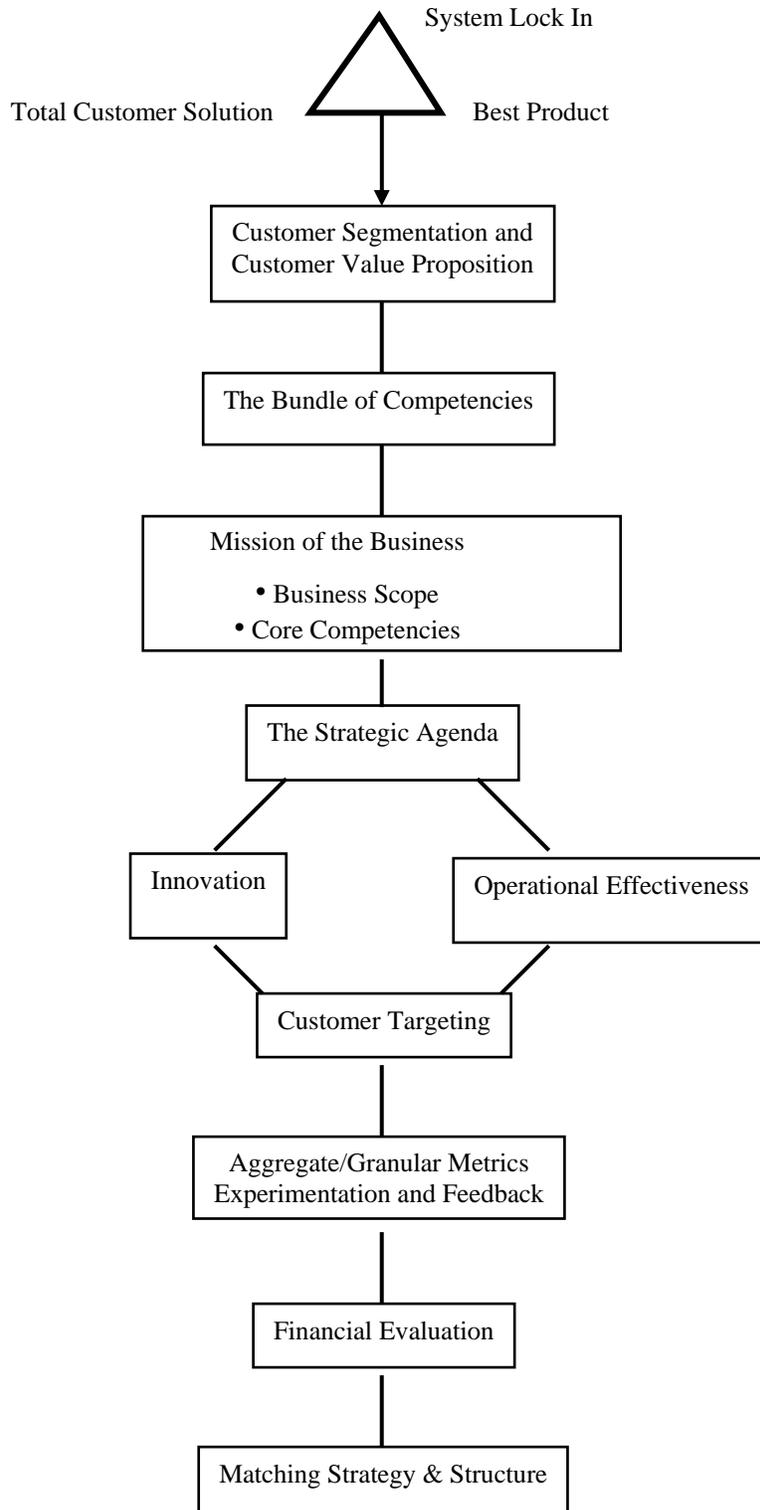
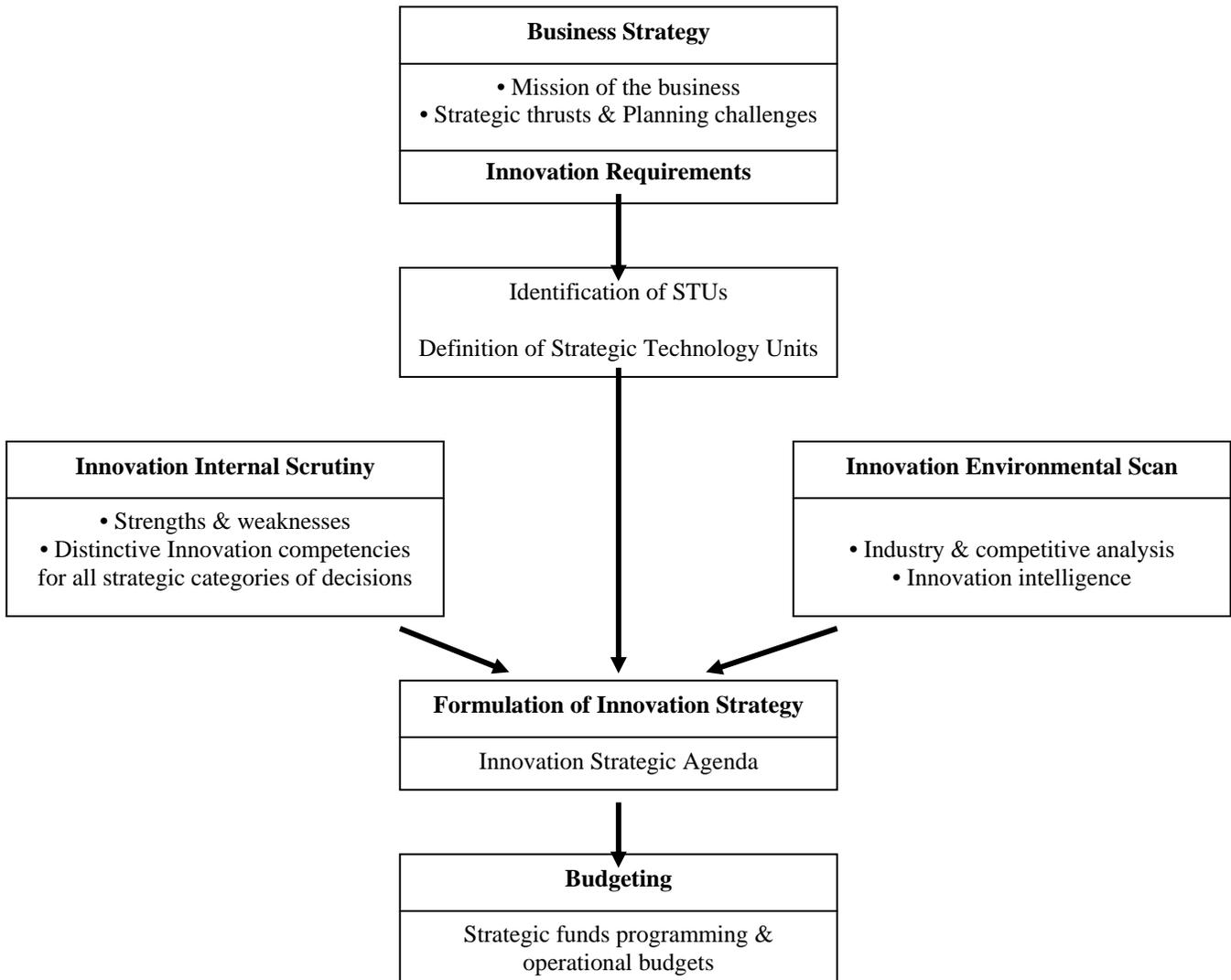


**WORKSHOP**  
**INNOVATION (TECHNOLOGY)**  
**STRATEGY**

# THE DELTA MODEL – AN INTEGRATIVE STRATEGIC FRAMEWORK



# THE FUNDAMENTAL ELEMENTS OF THE DEFINITION OF AN INNOVATION STRATEGY



# **MAJOR CATEGORIES OF STRATEGIC DECISIONS LINKED TO INNOVATION (TECHNOLOGY)**

## **1. INNOVATION INTELLIGENCE**

An effort oriented at gathering information concerning the current and future state of technology development. Some of the tasks associated with it are: identification of strategic technical units (STUs), evaluation of competitive technical strengths by STU, detection of the focus of innovation by key product areas (users, manufacturers, suppliers, others), collection and comparison of expenditures in technology by key competitive firms.

## **2. PRODUCT SCOPE & INTRODUCTION OF NEW PRODUCTS**

Including issues such as: the definition of the breadth of product lines, the rate and mode of new product introductions, and the desirable length of the product life-cycle.

## **3. TECHNOLOGY SELECTION**

It addresses the issue of selecting the technologies in which the firm will specialize, and the ways in which they will be embodied in the firm's products and processes. Some of the issues to be recognized are: selection of the technologies needed for product and process innovation, assuring the congruency of technology development with the business life cycle and with the desired business strategy, and assigning the appropriate priorities to resulting technological efforts.

## **4. TIMING OF NEW TECHNOLOGY INTRODUCTION**

It involves the decision as to whether to lead or to lag behind competitors in process and product innovations. Issues to be addressed are: identifying the benefits and risks associated with a leadership and followership strategy, and assuring the congruency of the selected technology strategy with the generic business strategy.

## **5. MODES OF TECHNOLOGY ACQUISITION**

The extent to which the firm will rely on its own internal efforts in developing internal capabilities, versus resorting to external sources. The options available for the modes of technology acquisition of products and processes are: internal development, acquisition, licensing, internal ventures, joint ventures or alliances, venture capital, and education acquisition.

## **6. HORIZONTAL STRATEGY OF TECHNOLOGY**

It consists of identifying and exploiting technological interrelationships that exist across distinct but related businesses. It is a mechanism by which a diversified firm enhances the competitive advantage of its business units. Sources of technological interrelationships are: common product technologies, common process technologies, common technologies in other value-added activities, one product incorporated into another, and interface among products.

## **7. PROJECT SELECTION, EVALUATION, RESOURCE ALLOCATION, & CONTROL**

The principal concern in this case is the appropriate allocate of resources to support the desired technological strategy. Issues to be addressed are: criteria for resource allocation, project-oriented resources versus loosely controlled funds to support and plan projects, the degree of fluctuation in technology funding, and magnitude in the profit gap to be filled by new products.

