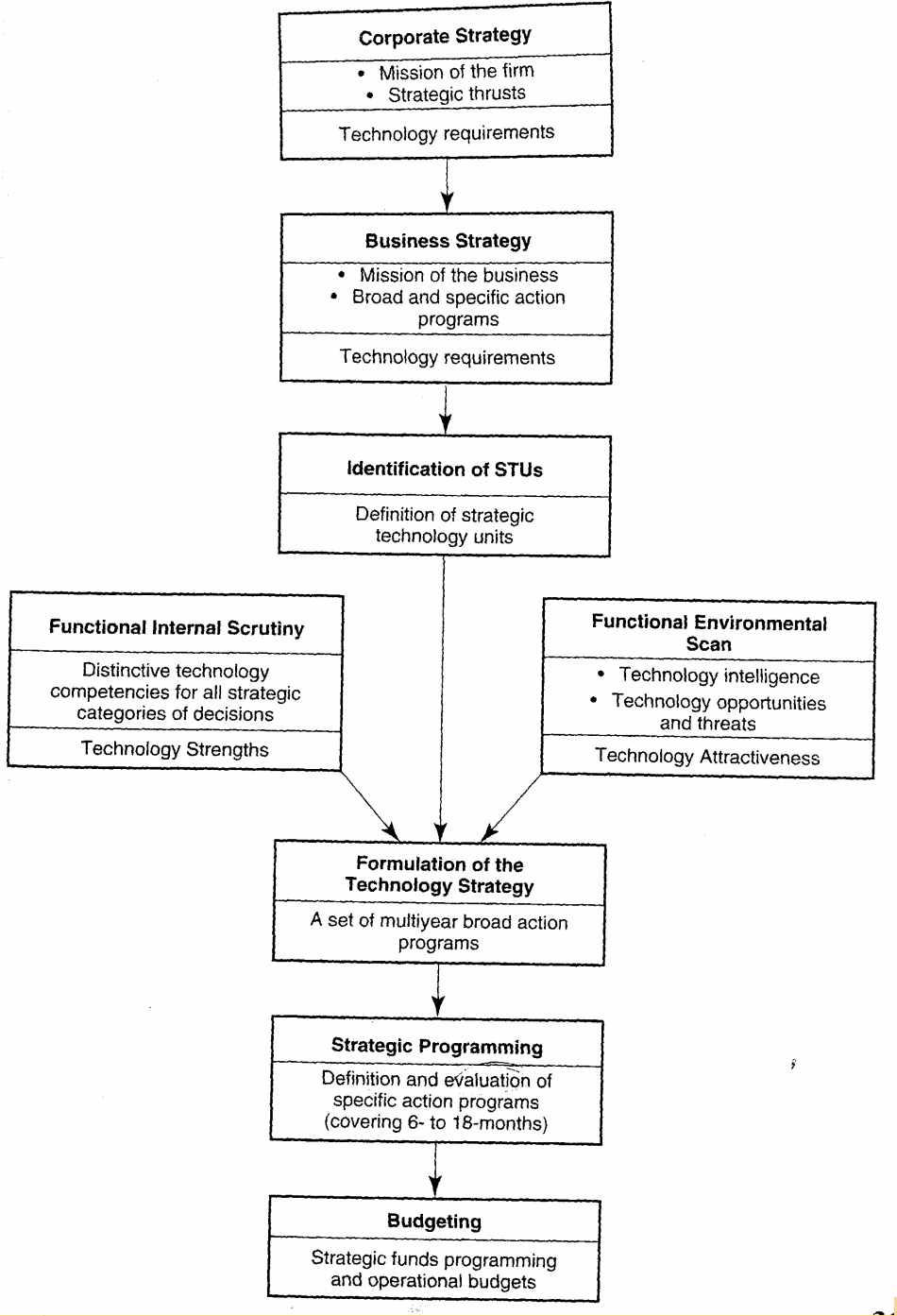
Technology Strategy

Linking technology and business strategies is a demanding task that has central importance in strategy formation. Now that technology is a critical source to achieve and sustain competitive advantage, the ability to incorporate technology into a business strategy can make the difference between a winning or a losing strategic alternative. This chapter discusses a methodology that can be

The role of technology has become so pervasive in the business world that it is appropriate to say there is hardly any significant industry that can be classified as low-tech. In fact, technological forces are restructuring industries and defining new ways to compete. Managers are confronted with the demanding task of accelerating the speed at which innovations in new products and processes are translated into profitable commercial ventures.


