CHAPTER 1

Investment Environment

The investment project creates an enterprise that functions in an environment comprising internal characteristics and external surroundings. Design of internal characteristics is essentially within the province of project personnel, but external features are variously susceptible to influence: Some are clearly independent of the existence of the project, others can be moderately affected, and some can be readily adjusted to serve project needs. Being aware of its features is the first step in assuring mutual compatibility between the investment environment and the project, which is essential to success.

A project is considered to be a set of coordinated activities intended to achieve a specific outcome, with a beginning and an end. The project starts when the investment idea attracts serious attention, progresses through preinvestment phases of study, design, analysis, and appraisal; then, if acceptable for investment, through commitment of resources and implementation, in which the enterprise is either created or modified, and production facilities assembled, constructed, installed, and then commissioned for operations. The decision to invest in the project is predicated on results of appraisal of the projected relationship between the investment and the excess of benefits over costs to be derived during the operations phase, as described in Chapters 2–4 (financial) and 5 and 6 (economic).

The enterprise commences operations as resources are consumed to produce goods and/or services (hereinafter referred to as *products*) provided to consumers; there follows a decommissioning phase, if applicable, or perhaps renewal in the next investment cycle. The project conception and design, and its appraisal, are inevitably predicated on forecasts that are inherently uncertain; thus, consideration of associated risks is an indispensable dimension of the planning process.

SYSTEMATIC PROJECT ANALYSIS

The investment project is most effectively studied and designed as a system, or perhaps a primary system with interacting subsystems. The enterprise in its environment is modeled as a whole rather than an assemblage of individual elements or parts. The description of system elements, structure, and processes, and their interactions, yields insights into their functions and dynamics, providing a basis for refining project design toward attainment of objectives and goals. This requires specifications of system elements and plans to effectively mobilize resources necessary for their proper functioning (e.g., energy, materials, labor, information, technology, finance) and creative conceptions about how they can be employed so that they are mutually reinforcing.

Design/study follows a logical, but not necessarily linear, sequence, often through several iterations, consisting of the following elements:

- Goals and objectives—what is to be accomplished, and why, by individuals and organizations involved.
- Criteria of acceptability for stakeholders—investors, lenders, guarantors, regulators, licensors.
- Alternatives—the range of choices for design of the system and its components: product; enterprise organization and staffing; location; site selection and layout; plant and ancillary facilities; process; machinery and equipment.
- Impacts of each alternative—resources consumed and generated and other tangible and intangible consequences.
- Quantitative and qualitative forecasts of impacts to the planning horizon.
- Benefits and costs to be counted—elements to be included in assessing profitability and other indicators of performance, and their individual, organizational and/or geographical range of relevance.
- Unit of measurement for meaningful aggregation of impacts, and identifying impacts that can only be assessed qualitatively.
- Determining quantitative performance indicators and nonquantifiable measures of project impact (e.g., commercial, economic, social).
- Assessing risk—decisions predicated on uncertainty in forecasts and their possible negative impacts on performance.
- Appraisal—comparing performance indicators and other impacts with criteria of stakeholders, considering risk of failure to meet criteria.
- Recommending a course of action as the most favorable among alternatives.

For practical reasons, it is necessary to select only those aspects of the project with the most significant impacts for detailed analysis. Some impacts are best estimated in aggregated form using accepted rules of thumb. However, details can be important: What appear as minor factors at the outset can loom large when they become problematic.[1]

A fundamental concept for all types of projects is *incremental analysis*, the difference between the situation for stakeholders *with the project* and *without the project*. This is not the same as after versus before the project. For a new investment the without-project situation is usually relatively straightforward. It is concerned with the current disposition, and effects for stakeholders, of resources that will be transferred or otherwise dedicated to the project. For a project undertaken by an existing enterprise, the without-project situation involves the operational scenario if the project is not undertaken. In either case, the incremental impact is the difference between the with-project and without-project situations. This concept is further explained in Victoria Coke Project case study, on our web site and in Chapter 3.

PROJECT ENVIRONMENT AND STRATEGY

An investment project becomes part of a system of supply and demand for goods and services, and also an integral part of socioeconomic and ecological systems within which it is to function and prosper. Its success depends upon how well it accommodates to its operating environment, as well as the degree of satisfaction that it provides to its clients and to the wider community that provides its market, its workers and those whose lives are affected by its presence. Whether the project is undertaken in an industrialized or developing country or a country in transition, the analogy of a biological organism employing a strategy to survive and grow in its habitat, or environment, described in the Introduction, is applicable.