## **8. INNOVATION ORGANIZATION & MANAGERIAL INFRASTRUCTURE**

It is oriented toward the definition of the organizational structure of the technology function. It includes the identification of the horizontal coordinating mechanisms needed to exploit the technological interrelationships existing among the various business units and the activities of the value chain. Issues to be considered are: centralization versus decentralization of the technology function, development of career paths for scientists and technical professionals, use of project team, use of lateral mechanisms to facilitate sharing technological resources, design of motivational and reward systems for scientists and technical professionals, degree of involvement of top managers in technological decisions, decision-making process for resource allocation to technological projects, protection of technological know-how, patents policies, and publication

# **MEASURES OF PERFORMANCE RELATED TO INNOVATION (TECHNOLOGY) STRATEGY**

- 1. RATE OF TECHNOLOGICAL INNOVATION**  
This implies selecting one or more measures of technological performance for key products and processes, and tracking their progress through time. The S-curve is a good graphical portrayal of the rate of technological innovation.
- 2. R&D PRODUCTIVITY**  
As any measure of productivity, it can be defined as the ratio of the change in output to the change in input, i.e., the improvement in the performance of the product or process divided by the incremental investment in R&D.
- 3. RATE OF RETURN IN R&D INVESTMENT**  
This, also referred to as R&D yield, measures the profit generated by the amount of R&D investment.
- 4. RESOURCES ALLOCATED TO R&D**  
This measurement monitors the level of expenditures being allocated to the various projects and businesses and at the level of the firm as a whole.
- 5. RATE OF NEW PRODUCT INTRODUCTION**  
This can be measured by the number of new products introduced per year, the number of patents obtained, or the percentage of sales derived from new products.
- 6. TECHNOLOGY-BASED DIVERSIFICATION**  
Whenever the technology strategy is at least partly oriented toward a diversification objective, it is important to measure the degree of success in achieving this goal via, for example, the percentage of sales resulting from related or unrelated diversification efforts.

**7. OTHER APPROPRIATE MEASUREMENTS**

**Depending on the nature of the firm other measurements can be used, such as: royalties or sales of technology, training time of people on new technology, cycle time of product development, developmental cost per stage, and level of technological competence.**

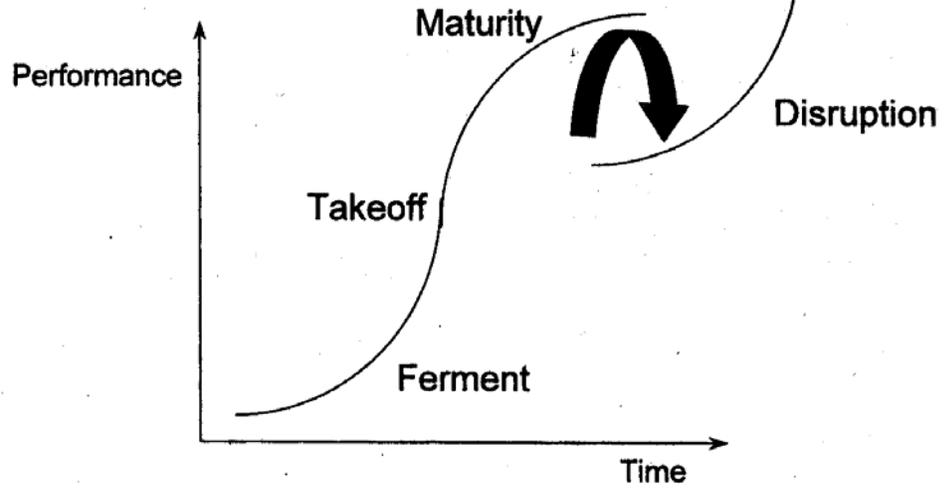
# THE SOURCES OF INNOVATION

The functional source of innovation differs significantly between innovation categories.

## SUMMARY OF FUNCTIONAL SOURCE OF INNOVATION DATA

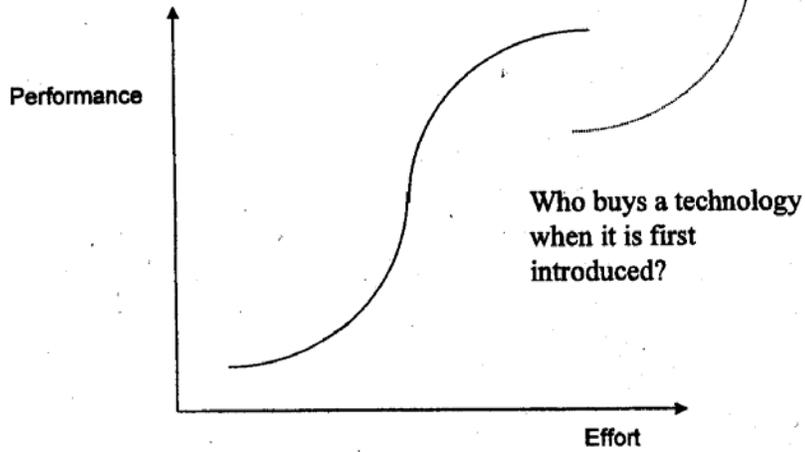
<u>Innovations Sampled</u>	<u>User</u>	<u>Innovations Developed by</u>				<u>Total</u>
		<u>Manuf</u>	<u>Supp</u>	<u>Other</u>	<u>NA</u>	
Scientific Instruments	77%	23%	-	-	17	111
Semicon PC Crd Proc	67%	21%	-	12%	6	49
Pultrusion Process	90%	10%	-	-	-	10
Tractor Shovel Related	6%	94%	-	-	-	11
Engineering Plastics	10%	90%	-	-	-	5
Plastic Additives	8%	92%	-	-	4	16
Industrial Gas-Using	42%	17%	33%	8%	-	12
Thermoplastic-Using	43%	14%	36%	7%	-	14
Wire Stripping Equip	25%	13%	83%	-	-	12

## The Industry life cycle as an S-curve

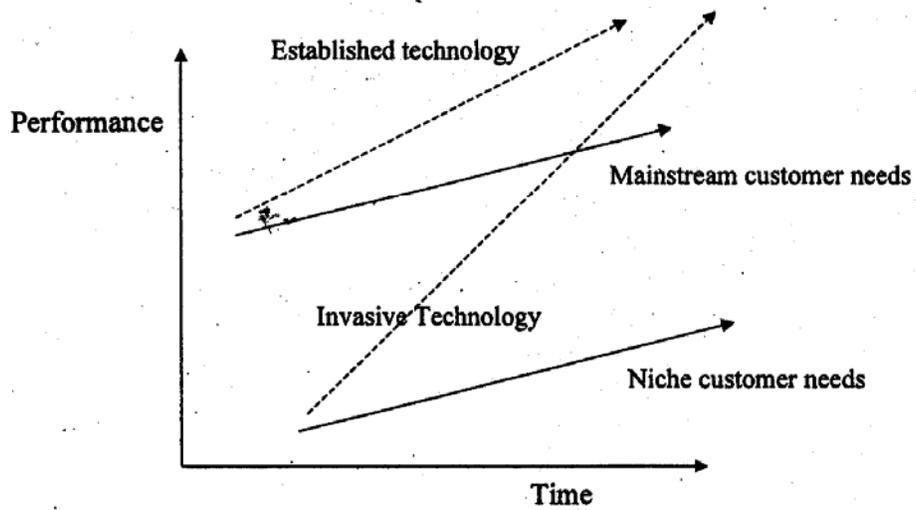


**The "Innovator's Dilemma": *Do existing customers understand discontinuities?***

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## Mapping the S-curve to customer needs: Christensen's Insight



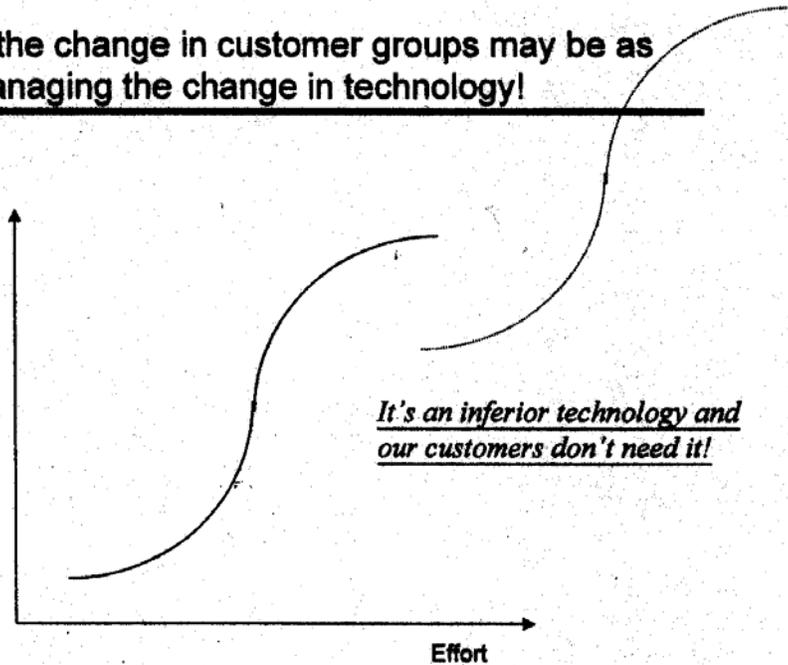
- **The pace of technological progress exceeds the pace that the customer can absorb.**
- **The dynamics of overshooting allows a new company to catch up with the customer requirements over time.**
- **The invasive technology invariably brings lower profitability to the established business.**
- **Disruption innovation has been ignored or opposed by leading institutions for rational reasons.**

**The PC was a disruption technology for DEC. It is not that DEC engineers could not design a PC. It is that the business model required sales and service efforts for the mini-computer quite different from the PC.**

Managing the change in customer groups may be as hard as managing the change in technology!