Corporate Strategy
• Mission of the firm
• Strategic thrusts
Technology requirements
Business Strategy
• Mission of the business
• Broad and specific action programs
Technology requirements
Identification of STUs
Definition of strategic technology units
Functional Internal Scrutiny
Distinctive technology competencies for all strategic categories of decisions
Technology Strengths
Functional Environmental Scan
• Technology intelligence
• Technology opportunities and threats
Technology Attractiveness
Formulation of the Technology Strategy
A set of multiyear broad action programs
Strategic Programming
Definition and evaluation of specific action programs (covering 6- to 18-months)
Budgeting
Strategic funds programming and operational budgets

development of the environment.

First, top managers have to decide, as part of the corporate strategy of the firm, what role is to be played by technology in advancing the firm's competitive capabilities, the amount of resources to be allocated to technology, and the aggressiveness the firm will use in the innovative process and in imbedding technology into the firm's products and processes. Corporate attention is required since frequently a given technology is shared by several businesses and affects various managerial functions. Therefore, its strategic development cannot be totally decentralized at the business and functional levels. The elements of corporate strategy that communicate more pointedly to the technological requirements are the mission of the firm—particularly the statement of unique competencies—and the corporate strategic thrusts—an expression of the primary issues the firm has to address in order to establish a strong competitive position.

Finally, at the technology level resides the task of interpreting all the requirements emerging from corporate and business levels, which will become the critical inputs for shaping the technology strategy of the firm. At this stage it is also necessary to identify the portfolio of specific technologies the firm will be using in supporting its business strategies. This leads to the definition of the strategic technology units (STUs), the central focus of attention in the development of technology strategy. The STU identifies the skills or disciplines that are applied to a particular product or process in order to gain technological advantage. The STUs should contain all the core technologies used now or needed in the future across the whole organization.

example

IMPLIED BY	TECHNOLOGICAL REQUIREMENTS
Corporate Strategy	• Acquire and develop those technologies and procedures required to ensure high quality and reliability in large scale production of existing Massive Parallel Computer (MPC) product line. (Period of accomplishment: 12 months) • Develop the technological capabilities needed to design and bring to the market a new generation of MPC. (Time period: 3 years) • Enhance existing product line with minor innovations every six months.
Business Strategy	• Reduce board and system manufacturing cost by 10% every six months by better use of available technologies. • Acquire technical capabilities (human and equipment) in the area of demonstration technologies to serve actual market needs. • Bring to the market high speed input/output and video devices in 9 months.

Required technology attributes

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 systems 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 methodologies for delivering service to the computer industry (e.g., remote diagnosis, education of technicians, etc.)

STU

STU	POTENTIAL SOURCE OF INNOVATION
1. Systems architecture	Competitors, universities
2. Chip design and engineering	Suppliers, competitors, and other computer companies
3. Board and system design and engineering	Suppliers, and electronic and computer companies
4. Support software	Lead users, suppliers, competitors
5. Application software	Lead users, suppliers, competitors
6. Management of information systems	Suppliers, industry in general
7. Process technologies	Suppliers and companies with analogous production processes
8. Testing technologies	Electronic companies and suppliers
9. Demonstration technologies	Lead users, competitors, and other computer companies
10. Peripherals	Lead users, and electronic and peripherals companies
11. Service	Lead users and competitors

Waekness-strength analysis

X: 1992
O: 1994–95

STU 3: Board and system design

FACTORS	=	–	E	+	++	COMMENTS
Potential for enhancing competitive advantage in						Most of the innovations are incremental, so a small group of people can keep up with them
• products				XO		
• process				XO		
Rate of technological change			O	X		
Potential for long-term value added			XO			
Impact on:						It is a key technology in terms of cost, performance, and quality. It drives most of the manufacturing and assembling processes and has strong implications in procurement
• cost					XO	
• performance					XO	
• quality					XO	
• differentiation				XO		
Impact on entry barriers			XO			The technology has a moderate impact on changing the industry structure, the barriers to entry, and the industry standards.
Impact on setting industry standards			XO			
Impact on improving industry			XO			