In some environments, demonstration that the project will serve socioeconomic goals and objectives and be compatible with the host ecology is required. Public interest is expressed through fiscal, administrative, environmental, and other conditions imposed by governing bodies requiring that the investment project employ scarce resources efficiently for local, regional, or national development. Government initiatives that encourage or compel adherence to public goals with incentives and restrictions enter into analysis and appraisal of the project.

The strategic plan might include factors involving corporate social responsibility (CSR) as a means of enhancing corporate image and reception of the project by the host community. For further discussion see our web site—Corporate Social Responsibility.

Project Domains

The relationship between the project's commercial domain and the wider domain with which it interacts is illustrated in Figure 1.1. The commercial domain comprises markets and suppliers, financiers, competitors, technologies, and internal project characteristics designed to produce desired benefits for investors. The wider domain is project-specific, encompassing the political, social, economic, and environmental milieu in which the enterprise is to function. It can be delimited geographically as the community (e.g., city), the region, the country, or the international setting, and operationally as the scope of major interactions between the project and external factors. In reality these domains are not so clearly demarcated—they are unified by interactions and mutual repercussions. As one example, aesthetics and culture (a feature of the wider domain) may affect the market—what people are willing to consume (a characteristic of the commercial domain).[2] A partial listing of elements of the commercial and wider domains for consideration is provided in Appendix 1.1.[3]

That project stakeholders are obliged to consider the commercial domain is obvious, certainly for private-sector projects and often in the

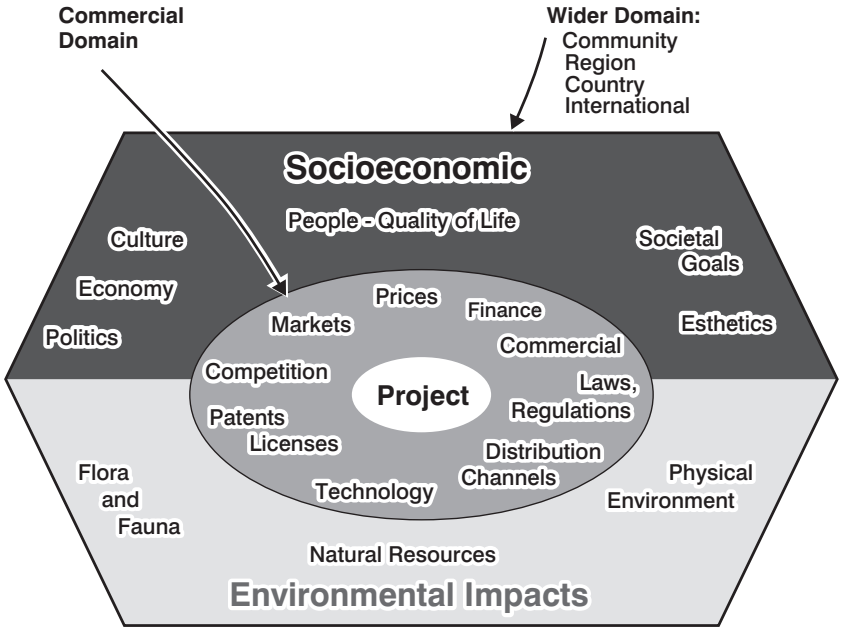


FIGURE 1.1 Commercial and Wider Domain

public sector as well. Investors, guarantors, and lenders are interested in how a project will fare—securing market share and operating with sufficient financial returns. Why there should be interest in the wider domain is often ignored.

All dimensions of the wider domain have consequences—the economy, culture, nature of the political arena, consumption of natural resources (renewable and nonrenewable), the physical environment, flora and fauna, aesthetics, and the general quality of life of the affected population. Strains at the local, regional, national, and international levels are an important consideration for the project, needing markets with people willing and able to consume the output of the enterprise and to supply needed inputs. As the project is imposed on commercial and more extensive systems, its repercussions create ripples that are reflected back, sometimes in amplified form. In recent years the scientific community has discovered the phenomenon of chaos in complex systems such as weather or economies, in which small perturbations in one corner of the world can have major consequences in another—prototypically the butterfly flapping its wings in an African village causing a tsunami in Asia.