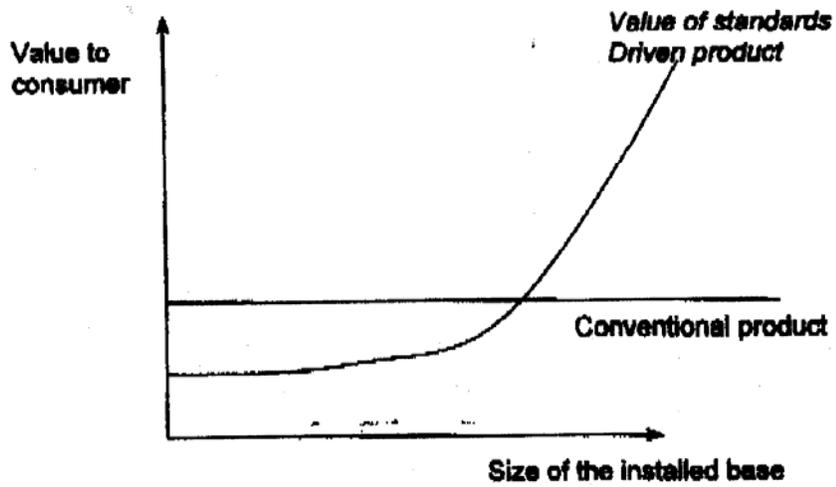
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Performance

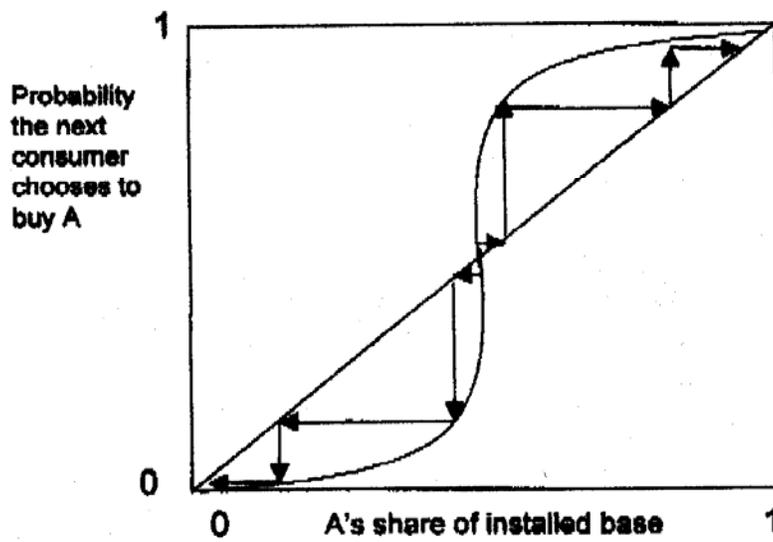


Effort

## With Strong Network Effects Market Share Creates Value



## Strong network effects create lock in



## **How are standards established?**

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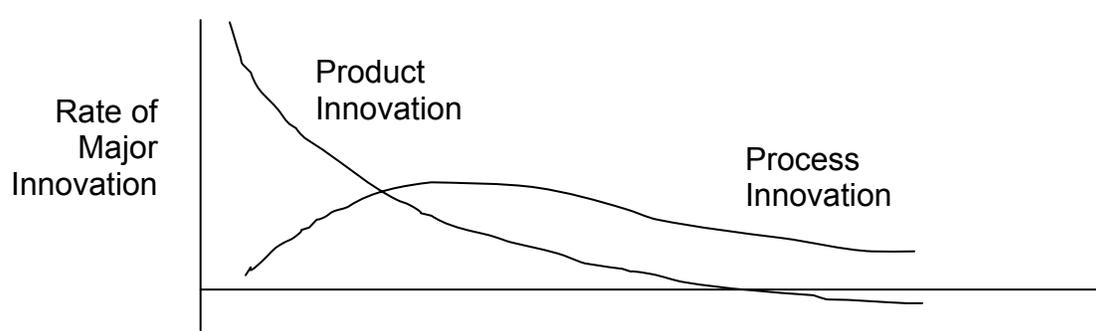
- ◆ Standards "win" when a critical mass of consumers have adopted them
- ◆ OR:
- ◆ *When a critical mass of key players believe that the standard will be adopted.*

## **Or by:**

---

- ◆ The sheer power of the concept, design or delivery of the product
- ◆ Coming to market ahead of competition
- ◆ Building expectations
- ◆ Very aggressive pricing: "giving the product away"
- ◆ Developing, or encouraging the development of, Collateral products and services

# THE RELATIONSHIP OF PRODUCT INNOVATION AND PRODUCTION PROCESS CHARACTERISTICS



## Fluid Pattern

**Product Innovation**

- Emphasis on maximizing product performance
- Stimulated by information on user needs
- Novelty or radicalness high
- Frequency of product innovation is rapid
- Predominant type is product rather than process

**Production Process**

- Flexible and inefficient
- Small size or scale
- General purpose equipment used
- Available materials used as inputs
- Product is frequently changed or custom designed

## Transitional Pattern

**Product Innovation**

- Emphasis on product variation
- Increasingly stimulated by opportunities created through an expanding technical capability
- Predominant type is process required by rising volume
- Demands placed on suppliers for specialized components, materials, and equipment

**Production Process**

- Some sub-processes are automated creating "islands of automation"
- Production tasks and control become more specialized
- Process changes tend to be major and discontinuous involving new methods of organization and changed product design
- At least one product design is stable enough to have significant production volume

## Specific Pattern

**Product Innovation**

- Emphasizes cost reduction
- Predominant mode is incremental for product and process
- Effect is cumulative
- Novel or radical innovations occur infrequently and originate outside productive unit
- Stimulation arises from disruptive external forces

**Production Process**

- Efficient, system-like, capital-intensive
- Cost of change is high
- Scale and facility market share is large
- Special purpose process equipment used
- Specialized input materials or extensive vertical integration
- Products are commodity-likely and largely undifferentiated

# TECHNOLOGY AND THE BUSINESS LIFE CYCLE

	CONCEPT DEVELOPMENT		LAB FEASIBILITY		PILOT PLANT FEASIBILITY		FINAL PRODUCTION	
	EARLIER STAGES	FINAL STAGES	EARLIER STAGES	FINAL STAGES	EARLIER STAGES	FINAL STAGES	GROWTH & MATURITY STAGES	AGING
R&D and ENGINEERING	<ul style="list-style-type: none"> <li>Assess initial technical Feasibility</li> <li>Strong interaction with marketing</li> </ul>	Demonstrate design feasibility	Design product to meet objectives	<ul style="list-style-type: none"> <li>Prove design, build prototypes</li> <li>Strong interaction with manufacturing</li> </ul>	<ul style="list-style-type: none"> <li>Transfer team to manufacturing</li> <li>Adjust design to meet manufacturing requirements</li> </ul>	Adjust design to meet marketing and manufacturing requirements	Adjust design as required	Adjust design as required
MARKETING	<ul style="list-style-type: none"> <li>Define product concept</li> <li>Investigate market potential</li> </ul>	Update marketing information	<ul style="list-style-type: none"> <li>Refine product concept</li> <li>Assess market &amp; estimate price</li> <li>Develop service strategy</li> </ul>	<ul style="list-style-type: none"> <li>Prepare all material for product introduction</li> <li>Train people</li> </ul>	<ul style="list-style-type: none"> <li>Test product in market area</li> <li>Define pricing, advertising, packaging</li> </ul>	Final definition of marketing strategy	Marketing follow up	Adjust marketing as required
MANUFACTURING	Check general consistency of product concept with manufacturing strategy	Collect manufacturing information	Update manufacturing information	Develop and run manufacturing process at the lab level	Develop pilot plant	<ul style="list-style-type: none"> <li>Optimize manufacturing process</li> <li>Cost vs. quality trade-offs</li> </ul>	<ul style="list-style-type: none"> <li>Build manufacturing facilities</li> <li>Check quality &amp; productivity</li> <li>Manage operations</li> </ul>	Adjust operations as required
FINANCE		Minor commitment of resources	<ul style="list-style-type: none"> <li>Prefeasibility study</li> <li>Some commitment of resources</li> </ul>	Economic and financial feasibility	<ul style="list-style-type: none"> <li>Analysis of pilot run data</li> <li>More important commitment of resources</li> </ul>	<ul style="list-style-type: none"> <li>Detailed study of project</li> <li>In-depth economic &amp; financial analysis</li> </ul>	<ul style="list-style-type: none"> <li>Major commitment of resources</li> <li>Manage for growth, profitability &amp; cash generation</li> </ul>	<ul style="list-style-type: none"> <li>Position for harvest or divestment</li> <li>Review project profitability</li> </ul>

MANAGERIAL DECISIONS

SHOULD DEVELOPMENT PROCEED?

IS PRODUCT FEASIBLE?

ARE PRODUCT SPECIFICATIONS COMPLETE?

CAN PRODUCT BE MANUFACTURED?

ARE MANUFACTURING SPECIFICATIONS COMPLETE?

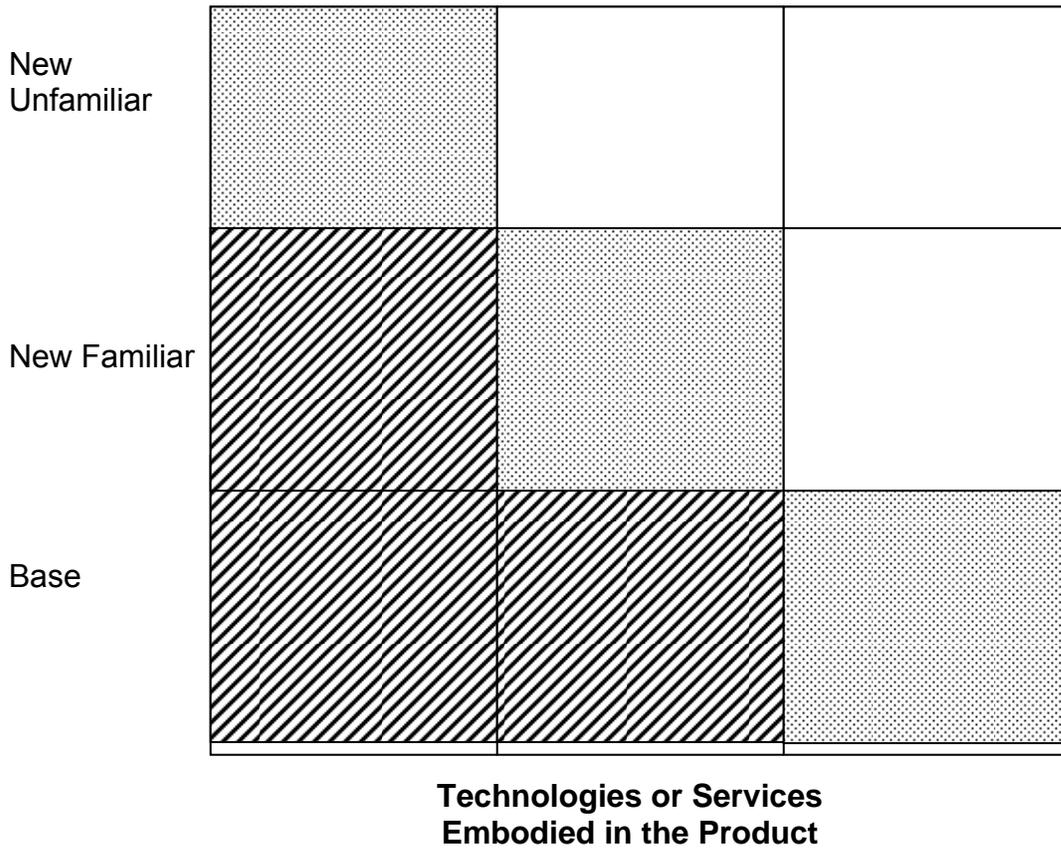
ARE COST & QUALITY GOALS BEING MET WITH REGARD TO THE MARKET?  
SHOULD THE INVESTMENT BE MADE?