Technology policies

Decision Category	Description of Policy	Strengths	Weaknesses
Technology intelligence	There is no action plan to capture external innovations nor any measure of how much information is coming in and how it is disseminated through the company.	The informal policy may be very adequate now that the company is small.	It is very dangerous because many important innovations, requirements, or problems with the product will probably not be captured on time.
Technology selection	With the exception of STUs 1 and 2, technologies are selected without consideration of the business mission.	None.	Cost ineffective. May endanger some of the key business objectives.
Timing of new technology introduction	Incorporate advanced versions of the technology once less sophisticated, safer ones are already in the product.	Low technological risk. Leverage of experience.	By not defining the policy in terms of STUs and its support to the business, there is a risk of missing the right time for technology introduction.
Modes of technology acquisition	Basically internal, with very few exceptions.	Easier coordination of proper development and use of technologies	Suboptimization of resources. Very unlikely to be able to excel in all areas.
Technology horizontal strategy	Relies basically on informal communications.	Better disposition to share technology.	Requires a strong culture to maintain this approach as the company grows.
Project selection, evaluation, and resource allocation	Projects selected based on market inputs.	Supports the company market driven approach.	Potential for losing long term innovations.
Technology organizational and managerial infrastructure	Most of the responsibilities for long and short term rely on the same people.	Gives control over what is going on, and facilitates coordination of previous policies.	May generate large decision problems as the company and the breadth of products grow.

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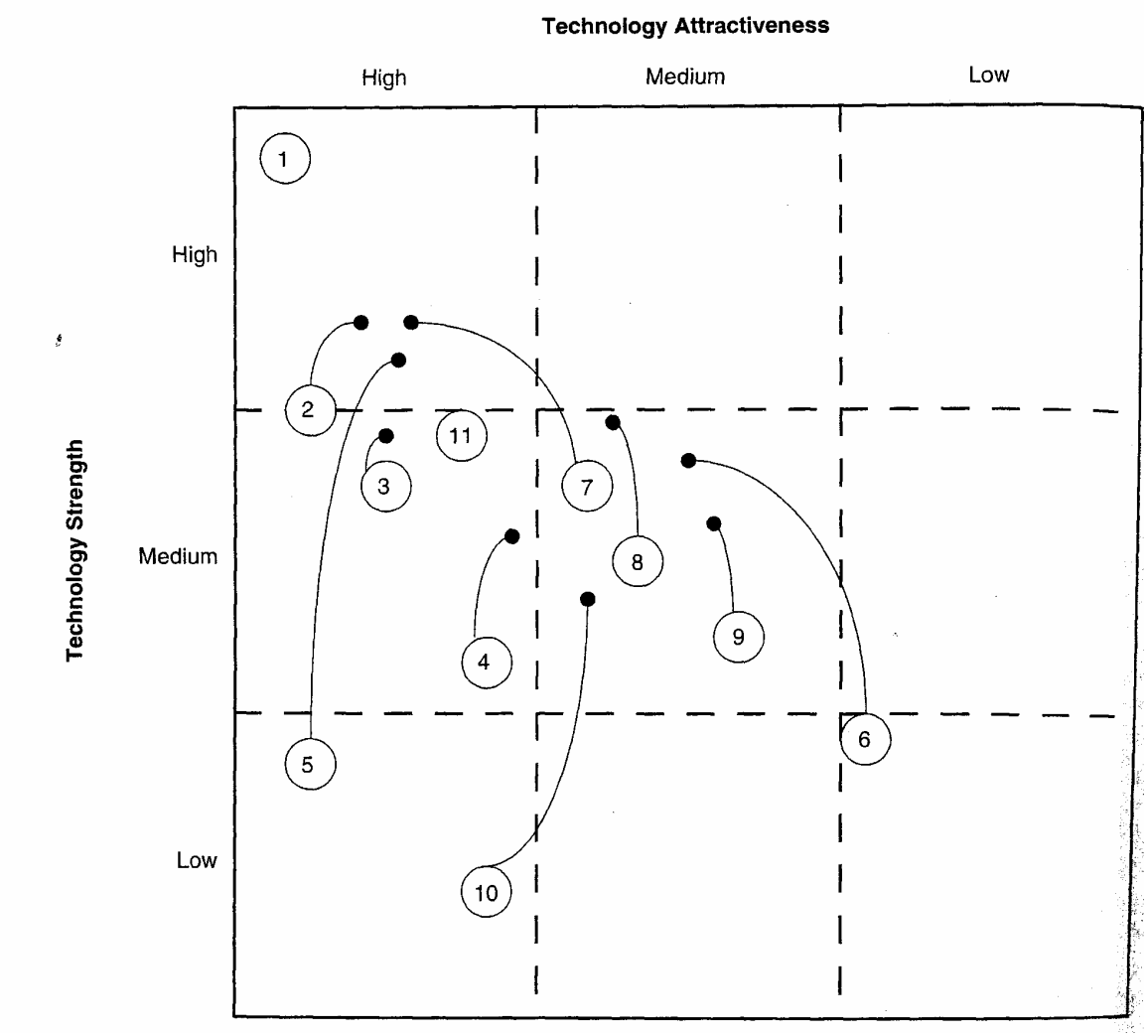