Although red flags of warning concerning resource constraints have been hoisted for centuries,[4] human ingenuity has usually found a way to circumvent these problems. However, until the human population stabilizes (perhaps at 10 or 12 billion by the end of the twenty-first century, according to some forecasts), by definition a decreasing quantity of Earth's surface and natural resources is allotted to each on average, a factor that may warrant examination in regard to project viability.

There are other pragmatic reasons for maintaining an interest in the wider domain. International agreements have lowered barriers to trade and to mobility of production factors. For this reason alone, elements of the wider domain, within and without host country borders, affect project viability. Differences in environmental protection, labor conditions, and human rights provisions among countries, coupled with global mobility, have a significant bearing on the nature of existing and future competition.[5] The project may benefit from heightened awareness by licensing authorities of external benefits attributable to the enterprise.

External effects, regarded as problematic by the larger community, also have to be identified and their long-term consequences for the enterprise taken into account. As information concerning consequences of resource consumption and applications becomes more widespread, the market will increasingly reflect impacts that presently do not affect the bottom line (profit) but that do have an impact upon interests of direct stakeholders and the broader community. To ignore these factors is to add to project risk. Better to account for these external impacts, derive the advantages of

beneficial effects, and protect against unanticipated consequences of real or perceived undesirable impacts.

Industrial policy embodied in measures such as incentives, quotas, and protection may reflect the host government's strategic policies regarding the general business environment. Macroeconomic policies and actions may be relevant: for example, fiscal (liberal or conservative), monetary (tightening or relaxing), and foreign trade (export/import financing by the banking system, import quotas and other protective barriers, export/import duties, promotion facilities). Design of project and marketing strategy are affected by entry/exit barriers to participation, restrictions on foreign participation, policy on repatriation of earnings, and exchange controls. For example, the existence of exchange controls (usually responsible for local currency overvaluation) may render export difficult or impossible.

The wider domain has more direct significance. As an example, the state of flora and fauna may have implications for stability of needed inputs. A lake supplying cooling water to the project, if contaminated, can lose required qualities and consequently its usefulness for the project.[6] Reliability and loyalty of workers are enhanced when health and quality of life are maintained at acceptable levels. Generally favorable economic conditions provide a healthy environment for the enterprise to survive and grow.

International and domestic terrorism is increasingly a factor with the potential to affect project outcomes, so that consideration of prevention and/or mitigation strategies is sometimes appropriate. For further discussion see our web site—Domestic and International Terrorism.

Size is a determinant of the degree of investigation: For relatively small projects, with little or no regional or national impact, assessing compatibility with concerns of the local community is probably as far as appraisal goes in the investment decision process. For an export project, the international economy and national parameters such as trade balance and exchange rates are relevant.

The extent of analysis has to serve the interests of stakeholders but also reflect the larger implications for sustainability of operations and public interest. A major issue is whether there is any conflict, at present and in the long run, between basic project (corporate) objectives and development objectives in the operational socioeconomic environment.[7]

At the micro (project) level, sponsors' primary concerns for the project as a business opportunity, where commercial profitability is of paramount importance, invariably need to be supplemented with some concern for wider impacts, if only to satisfy licensors and regulators. When the project is either large enough or otherwise strategically significant, macro-level appraisal may be warranted, considering its contribution to regional, national, and perhaps international income, distribution effects, and job creation.

Examination of the wider domain can lead to alternative project configurations that benefit investors. For example, the cost of pollution abatement or mitigation can be weighed against adverse impacts if such measures are not taken. Enterprises have been held legally and financially accountable for contamination even when in compliance with emissions regulations.[8] Projects planned for 10 to 20 years or longer can anticipate more stringent regulation and consider including anticipated compliance requirements in the initial investment cost.

Infrastructure Investment Projects

Infrastructure can most generally be considered as the entire range of elements of the wider domain, as previously described, or more commonly as service components of the project's external environment, provided by entities created with private investment, public-private partnerships (PPPs), or by the government. The complex of services is usually the cumulative effect of investments over an extended period of time—Rome was not built in a day.