IS PRODUCT BECOMING OBSOLETE?

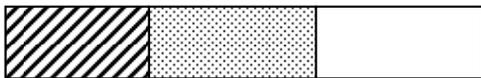


# THE FAMILIARITY MATRIX

## Market Factors



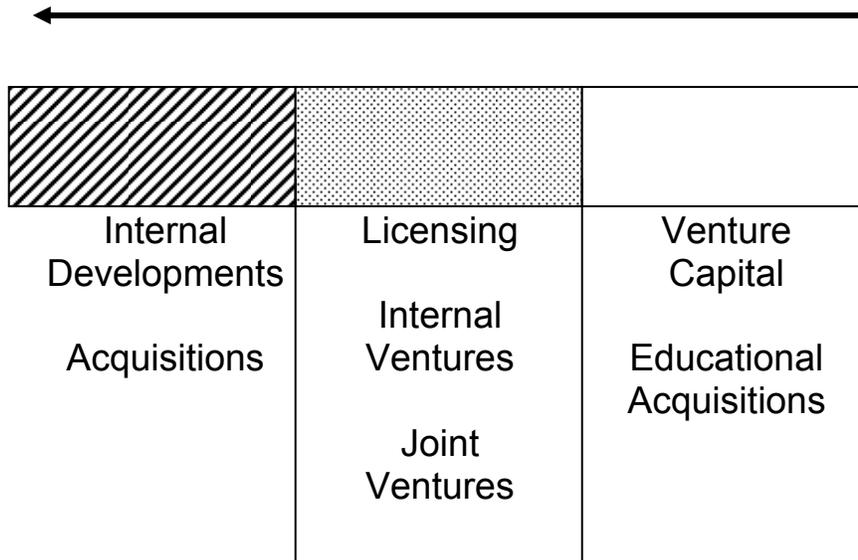
## Key



← Increasing Corporate Familiarity

# SPECTRUM OF ENTRY STRATEGIES

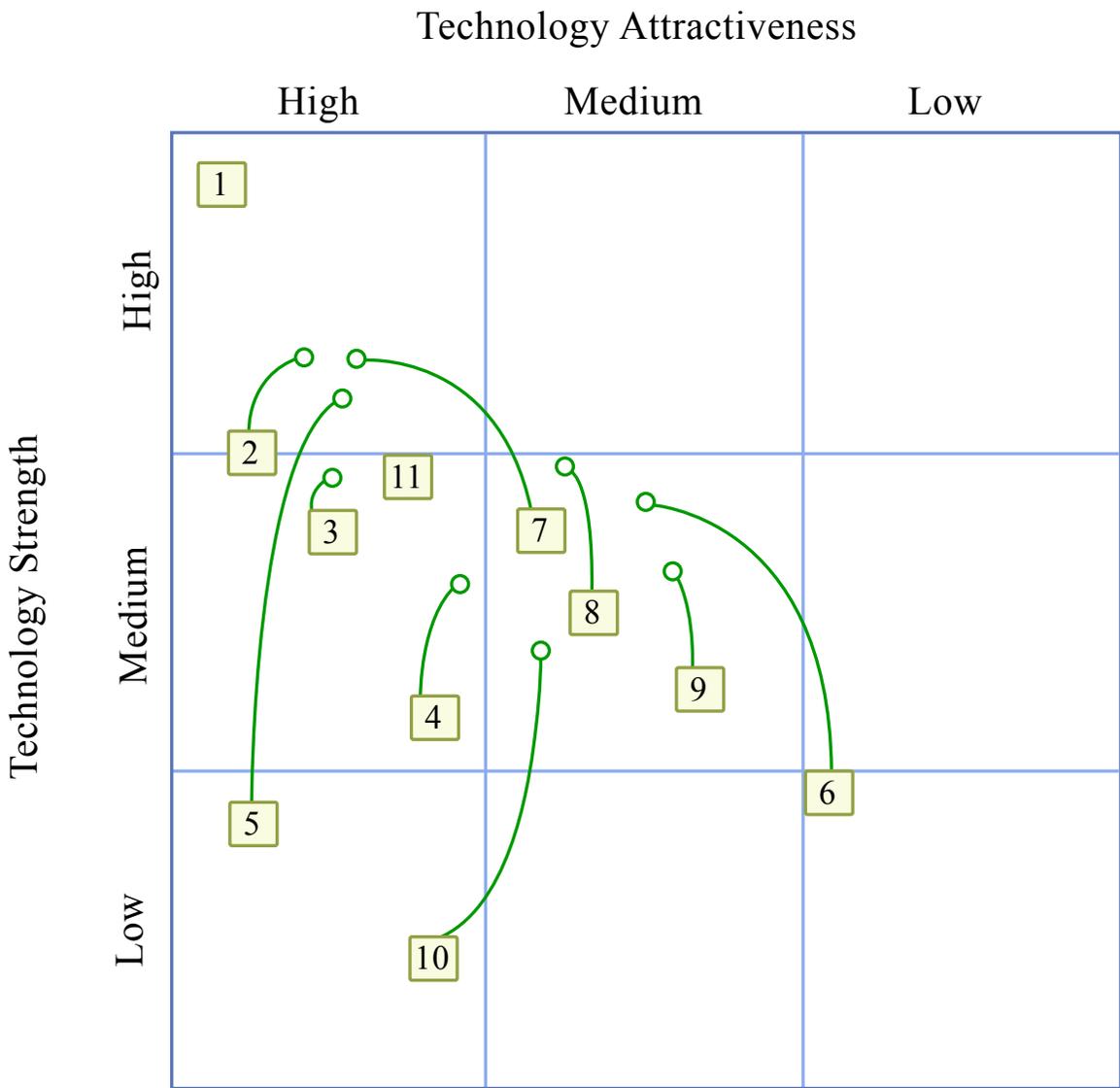
Increasing Corporate Involvement Request



## **A KEY FOCUS OF ANALYSIS FOR TECHNOLOGY STRATEGY IS THE STRATEGIC TECHNOLOGY UNIT (STU)**

**An STU includes the skills or disciplines that are applied to a particular product, service, or process addressing a specific market need. Identifying all the relevant STUs of the firm is a critical task in the development of technology strategies. It produces the full portfolio of the key technologies the firm needs to embody in its products and processes in order to achieve competitive advantage. This leads to a critical question: which technologies do we possess, and which ones should we acquire in order to protect and enhance our competitive capabilities? Defining all of the relevant technologies is the core of the STU segmentation. Next, we have to analyze the strengths of the resulting technology portfolio.**

# TECHNOLOGY PORTFOLIO MATRIX



**STU Representation**

- |  |                                      |
|--|--------------------------------------|
| 1. Systems architecture                | 2. Chip design & engineering         |
| 3. Board & system design & engineering | 4. Support software                  |
| 5. Application software                | 6. Management of information systems |
| 7. Process technologies                | 8. Testing technologies              |
| 9. Demonstration technologies          | 10. Peripherals                      |
| 11. Service                            |                                      |

Figure by MIT OCW.

**INNOVATION (TECHNOLOGY) REQUIREMENTS FROM THE BUSINESS STRATEGIC THRUSTS**

<b>Strategic Thrust</b>	<b>Innovation (Technology) Requirements</b>

## **IDENTIFICATION OF ALL RELEVANT STUs TO SUPPORT COMPETITIVE ADVANTAGE**

- 1. System architecture: Technologies related to the definition of the basic architecture of the computer.**
- 2. Chip design and engineering: Technologies related to chip design and manufacturing. It includes alternative technologies to the one used right now.**
- 3. Board and system design and engineering: Board and system design and manufacturing.**
- 4. Support software: Includes microcodes, compilers, and basic libraries.**
- 5. Application software: Technologies to support companies that develop software to run in Masscalc machines.**
- 6. Management of Information Systems: Information system to support all activities of the company, including marketing, sales, and service.**
- 7. Process technologies: Procurement and control of suppliers' production processes as well as in-house assembly.**

8. **Testing technology**: Technologies used to test subassemblies and the whole system.
9. **Demonstration technologies**: Includes video and communications vehicles to help in preparing and delivering shows, demonstrations, etc.
10. **Peripherals**: Technologies required to design or subcontract the design of high-speed peripherals for visualization and image processing.
11. **Service**: Technologies and method-ologies for delivering service to the computer industry (e.g., remote diagnosis, education of technicians, etc.).

## TECHNOLOGY ATTRACTIVENESS

<b>Factors contributing to Technology Attractiveness</b>	<b>Very Weak</b>	<b>Weak</b>	<b>Even</b>	<b>Strong</b>	<b>Very Strong</b>
Potential for enhancing competitive advantage in: <ul style="list-style-type: none"> <li>• Product application</li> <li>• Process application</li> </ul>					
Impact on value-added chain <ul style="list-style-type: none"> <li>• Cost</li> <li>• Performance</li> <li>• Quality</li> <li>• Differentiation</li> </ul>					
Proprietary positions available					
Rate of technological change					
Impact on entry barriers					
Impact of alternative technologies <ul style="list-style-type: none"> <li>• Maturity and volatility</li> <li>• Complexity</li> </ul>					

## TECHNOLOGY STRENGTHS

<b>Factors contributing to Technology Strengths</b>	<b>Very Weak</b>	<b>Weak</b>	<b>Even</b>	<b>Strong</b>	<b>Very Strong</b>
Rate of technological innovation					
Technology productivity					
Rate of return in technology investment					
Resources allocated to technology					
Impact on rate of new product introduction					
Impact on process capabilities					
Impact on technology-based diversification <ul style="list-style-type: none"> <li>• Royalties or sales of technology</li> <li>• Training time of people on new technology</li> </ul>					
Level of technological competence					
Human resources					
Patent positioning					

# TECHNOLOGY PORTFOLIO MATRIX

		Technology Attractiveness		
		High	Medium	Low
Technology Strength	High			
	Medium			
	Low			



# COMPETITIVE STANDING. STRATEGIC PERFORMANCE MEASUREMENT OF INNOVATION (TECHNOLOGY)

Relevant Competitor \_\_\_\_\_

Indicators	Very Weak	Weak	Even	Strong	Very Strong
<ol style="list-style-type: none"> <li>1. Rate of technological innovation</li> <li>2. Technology productivity</li> <li>3. Rate of return in technology investment</li> <li>4. Resources allocated</li> <li>5. Impact of rate of new product introduction</li> <li>6. Impact on process capabilities</li> <li>7. Impact on technology-based diversification               <ul style="list-style-type: none"> <li>• Royalties or sales of technology</li> <li>• Training time of people on new technology</li> </ul> </li> <li>8. Level of technological competence</li> <li>9. Human resources</li> <li>10. Patent positioning</li> </ol>					