TECHNOLOGY POLICIES

When the strategic analysis uncovers some serious deficiencies in the technology policies of the firm, it might be necessary to reevaluate them. Technology policies tend to be broad guidelines that define the scope in which technology decisions are to be made. These policies have some inherent stability and, therefore, are not supposed to be redefined at the end of every planning cycle. In the case of Masscalc, managers opted for issuing a simple statement of technology policies that group the seven categories of decision making we used for policy evaluation under three headings: *innovation policies,* including technology intelligence, technology selection, timing of new technology introduction, and

برنامه ریزی تکنولوژی

FIGURE 20–9. Technology Broad Action Programs

Action Program	Responds To*	1st Milestone
Define the specific needs of people in engineering and procurement for complying with short product cycles and incremental innovations.	TR, IS	June 1992: the specification of needs.
Define the specific technologies to be used in board design according to the established innovation policies.	TR, ES	September 1992: critical analysis of available technologies rated by cost, performance, and riskiness.
Develop and launch a program to acquire the next generation of board design and manufacturing techniques with special focus on cost reduction and quality.	ES, TR	September 1992: critical analysis of new developing technologies.
Create a unit fully responsible for board design and manufacturing.	IS	December 1992: description of needs to be covered by this unit and means needed to achieve it.
Set up review meetings for chip and architectural design each six months. The purpose of these review meetings should be to track and evaluate external upcoming innovations.	IS	First review meeting in September 1992.
Introduce demonstration technologies in accordance with technology policies and marketing requirements.	TR, IS	In two months there should be a specification of what the company needs in the near future and which companies can provide the service.
Establish a program to develop a new generation of chip and architecture within three years.	IS	Define project by June 1992.

*...technology planning process a particular action program is responding to,

سیاستگذاری نوآوری

INNOVATION POLICIES

- Be leaders in introducing incremental concepts in system architecture and chip design.
- Be followers in major innovations in chip manufacturing and board design and manufacturing technologies.
- Select those technologies that lead the company toward standards, mainly in those technologies that are not the core of the business.
- Select standard hardware and software available in the market or that can be designed and manufactured outside without interfering with company's proprietary knowledge.
- Acquire from outside all the support software that is not crucial for the proprietary technology or expertise of the company.
- With regard to demonstration technologies and other non-crucial activities, look for an agreement with some external company and an internal coordinator.

تخصیص منابع

TECHNOLOGY DISSEMINATION AND RESOURCE ALLOCATION

- Set a program for temporal rotation of people. It should include:
  - Interchange between people at R&D center and engineering.
  - People working at the R&D center should be allocated one month every three years as marketing support personnel, in a rotational basis.
- Maintain policies regarding resource allocation.

سازماندهی تکنولوژی

TECHNOLOGY ORGANIZATION AND MANAGERIAL INFRASTRUCTURE

- Establish a program for evaluation of new changes in current designs, to ensure that each new innovation included is appropriate in terms of factors such as market needs, cost reduction, better service to either final customer or software companies, etc. Establish priorities among these factors.
- The R&D organization will be under the Engineering and Manufacturing department. But, R&D will be seated at all the top-management committees to ensure that its long term objectives are pursued.
- Lower the organizational level at which technological decisions are made.
- Set up, within the evaluation program, an analysis of technological decisions made and its agreement with satisfaction of technological requirements and technology policies.