Some infrastructure projects are designed as revenue generating, some completely supported by fees charged to users, and others with varying degrees of subsidization for consumers of services produced. Government subsidies can be provided for the investment and/or more directly to the consumer in the form of a price per unit of service lower than production cost. Other projects provide services without direct cost to consumers, such as roads and bridges that are free of user tolls.

Private investors regard infrastructure projects as any other investment, with acceptability based on criteria such as risk-adjusted cost of capital, payback, and breakeven. The public side of PPPs or strictly government projects, whether or not revenue generating, considers the economic consequences to a much greater degree. In fact, economic impact may be the primary criterion from the government's point of view.

For relatively small infrastructure projects (small to medium enterprise, or SME), such as technical services or local transportation, the approach to project design and analysis is similar to that for a manufacturing or service project. For large projects, such as hydroelectric, fuel-powered, or nuclear electricity generating stations, a very significant difference is financing (see the section on build-operate-transfer [BOT] financing in Chapter 4). Power plants may require investment in billions of U.S. dollars, so the financing arrangements are considerably more complicated than for SMEs.

The sheer size of these projects frequently requires government involvement. In smaller economies the investment is usually too great for the local private sector. Governments intent on economic development look upon the provision of infrastructure services as a means of attracting domestic and foreign investment. Under government sponsorship there is greater likelihood

of subsidized prices (e.g., utility service rates) for industry as an inducement for investment.

Government sponsorship also reflects growth-oriented economic policy, particularly in developing countries. For the production of consumer and industrial goods, in principle governments have the option of direct investment (as in former centrally planned economies) or indirectly influencing investment by the private sector, the approach now followed by all but a few command economies. In this way, governments promote investment by creating a supportive environment, in which the barriers for entrepreneurs are lowered, and prospects for meeting criteria enhanced, with adequate and reasonably priced (or publicly supported) infrastructure.

Physical infrastructure (e.g., transportation, communications, energy) is the most important. Some projects produce commercial services, with any of the structures previously discussed. For self-supporting revenue projects, calculation of expected return is identical to that of industrial projects. If services are provided with some degree of subsidization or free of charge (i.e., nonrevenue), the design might be oriented to cost minimization and the economic perspective, which in effect weighs the cost of subsidies against the benefits provided to consumers and to the economy in general.

Need alone is not a sufficient criterion for selection of a project within existing constraints (financing is usually the most apparent). Less developed countries often also are confronted with an *implementation constraint* (alternatively, *absorptive capacities constraint*).[9] Meaningful financial and economic analysis requires realistic assessments of benefits and costs under prevailing conditions. If the government is the sponsor, performance indicators for the project under consideration are compared with alternative uses of available capital to determine whether the project is a good use of public funds. Accurate estimation of benefits is the difficult part. Use of public funds imposes a need to analyze the effect on targeted beneficiaries, which is a function of numbers, income level, and social status. To avoid political bias, uniform standards for benefits and costs are applied across the country. In appraising alternative road projects, for example, cost savings accruing to users (per mile or kilometer) would be valued by the same or similar standards. For example, savings in fuel and maintenance would be the same for a project in one province or another, except for local adjustments (less developed regions might have slightly lower prices and wages).

The history of applying public funds for infrastructure projects across the world is not very encouraging. Large quantities of public funds have been expended on politically inspired projects of dubious utility, while socially valuable projects have often been set aside for lack of funding. Even in advanced economies, so-called pork-barrel projects are often added to

completely unrelated legislative actions, sometimes in the dead of night to avoid public scrutiny. But that is another story.

Infrastructure as a Design Constraint

The enterprise to be created by the project exists in an environment in which it requires supportive services—infrastructure—to function and prosper. The surrounding community (local, regional, and national) has provided services whose costs are either shared or, in some instances, completely covered with public funds, a form of private/public synergy. The greater the proportion of required infrastructure provided by the community, the less the burden on the project to augment services to the point that they provide a healthy and adequately supportive environment. Interacting with public officials and community leaders is one way to smooth the way. In fact, in many communities, public works projects have been implemented for the sole purpose of attracting a desired industry.

Infrastructure is a public good that affects the capacity of industry in general, and the project in particular, to operate effectively. It often requires commitment of public funds, which is not always the first priority of budget authorities. Although there is ample evidence that infrastructure investment is a factor in the level of productivity, when the host economy is under stress the tendency is to divert funds to consumption rather than investment.