# INNOVATION (TECHNOLOGY) ENVIRONMENTAL SCAN – IDENTIFICATION OF OPPORTUNITIES AND THREATS

Critical External Factors	Impact	
	Positive (Opportunities)	Negative (Threats)
<ul style="list-style-type: none"><li>• Market Factors</li></ul>		

# INNOVATION (TECHNOLOGY) ENVIRONMENTAL SCAN – IDENTIFICATION OF OPPORTUNITIES AND THREATS

Critical External Factors	Impact	
	Positive (Opportunities)	Negative (Threats)
<ul style="list-style-type: none"><li>• Competitive Factors</li></ul>		

# INNOVATION (TECHNOLOGY) ENVIRONMENTAL SCAN – IDENTIFICATION OF OPPORTUNITIES AND THREATS

Critical External Factors	Impact	
	Positive (Opportunities)	Negative (Threats)
<ul style="list-style-type: none"><li>• Economic Factors</li></ul>		

# INNOVATION (TECHNOLOGY) ENVIRONMENTAL SCAN – IDENTIFICATION OF OPPORTUNITIES AND THREATS

Critical External Factors	Impact	
	Positive (Opportunities)	Negative (Threats)
<ul style="list-style-type: none"><li>• Government &amp; Political Factors</li></ul>		

# INNOVATION (TECHNOLOGY) ENVIRONMENTAL SCAN – IDENTIFICATION OF OPPORTUNITIES AND THREATS

Critical External Factors	Impact	
	Positive (Opportunities)	Negative (Threats)
<ul style="list-style-type: none"><li>• Regulatory Factors</li></ul>		

# INNOVATION (TECHNOLOGY) ENVIRONMENTAL SCAN – IDENTIFICATION OF OPPORTUNITIES AND THREATS

Critical External Factors	Impact	
	Positive (Opportunities)	Negative (Threats)
<ul style="list-style-type: none"><li>• Technological Factors</li></ul>		

# INNOVATION (TECHNOLOGY) ENVIRONMENTAL SCAN – IDENTIFICATION OF OPPORTUNITIES AND THREATS

Critical External Factors	Impact	
	Positive (Opportunities)	Negative (Threats)
<ul style="list-style-type: none"><li>• Human Resources &amp; Labor Factors</li></ul>		

# INNOVATION (TECHNOLOGY) ENVIRONMENTAL SCAN – IDENTIFICATION OF OPPORTUNITIES AND THREATS

Critical External Factors	Impact	
	Positive (Opportunities)	Negative (Threats)
<ul style="list-style-type: none"><li>• Environmental Factors</li></ul>		

## CHARACTERIZE YOUR PRESENT INNOVATION (TECHNOLOGY) POLICIES REGARDING THE MAJOR DECISION MAKING CATEGORIES

Decision Category	Description of Policy	Strengths	Weaknesses
1. Technology Intelligence			

**Note:** In the assessment of strengths and weaknesses try to have relevant competitors in mind and use proper strategic performance measurement.

**CHARACTERIZE YOUR PRESENT INNOVATION (TECHNOLOGY) POLICIES  
REGARDING THE MAJOR DECISION MAKING CATEGORIES**

<b>Decision Category</b>	<b>Description of Policy</b>	<b>Strengths</b>	<b>Weaknesses</b>
2. Technology Selection			

**CHARACTERIZE YOUR PRESENT INNOVATION (TECHNOLOGY) POLICIES  
REGARDING THE MAJOR DECISION MAKING CATEGORIES**

<b>Decision Category</b>	<b>Description of Policy</b>	<b>Strengths</b>	<b>Weaknesses</b>
3. Timing of New Technology Introduction			

**CHARACTERIZE YOUR PRESENT INNOVATION (TECHNOLOGY) POLICIES  
REGARDING THE MAJOR DECISION MAKING CATEGORIES**

<b>Decision Category</b>	<b>Description of Policy</b>	<b>Strengths</b>	<b>Weaknesses</b>
4. Modes of Technology Acquisition			

**CHARACTERIZE YOUR PRESENT INNOVATION (TECHNOLOGY) POLICIES  
REGARDING THE MAJOR DECISION MAKING CATEGORIES**

<b>Decision Category</b>	<b>Description of Policy</b>	<b>Strengths</b>	<b>Weaknesses</b>
5. Horizontal Strategy of Technology			

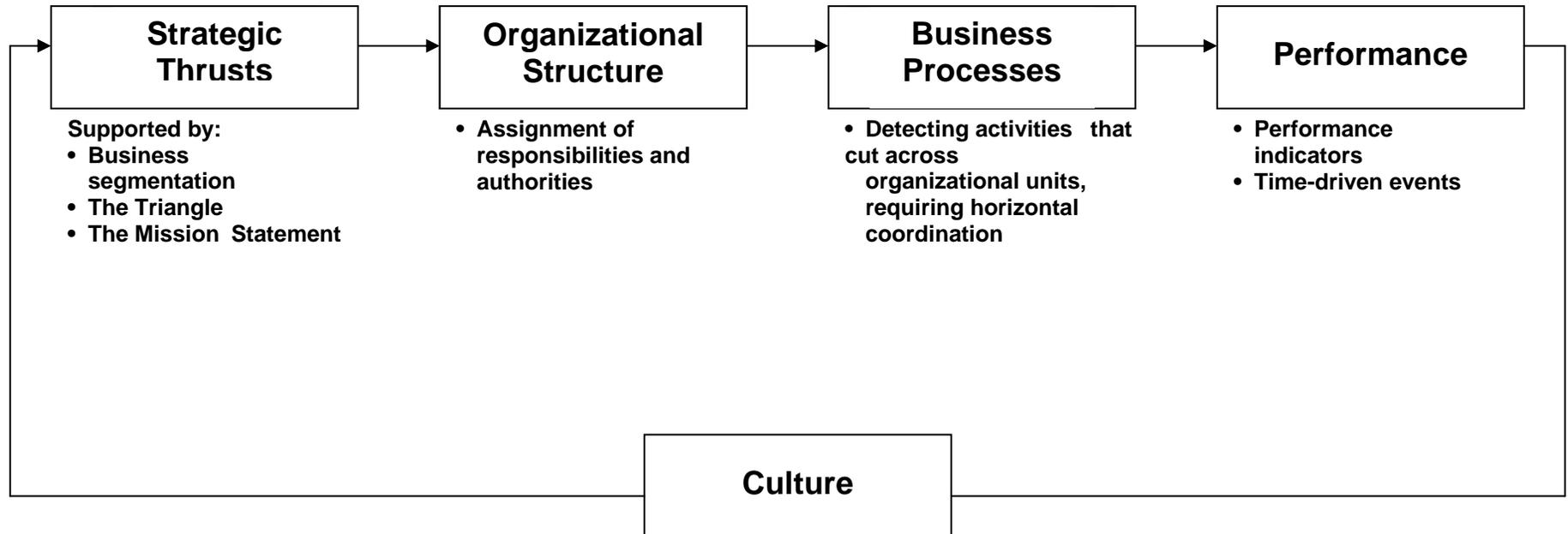
**CHARACTERIZE YOUR PRESENT INNOVATION (TECHNOLOGY) POLICIES  
REGARDING THE MAJOR DECISION MAKING CATEGORIES**

<b>Decision Category</b>	<b>Description of Policy</b>	<b>Strengths</b>	<b>Weaknesses</b>
6. Project Selection, Evaluation, Resource Allocation, & Control			

**CHARACTERIZE YOUR PRESENT INNOVATION (TECHNOLOGY) POLICIES  
REGARDING THE MAJOR DECISION MAKING CATEGORIES**

<b>Decision Category</b>	<b>Description of Policy</b>	<b>Strengths</b>	<b>Weaknesses</b>
7. Technology Organizational & Managerial Infrastructure			

# THE COMPONENTS OF THE STRATEGIC AGENDA







## DEFINITION OF STRATEGIC THRUSTS

Name \_\_\_\_\_

**Description**

--

**Responsible Manager**

--

**Other Key Participants**

--

**Other Important Contributors**

--

**Key Indicators for Management Control and Targets**

--

**First Major Milestone Description**

--

**First Major Milestone Date**

--

**Resources Required**

--

**Statement of Benefits**

--

## **TESTS TO EVALUATE THE QUALITY OF THE STRATEGIC AGENDA**

### **1. Comprehensiveness**

--

### **2. Stretch**

--

### **3. Monitoring and Control- Ease of Implementation**

--

### **4. Motivation- Quality of Working Environment**

--

### **5. Vulnerability**

--

# **DMK Innovation Strategy**

**Figure 1: Innovation (Technology) Requirements from Thrusts**

	Strategic Thrust	Technology Requirements
1	Invest in people, train and motivate. Hire outstanding talent. Develop strong technical design capabilities.	Need central system to track skills by associate and request specific skills for projects. Need web based self training and class-room type group training technology. Require knowledge management intranet. Need design tools like Rational Rose, etc. for system design.
2	Expand nationally leveraging government programs to develop global delivery centers throughout China.	Require global resource management (request, allocation, and projection) software. Require global time and expense entry/tracking and billing software Require global client/project profitability tracking software
3	Work with exclusive channel partners to develop horizontal frameworks (portals, content/doc management) and industry specific solution sets (energy, publishing, financial services) for rapid development.	Need rapid prototyping tools (VB, frontpage, rational rose, etc.) Rapid development frameworks for .NET and J2EE based architectures Horizontal application frameworks for CMS and Portals Vertical solution sets for Energy and Financial Services industry
4	Dominate IBM mainframe outsourcing market in Japan through aggressive sales and marketing programs.	Need VPN and T1 links for tier-1 clients Require CRM system for contact management, lead tracking, sales forecasting, account planning, etc.
5	Strengthen strategic relationships (e.g. IBM, GE, Kawasaki, Unisys) through deep customer understanding/integration and continuous improvement.	Need client extranet infrastructure for security and ease of integration Need on-demand collaboration software such as instant messaging, conference bridge, MS LiveMeeting, etc. Need shared source code control deployable globally