This is a problem even in industrialized countries. In the United States, "on average since 1980, the growth of infrastructure investment has lagged behind overall economic growth. The result has been slow degradation of infrastructure, a worsening infrastructure deficit and mounting investment needs."[10] In a 2006 study, Rodriguez[11] found that a measure of "core infrastructure" which included highways, mass transit, airports, electrical and gas facilities, water, and sewers had a highly significant effect on both labor and multifactor productivity: "The decline in U.S. infrastructure investment after 1970 had led . . . to a decline in TFP (total factor productivity) growth of 0.8 percent a year—a very large effect."

Where infrastructure development requires commitment of public funds, government authorities tend to respond to what appear to be more pressing problems on their hands, to apply resources to the squeaky wheel, which becomes infrastructure only under dire circumstances such as the collapse of a bridge, a rail catastrophe, or a road washout from heavy rains or flooding.

The complex of infrastructure services, their availability, and the cost to the project is a key factor in location, best selected to optimize project performance. Services might be provided by private, private-public (PPP), or public entities. Private infrastructure investment is invariably for-profit, but its services are not necessarily more expensive than revenue-generating

public services. Public services provided at no cost to the project (funded from taxation and other government sources) are usually the most desirable but subject to uncertainty if public coffers are stretched tight.

Project investment and operating costs would be much higher in some locations as compared with others in the country, the difference usually attributable to infrastructure—typically, access to no-cost or low-cost services. For this reason projects are rarely implemented in the desert (unless there are natural resources to exploit). In fact, a salient feature of location analysis is cost minimization, with the cost of transportation for inputs and outputs of primary importance. In light of the possibility of changes in the energy outlook, prudence suggests at least consideration of a futuristic view concerning transportation. Some analysts believe that the system of energy generation and consumption will undergo a virtual metamorphosis, with far less international, and even interregional, movement of goods and services.[12]

Infrastructure is a significant factor in site selection. Many projects of existing companies are essentially design replicas of plants already in existence. These can be considered black boxes that need connections to supporting supplies of nutrients—utilities and other services that derive from local infrastructure—with availability, cost minimization, and reliability the major criteria. They may also require connections to sites and other facilities for disposal of effluents and wastes. For an assembly plant, transport costs of components from upstream affiliates or suppliers are a major consideration in site (or location) selection.

Profitability is directly linked to the existence of infrastructure services. Without this kind of public support, project capital would be needed to create the facilities and services needed for profitable operation—roads, power supplies, water wells and treatment plants, housing facilities for workers if not otherwise available at the project site. It is no wonder that profitability of a project with the benefit of services provided with public support is more favorable than a similar project in a location where such facilities are unavailable. This explains, to some extent, why investments flow to favorable areas with well-developed infrastructure, unless high product value justifies expensive modes of transportation (e.g., gold and diamonds mined in Russian Siberia are transported by air, which would not be possible in the case of most of the other minerals waiting to be exploited there, were cheaper transportation available).

Cost structure is fundamental to a profit-oriented project but is important in any case, even for nonrevenue public service projects. Infrastructure services represent a significant part of the cost of operations in any case: The question is, what part of the bill, and how much, does the project have to pay? Projects to develop or expand the capacity of infrastructure are usually too large for an individual manufacturing project to handle. A power plant

has to be large enough to exploit economies of scale—for example, 1,000 megawatts—while an individual energy user such as the project would rarely require more than 50 to 100 megawatts. Unless there are fortuitous conditions (e.g., a fast-flowing river with potential to build a dam and generating station that would serve project needs, or wind conditions at or near the site that justify erecting wind turbines), construction and operation of a small diesel generating station might be a solution, but the energy generated would usually cost considerably more than energy from the grid. Particular attention to cost and reliability has to be applied to those infrastructure services, usually including energy, transportation, and communications, which are essential for efficient operations.

As the buildup of infrastructure in an area has occurred over an extended period of time, expecting rapid response of the government to project needs is probably unrealistic. Appeals for government-funded infrastructure improvements in a given location have to be timed to account for lengthy delays involving legislative hearings and debate, the funding cycle, and implementation. Infrastructure needs involving SME projects might be much more quickly and securely implemented by the private sector. In some cases cooperative agreements can be drawn with other entities (enterprises, investment groups, or individuals) in appropriate fields to secure creation of needed service facilities.

Of primary concern from the project's point of view:

- Capacity of existing infrastructure to support project activities and to accommodate future growth—what issues need to be addressed?
- Capital investment and operating costs necessary to attain a level of infrastructure capacity and reliability that allows for unfettered project operations.
- Willingness of the community (local, regional, national) to expand capacity in accordance with the needs of the project at public expense; what is the funding gap between public support and project need (cost to project to provide needed infrastructure if not provided with public funds)? Consider possible reversion to community control at termination of the project (alternatively, consider cooperative agreements with private services providers).
- The funding gap, if any, between the cost of maintenance and repair of infrastructure and what will be provided by the community (costs that will have to be borne by the project).

Analysis of existing infrastructure service systems takes into account current capacities in relation to existing demand versus project needs, and reliability of the community to continue current levels of service. In all cases

it is advisable to consider the *aggregated contemporary* (all existing sources or demands) and *temporal* (cumulative demands and impacts over time) relations. Some other possible issues of concern regarding infrastructure components (other than capacity, maintenance, and repair) are:

- Solid waste management: disposal fees and outlook; indiscriminate dumping, pollution.
- Liquid waste management (nonseptic): disposal system—are lakes, rivers, and other waterways being contaminated or untreated wastes spread on land?
- Drainage and flood protection (storm drains, swales, dams, outlets—rivers and streams, lakes, etc.): designed for extreme events?
- Sewerage: pretreatment requirements, characteristics of effluents of other users.
- Water supply (waterways, groundwater, drilled and surface wells): treatment (primary, secondary, tertiary), quality (minerals, organics, radiations—e.g., radon, radium, uranium, etc.).
- Fuel supply (sources of gasoline, diesel, natural gas, propane): domestic supplies or imported; foreign exchange requirements.
- Transportation (roads and parking areas, railroads, and airports [passenger, freight]): traffic bottlenecks, safety.
- Communications (telephone, cellular, wireless, Internet): status of technology.
- Public facilities (recreation [parks, playgrounds, open space], cultural, educational, personal services): open access for project personnel?
- Housing (private residences, apartments, condominiums, hotels): to acceptable standards for project personnel, hospitality?
- Law enforcement (civil and private organizations): crime rate, respect for statutes and laws, impartiality of justice system.
- Financial: banks, securities exchanges, financial services.
- Technical services (private and public organizations): personnel qualifications; availability of materials, supplies, and equipment.
- Public health facilities (hospitals, clinics, private practitioners): endemic illnesses, state of medical practice and technology.
- Natural resources (mineral deposits, forests, watercourses, vistas, open space): overexploited to detriment of project interests?
- Educational and research institutions (colleges, universities, technical schools, laboratories): quality of training available to project personnel, research facilities, availability of consulting services for industry.

The project benefits from availability of skilled workers supplied locally, reducing or eliminating the costs of in-house education and training.

In the knowledge-based economy that extends to the developing countries, economists now include knowledge as a variable in the *production function* (describing relationships affecting efficiency of resource utilization) along with other factors, such as labor, capital, materials, and energy.[13] In addition to creating opportunities for transforming production factors into new products and processes, knowledge investments increase productivity of the other factors of production. For these reasons, project interests are served by collaborating with institutions that prepare highly qualified personnel and that conduct research related to project needs, promoting allocation of public funds and applying project funds to the extent necessary and practicable.

Infrastructure capacities as they relate to project needs have to take into account demands of other government, commercial, industrial, and public users, which may be affected by factors in the host environment: uncontrolled migration, excessively high population density, unauthorized or illegal settlements in areas not presently served.

SWOT analysis (strengths, weaknesses, opportunities, and threats) can be applied to those infrastructure elements that are critical to project operations, although a liberal approach to what is to be included in detailed analysis is prudent to avoid unforeseen potholes in the road. An example applies to the transportation system of the Cambria Yarns project. This essentially qualitative assessment is useful to deal with organizational issues related to infrastructure and also for pinning down related capital and operating expenditures.

Strengths

- Restricted access road to port, well engineered for safety and speed.
- Private haulers with sufficient capacity who have been in business for a minimum of 15 years, with good records for safety and timely deliveries.
- Efficient containerized port facilities.