### Innovation (Technology) Requirements from Thrusts (continued)

	Strategic Thrust	Technology Requirements
6	Develop strong direct-marketing program to target the intermediary service provider channel in the US.	Develop marketing oriented website and secure high placement in leading search engines Develop direct marketing engine for campaign mgmt with closed loop tracking for analysis
7	Actively pursue US based Consulting/high-end IT Service firms to become their exclusive provider of design, development, & maintenance services	Develop centralized demo infrastructure and vertical solutions to help sales Develop direct marketing engine for campaign mgmt with closed loop tracking for analysis Deploy CRM system for contact management, lead tracking, sales forecasting, account planning, etc.
8	Develop an engagement program with processes to ensure long-term, successful integration of offshore DMK team with local service firm.	Build VPN and T1 links to tier-1 clients Need client extranet infrastructure for security and ease of integration Need on-demand collaboration software such as instant messaging, conference bridge, MS LiveMeeting, etc. Develop knowledge transfer/client training infrastructure deployable globally
9	Expand to UK and test EU (Germany, France, Italy) using an intermediary partnership network similar to US-strategy.	Develop support for German and other European language characters as required Extend architecture/solution sets to support multi-language deployments Develop localized demos within centralized infrastructure to help sales
10	Enter and test the Latin American market (Brazil, Mexico, Chile) also through an intermediary partnership network.	Develop support of Portuguese and Spanish language characters in frameworks (unicode) Develop localized demos within centralized infrastructure to help sales

**Figure 2: Technology Attractiveness**

	Highly Unatt.	Mildly Unatt.	Neutral	Mildly Att.	Highly Att.
Potential for Enhancing competitive advantage in: <ul style="list-style-type: none"> <li>■ Product application</li> <li>■ Process application</li> </ul>					• • •
Impact on value-added chain <ul style="list-style-type: none"> <li>■ Cost</li> <li>■ Performance</li> <li>■ Quality</li> <li>■ Differentiation</li> </ul>				• • • •	•
Proprietary positions available				•	
Rate of technological change				•	
Impact on entry barriers			•		
Impact on alternative technologies <ul style="list-style-type: none"> <li>■ Maturity and volatility</li> <li>■ complexity</li> </ul>			• • •		

**Figure 3: Identification of STU's for Competitive Advantage**

#	Strategic Technical Unit	Description
1	Proprietary ERP for strategic management	Technology required to track skills, global resource management, time & expense tracking, client/project profitability
2	Integrated (transparent) Development tools	Combination of high-speed T1, VPN, tools for integrated source code and iteration management to create greater transparency between development team and client teams
3	Collaborative technologies	An integrated suite of technologies including audio & video conferencing, MS LiveMeeting, Instant Messaging, etc. to facilitate demos, distance learning, knowledge transfer, etc.
4	Rapid prototyping and Design tools	Tools to facilitate the development of horizontal application frameworks and vertical solution sets with strategic complementors (i.e. complementary service providers)
5	Customer Relationship Management system	Centralized system to facilitate contact management, lead generation, campaign tracking and analysis, sales forecasting, account management, etc.
6	Application servers	Frameworks for key server technologies such as J2EE (Websphere, Weblogic, Domino), MS .NET for rapid code development
7	Portals	Portal solution platforms including Plumtree, Epicentric, MS Sharepoint for integrated user interface design and deployment
8	Enterprise Application Integration	Technologies such as TIBCO and WebMethods to facilitate workflow integration, composite application management, business activity monitoring and business process management
9	IBM Mainframes	Continue this area of technology strength to outsource critical legacy business systems
10	Oracle ERP	Acquire deep technical expertise in Oracle ERP to dominate this niche market
11	Data Warehousing	ETL tools to extract, translate and load data; star schema design tools; analysis tools such as Business Objects, Cognos for business intelligence

**Figure 4: Technology Portfolio Matrix**

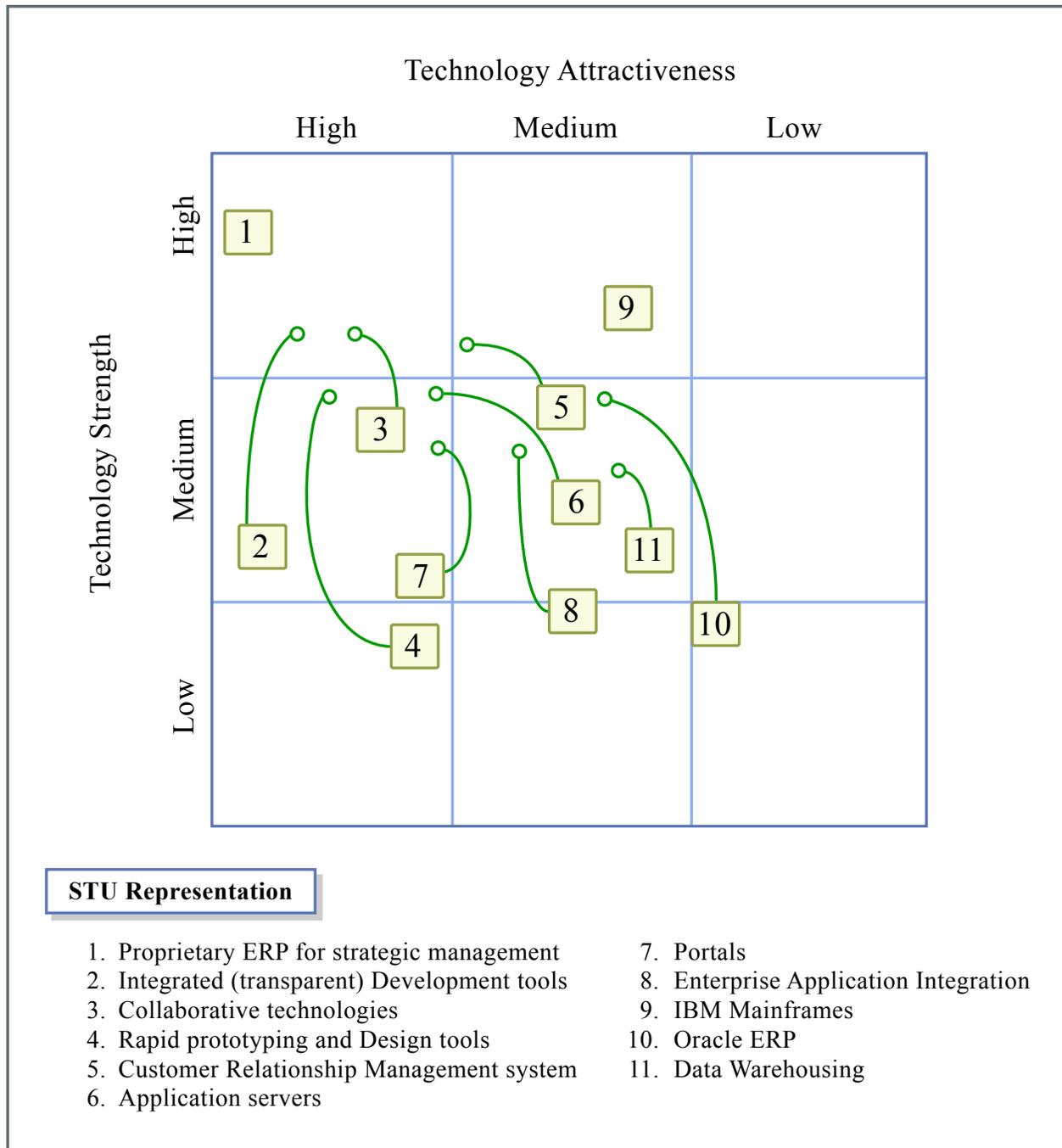


Figure by MIT OCW.

**Figure 5: STU Options**

<b>STU</b>	<b>Lead</b>	<b>Compete</b>	<b>Sustain</b>	<b>Harvest</b>	<b>Purchase</b>	<b>Abandon</b>
Proprietary ERP for strategic management	●					
Integrated (transparent) Development tools	●					
Collaborative technologies					●	
Rapid prototyping and Design tools		●				
Customer Relationship Management system					●	
Application servers			●			
Portals		●				
Enterprise Application Integration		●				
IBM Mainframes				●		
Oracle ERP	●					
Data Warehousing			●			

**Figure 6: Competitive Standing - Strategic Performance Measurement of Innovation (Technology)**

Relevant Competitor: Tata Consultancy Service (TCS), based in India

Indicators	Very Weak	Weak	Even	Strong	Very Strong
Rate of technological innovation	●				
Technology productivity			●		
Rate of return in technology investment		●			
Resources allocated			●		
Impact of rate of new product introduction				●	
Impact on process capabilities				●	
Impact on technology-based diversification <ul style="list-style-type: none"> <li>■ Royalties or sales of technology</li> <li>■ Training time of people on new technology</li> </ul>			● ● ●		
Level of technological competence		●			
Human resources				●	
Patent positioning			●		

**Figure 7: Innovation (Technology) Environment Scan - Identification of Opportunities and Threats**

Critical external factors	Impact	
	Positive (Opportunities)	Negative (Threats)
<p>■ <b>Market Factors</b></p> <p>Mature market and domination by key technology leaders</p> <p>In Japan, high demand to maintain or improve mainframes and related systems under pressure of cost reduction</p> <p>In US, Indian offshore outsourcing firms have already been bonding with large sized clients.</p> <p>In Japan and US, mid-sized corporations have huge potential demand of offshore outsourcing.</p>	<ul style="list-style-type: none"> <li>■ Low risk in investing in leading technology</li> <li>■ Low risk of investing in mainframe related technology and skills</li> <li>■ Nil</li> <li>■ New markets with little or no competition</li> </ul>	<ul style="list-style-type: none"> <li>■ More competition because competitors also go for the same technology</li> <li>■ Competition and increasing demand for both efficiency and quality in supply chain</li> <li>■ Limited chance of acquiring customer technology domain knowledge</li> <li>■ Lack best practices</li> </ul>

**Innovation (Technology) Environment Scan - Identification of Opportunities and Threats (continued)**

<b>Critical external factors</b>	<b>Impact</b>	
	<b>Positive (Opportunities)</b>	<b>Negative (Threats)</b>
<p>■ <b>Economics Factors</b>                      World economy is improving as indicated by key indices such as Dow Jones, NASDAQ, and other world market and analysis data.</p> <p>China becoming WTO and consistent GDP growth of 8%</p>	<ul style="list-style-type: none"> <li>■ Capital spending is expected to rise in developed countries, leading to increase demand on wide range of leading technology.</li> <li>■ Stable economic growth leading to stable supply and support of technology and technical personnel</li> </ul>	<ul style="list-style-type: none"> <li>■ High cost if invested in wrong technology</li> <li>■ Cost of acquiring technology may rise fast</li> </ul>

**Innovation (Technology) Environment Scan - Identification of Opportunities and Threats (continued)**

Critical external factors	Impact	
	Positive (Opportunities)	Negative (Threats)
<p>■ <b>Government &amp; Political Factors</b></p> <p>Relief in import of technology equipment in India and China</p> <p>Promotion of partnering with foreign corporations</p> <p>Further support on country infrastructure</p>	<ul style="list-style-type: none"> <li>■ Required technology is more readily available and cost is expected to be lower</li> <li>■ Offshore development centers are likely to be built</li> <li>■ Faster implementation and lower cost</li> </ul>	<ul style="list-style-type: none"> <li>■ Nil</li> <li>■ Nil</li> <li>■ Nil</li> </ul>

**Innovation (Technology) Environment Scan - Identification of Opportunities and Threats (continued)**

Critical external factors	Impact	
	Positive (Opportunities)	Negative (Threats)
<p>■ <b>Regulatory Factors</b> China's recent new regulation on liberation of human capital inter-city mobility</p>	<p>■ Technologically skilled people are well spread within China which helps make increase overall national technology skills, and in business domain knowledge</p>	<p>■ Concentration of labor force in higher income cities such as Beijing and Shanghai will drive labor cost up quickly</p>

Critical external factors	Impact	
	Positive (Opportunities)	Negative (Threats)
<p>■ <b>Technological Factors</b> IT trends keep changing</p> <p>Technological enhancement is becoming key to success due to competition</p>	<p>■ Easier to differentiated from competitors</p> <p>■ New revenue opportunities as new requirements evolve</p> <p>■ Create differentiation with speed in high technology and service</p>	<p>■ Wrong or obsolete solutions for own infrastructure or for customers</p> <p>■ High capability in marketing and strategic resource allocation</p>

**Innovation (Technology) Environment Scan - Identification of Opportunities and Threats (continued)**

Critical external factors	Impact	
	Positive (Opportunities)	Negative (Threats)
<p>■ <b>Legal Factors</b>                      Poor management of license piracy problem in China</p>	<p>■ Nil</p>	<p>■ Confusion in the use of license, and risk of being sued due to unclear rules</p>

Critical external factors	Impact	
	Positive (Opportunities)	Negative (Threats)
<p>■ <b>Social Factors</b>                      Group of organizations in China favor only technology developed in China as an effort to support homeland technology</p>	<p>■ High barrier for foreign competitors to acquire skills</p>	<p>Limit in knowledge sharing as it is only unique in China</p>

**Innovation (Technology) Environment Scan - Identification of Opportunities and Threats (continued)**

<b>Critical external factors</b>	<b>Impact</b>	
	<b>Positive (Opportunities)</b>	<b>Negative (Threats)</b>
<p>■ <b>Environment Factors</b></p> <p>China's focus and heavy investment on telecom infrastructure has allowed remote real time support. Also, India's free trade zones such as SEEPZ in Mumbai has stable telecom infrastructure.</p>	<p>■ Reduced risk of remote support and increased offshore outsourcing value proposition</p>	<p>■ Nil</p>

**Figure 8: Characteristics of Present Innovation (Technology) Policies Regarding Major Decision Making Categories**

Decision Category	Description of Policy	Strengths	Weaknesses
<ul style="list-style-type: none"> <li>■ <b>Technology Intelligence</b></li> </ul>	<ul style="list-style-type: none"> <li>■ ERP – Developed own ERP system, for workflow management, integrating information across all departments. Gather data, manage and monitor performance.</li> <li>■ Make development process more transparent to clients.</li> <li>■ Video Conference – important to gain confidence about facility in China. To get over culture gap.</li> <li>■ Java, Domino – Common</li> <li>■ Portal- growing, establish center of excellence</li> <li>■ EAI(WebMethods)-fast growth, not many competitors with expertise in this, can be an advantage to dominate in Chinese market</li> <li>■ Mainframe- high entry barrier, not a growth market, cash cow, stable market</li> <li>■ Oracle ERP – high barrier to entry, high margin</li> <li>■ Data warehousing – continue to explore</li> </ul>	<ul style="list-style-type: none"> <li>■ Well understanding on products strength</li> <li>■ And market technology trend.</li> <li>■ Competitive advantage</li> </ul>	<ul style="list-style-type: none"> <li>■ Limited resources, and to focus on future cash cows.</li> <li>■ Not easy to find partner, high entry barrier</li> </ul>

**Characteristics of Present Innovation (Technology) Policies Regarding Major Decision Making Categories (continued)**

<b>Decision Category</b>	<b>Description of Policy</b>	<b>Strengths</b>	<b>Weaknesses</b>
<ul style="list-style-type: none"> <li>■ <b>Technology Selection</b></li> </ul>	<ul style="list-style-type: none"> <li>■ Formal process for selection, metric established includes market potential, costs (entry barrier), speed to ramp-up resources, competitors strength, return of investment, existing knowledge, etc.</li> <li>■ Assign weights to different dimensions.</li> <li>■ Potential market size, growth rate and speed to ramp-up resources are key factors. Market entry costs are least important.</li> </ul>	<ul style="list-style-type: none"> <li>■ Objective</li> <li>■ Highly accurate</li> <li>■ Resourced based</li> </ul>	<ul style="list-style-type: none"> <li>■ May sacrifice long-term benefit for short term benefit</li> </ul>

<b>Decision Category</b>	<b>Description of Policy</b>	<b>Strengths</b>	<b>Weaknesses</b>
<ul style="list-style-type: none"> <li>■ <b>Timing of new technology introduction</b></li> </ul>	<ul style="list-style-type: none"> <li>■ Mostly looking at returns on specific technology in the short term.</li> <li>■ No sense (bias) on the long run as technology changes fast. If ramp-up takes too long, it make on sense to invest.</li> <li>■ Not in the business of bleeding edge tech. It has to be some what mature to get it.</li> </ul>	<ul style="list-style-type: none"> <li>■ Very flexible, market-oriented approach.</li> <li>■ Financial based</li> </ul>	<ul style="list-style-type: none"> <li>■ Located at developing countries, risk of time lag to obtain advance tech.</li> </ul>

**Characteristics of Present Innovation (Technology) Policies Regarding Major Decision Making Categories (continued)**

Decision Category	Description of Policy	Strengths	Weaknesses
<ul style="list-style-type: none"> <li>■ <b>Mode of technology acquisition</b></li> </ul>	<ul style="list-style-type: none"> <li>■ Multi-modes for technology acquisition.</li> <li>■ Internal development of technologies is used most often for technologies that are integral to the services it provides.</li> <li>■ The company acquires technology such as video conferencing technology for use in the delivery of services.</li> <li>■ Licensing of technology is also very common and occurs for most platform software that is the customized by the company.</li> <li>■ Set up one joint venture with IBM, Japan and is open to doing more.</li> <li>■ Have many alliance partners who serve as complementors and are critical to its strategy.</li> </ul>	<ul style="list-style-type: none"> <li>■ Very flexible multi-channel to acquire technology.</li> </ul>	<ul style="list-style-type: none"> <li>■ Need to be very sensitive on trend of technology development</li> </ul>

**Characteristics of Present Innovation (Technology) Policies Regarding Major Decision Making Categories (continued)**

Decision Category	Description of Policy	Strengths	Weaknesses
<ul style="list-style-type: none"> <li>■ <b>Horizontal strategy of Technology</b></li> </ul>	<ul style="list-style-type: none"> <li>■ Business units by geographies.</li> <li>■ Technology is the key to the integration of these geographically dispersed units.</li> <li>■ Proprietary ERP system is used across all business units.</li> <li>■ The company’s software delivery methodology with CMM5 and 6-sigma processes provide and enforce a common set of process across the entire organization, technology such as video conferencing and other software add value to the client relationship and greatly facilitates integration,</li> <li>■ Common development frameworks and solution sets allow re-use across projects</li> </ul>	<ul style="list-style-type: none"> <li>■ High quality products, standardized process.</li> </ul>	<p>Maybe higher cost compared to competitors with no process – need to sell value</p>

**Characteristics of Present Innovation (Technology) Policies Regarding Major Decision Making Categories (continued)**

Decision Category	Description of Policy	Strengths	Weaknesses
<ul style="list-style-type: none"> <li>■ <b>Project selection, evaluation, resource, allocation, and control</b></li> </ul>	<ul style="list-style-type: none"> <li>■ Dedicated team for critical internal application, owns its CDQs.</li> <li>■ For other non-critical projects, use resources on the bench. Group TSG (tech support group) lead by CTO, constantly surveying market, collect feedback from people in the field and make recommendations.</li> </ul>	<ul style="list-style-type: none"> <li>■ Effective allocation of resources on dedicated team</li> </ul>	<ul style="list-style-type: none"> <li>■ Need to expand and replace technology</li> <li>■ Available in the bench from time to time.</li> </ul>

**Characteristics of Present Innovation (Technology) Policies Regarding Major Decision Making Categories (continued)**

Decision Category	Description of Policy	Strengths	Weaknesses
<ul style="list-style-type: none"> <li>■ <b>Technology organization and managerial infrastructure</b></li> </ul>	<ul style="list-style-type: none"> <li>■ Horizontal deployment of technology – 2 sources</li> <li>■ Technology group makes request, submits to CTO who make final decision.</li> <li>■ For development project gets transferred to development team. They fill out request, send to TSG, and enter approval process. TSG will drive initiatives and push it our horizontally.</li> <li>■ Development solutions that do get patented (20 to 30 patents), but product sales not a major business. Application solutions that can be customized.</li> <li>■ Couple of publications, software development trends, also published a book. Set standard for China-brand awareness. And help to get complementors.</li> </ul>	<ul style="list-style-type: none"> <li>■ Well-defined mechanism for decision flow.</li>   <li>■ Good on documentation</li> </ul>	<ul style="list-style-type: none"> <li>■ May take long in decision – need to further define process for quickest possible decision response</li> </ul>

**Figure 9: Innovation (Technology) Strategic Agenda**

Technology Strategic Thrusts	Organizational Units									Businesses Processes	Performance Measures	
	Chief Technology Officer	Technical Team Leads	Vice President Operations	Regional President - US	Regional President - Japan	Regional President - China	Vice President Sales	Vice President Marketing	Chief Financial Officer			VP Human Resources
<b>Streamline, Integrate, and Innovate in Technology Infrastructure</b>												
1 Enhance proprietary ERP for global operations and deploy globally as common infrastructure for resource management, forecast and planning; revenue & profitability tracking.	1	1	①	2	2	2			1	1	OE	# of GDCs on ERP, speed of deployment, number of users and freq of use, user satisfaction
2 Customize ClearCase development environment to allow secure client access to sand-boxed iteration releases to enhance transparency during development phase	①	1	1	2	2	2					I	Client satisfaction, increase in client profitability, development & account team satisfaction
3 Standardize all GDC's with collaborative tools such as audio/video conferencing, MS LiveMeeting, InstantMessaging, shared servers, VPN, etc. to facilitate demos, training, knowledge transfer, etc.	①	1	1	2	2	2	2	2	1		OE	Ease & frequency of use, cost effectiveness, client satisfaction, project profitability
4 Evaluate, procure licenses and implement an integrated set of rapid prototyping and design tools to facilitate joint development of vertical solution sets with strategic partners	1	①	1	2	2	2			2		I	Cost effectiveness and flexibility of licenses, increased project efficiency/profitability, client sat
5 Deploy centralized customer relationship management system with global access to meet identified sales & marketing needs	1	1		2	2	2	①	1	2		CT	Security, cost effectiveness, time to deploy, adoption, user satisfaction
<b>Build Technology Knowledge &amp; Capabilities for Client Services</b>												
6 Evaluate, select and obtain site licenses for application servers (J2EE: Websphere, Weblogic; MS .NET) and develop rapid development frameworks for the same	2	①	2	2	2	2	2				OE	Increase in quality, efficiency, and profitability of client projects, increased client satisfaction

## Innovation (Technology) Strategic Agenda (continued)

	Technology Strategic Thrusts	Organizational Units										Businesses Processes	Performance Measures	
		Chief Technology Officer	Technical Team Leads	Vice President Operations	Regional President - US	Regional President - Japan	Regional President - China	Vice President Sales	Vice President Marketing	Chief Financial Officer	VP Human Resources			
7	Develop center of excellence in Portal Technology. Evaluate and select strategic portal technologies (e.g. Plumtree, Epicentric, MS Sharepoint), obtain development licenses and build application frameworks for rapid client deployment.	1	1	2	①			1	2	2			I	Increase in close rate of portal sales effort, efficiency and profitability of portal projects, client satisfaction
8	Develop capabilities in EAI. Evaluate and select industry leading solutions and develop strategic technology partnership with associated vendors to help sell and deploy EAI projects.	2	1	2	1	1	①	1	2	2			I	Increase in close rate of EAI sales effort, efficiency and profitability of EAI projects, client satisfaction
9	Enable mainframe access to new regions. Harvest existing IBM mainframe but continue to remain current on all software and maintain market dominance.		1	1	2	①	2						OE	Client satisfaction, increase in rev/profits, profitability of client
10	Develop horizontal practise in Oracle ERP. Negotiate VAR relationship with Oracle and develop deep technical expertise for end-to-end solutions deployment.	1	2	①	1			2	2			1	I	Preference level of partnership, depth in skills, market share and profitability of practise.
11	Evaluate and select integrated data warehousing (DW) products across ETL tools, design tools and analysis tools and build associated skills and solution sets	①	1		2	2	2	1	1	2			I	Increase in close rate of DW sales effort, efficiency and profitability of DW projects, client satisfaction

1 = Key role in formulation and implementation

B = Business Model

2 = Important role of support and concurrence

OE = Operational effectiveness

①= Identifies the “Champion” who takes leadership for the strategic thrust execution

CT = Customer Targeting

# **Technology Portfolio Analysis for a Computer Company**

# SILICON PRODUCT TECHNOLOGIES. TECHNOLOGY PORTFOLIO MATRIX

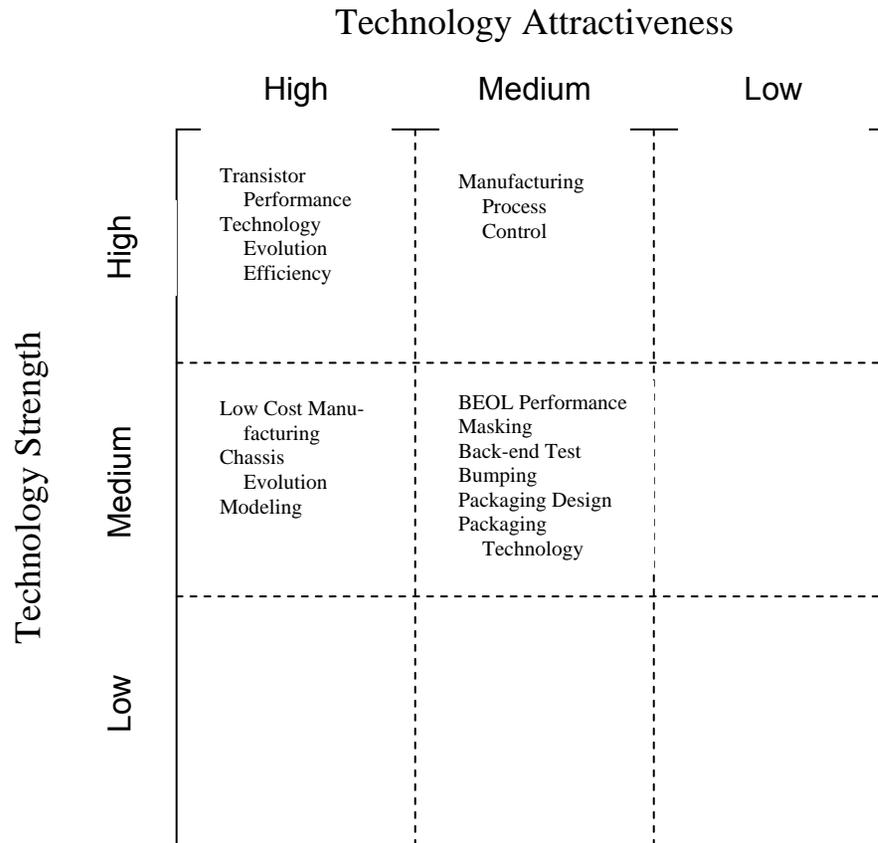
		Technology Attractiveness		
		High	Medium	Low
Technology Strength	High	X86		
	Medium	System Architecture Circuit Design	Connectivity VLSI Design Performance Analysis Silicon Analysis	
	Low	Communication DFT/DFM	Graphics Design I/O Architecture Program Management	

**Note:** DFT = Design for Technology  
DFM = Design for Manufacturability

# STU OPTIONS

<b>Silicon Product Technologies</b>	<b>Lead</b>	<b>Compete</b>	<b>Sustain</b>	<b>Harvest</b>	<b>Purchase</b>	<b>Abandon</b>
<b>Intellectual Property</b>						
X86 CPU	L					
Graphics			S		P	
Communications			S			
Connectivity		C				
Systems Architecture	L					
<b>Development Methods</b>			S			
VLSI Design Tools			S		P	
Performance Analysis			S			
DFT/DFM & Test Technology		C				
I/O Architectures & Implementation			S			
Program Management			S			
Good Circuit Design		C				
Silicon Analysis			S			

# PROCESS AND MANUFACTURING TECHNOLOGIES. TECHNOLOGY PORTOFLIO MATRIX

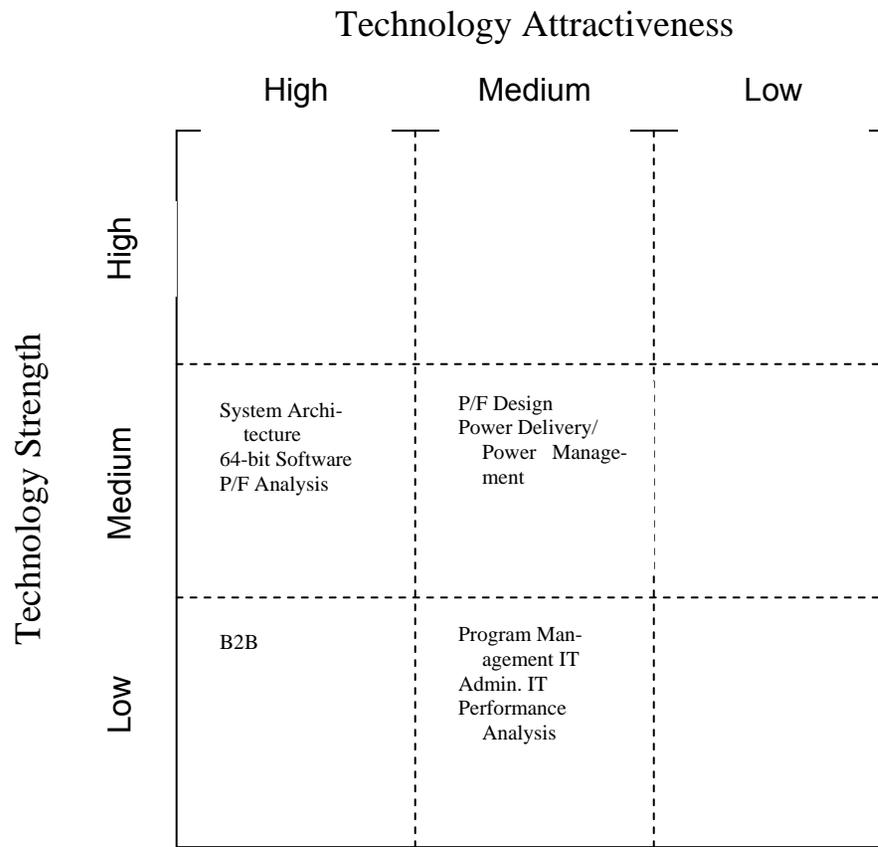


# STU OPTIONS

<b>Process and Manufacturing Technologies</b>	<b>Lead</b>	<b>Compete</b>	<b>Sustain</b>	<b>Harvest</b>	<b>Purchase</b>	<b>Abandon</b>
Low Cost Mfg.		C			P*	
Chassis Evolution		C			P*	
Transistor Performance	L					
BEOL Performance		C			P*	
Technology Evolution Efficiency		C				
Modeling (DFWYW)			S		P*	
Mfg. Process Control		C				
Masking		C				
Back-end Test			S			
Bumping		C			P*	
Packaging Design			S			
Packaging Technology			S			

\* Confirm if "C" is deliverable

# PLATFORM TECHNOLOGIES. TECHNOLOGY PORTFOLIO MATRIX



# STU OPTIONS

<b>Platform Technologies</b>	<b>Lead</b>	<b>Compete</b>	<b>Sustain</b>	<b>Harvest</b>	<b>Purchase</b>	<b>Abandon</b>
<b>P/F Design (Custom).</b>			<b>S</b>			
<b>64-bit Software</b>		<b>C</b>				
<b>P/F Analysis</b>		<b>C</b>				
<b>B2B</b>			<b>S</b>		<b>P</b>	
<b>Program Management IT</b>			<b>S</b>		<b>P</b>	
<b>Admin. IT</b>			<b>S</b>		<b>P</b>	
<b>Performance Analysis</b>		<b>C</b>				
<b>Power Delivery/Power Management</b>			<b>S</b>			