Weaknesses

- Existing provincial and national fuel tax revenues consumed in maintenance of existing road system, limiting capacity of these government entities to expand the transportation infrastructure.
- Seventy-five percent of local (municipal) transportation and public utility budget spent on maintaining the existing system, so little available for new capital needs; local roads in need of repair.

Opportunities

- Try to employ good relations with local officials to promote use of local infrastructure budgets for leveraging additional private and public

investment in transportation infrastructure. Encourage private transporters to develop partnerships with local government to provide better and more restricted access routes from plant to turnpike.
- Initiate ongoing discussions between national government and neighboring country (location of port facilities) to improve rail line to port city.
- Growing level of industrial activity in country favors greater attention of authorities to transportation infrastructure.

Threats

- Inconsistent and subjective local and interstate enforcement of traffic safety laws and regulations.
- Heavy fines levied for violations of load and vehicular safety inspections, inhibiting expansion.

Resource Constraints

The enterprise, and the project from which it derives, requires a flow of feedstock in the form of people, materials, machines, equipment, and other types of capital to maintain its vitality and to allow it to grow. The design has to include the system of procurement for all major inputs, along with product specifications, sources, and supply channels. Logistical planning for acquisition of resources has to be applied both to the implementation project and for the operating enterprise. The supplies program for the implementation project (see Chapter 9) involves a sequence of purchasing, transportation, and storage (inventory management), many of them one-time or intermittent events. For the operating enterprise, an optimal plan for providing a continuous flow of materials and supplies has to be developed, taking into account trade-offs such as price, quality, order quantity, warehousing requirements, and reliability.

Logistical issues associated with maintaining the flow of required inputs involve extended and complex supply chains in the global economy. For critical inputs it is advisable to develop details of the supply chain from point of origin (source) to the enterprise gate, including transportation and handling sequences, storage nodes, and price buildup (e.g., markups, taxes and duties, commissions, and handling fees). Selection of production scale has to be commensurate with any constraints on the supply of resources. Where a potentially significant impact is indicated, design of the supply chain should be predicated on application of supply optimization tools and techniques that include consideration of management (coordination), transaction, and transportation costs.[14]

An overriding issue in the selection of sources of supply is make-or-buy. Availability and cost from prospective suppliers, particularly for imported items, can be compared with cost and reliability of including production as part of the project, or backward integration (bringing an existing supplier into the project fold). Make-or-buy can be decided independently of the basic project design, unless there is a capital constraint. Decisions on make-or-buy depend on exploiting cost differentials. Within a particular country, usually economies of production scale adjusted for transportation cost and supply security considerations would indicate the better alternative.

Extended supply chains in the globalized market rely heavily on low transportation costs, which in turn depend on inexpensive energy. However, fossil fuel costs are subject to increasing demand in the face of nonrenewable supply, a factor to be taken into account in designing the system for supplying inputs to the project.[15]

International trade has mushroomed since World War II, and particularly in the past few decades,[16] as a result of production factor cost differentials, mainly labor, which is not as mobile as capital. For some inputs, labor-intensive elements can be outsourced to lower-labor-cost countries (these conditions are by no means static; labor cost differentials are subject to change as working conditions improve in low-labor-cost countries). This applies mainly to assembly-type industries (garment, automotive, and others) with clearly identifiable production components that are assembled into the final product (consumer or industrial markets).

The automotive industry provides a good illustration: Volkswagen assembles one of its models in its factory in Wolfsburg (Germany). Wiring (as a fully assembled component) for this car is made in Jelenia Gora (Poland). All the subcomponents to produce the wiring bundle are outsourced—for example, all individual wires of different colors and diameter are imported, in this case, from Tunisia, already precut to the length according to Volkswagon's design and requirements. Wires travel some 1,500 kilometers from Tunisia to Poland and then 500 kilometers from Poland to Germany. Still, the transportation cost is lower than differences between labor costs in Germany and in suppliers' countries.

The relationship between material and labor costs varies by industry and the host environment. Together they usually make up the largest portion of production costs. Project inputs can be in the form of solids, liquids, gases, and any combination thereof, each presenting its particular issues of transportation and handling. Resources needed for production and other enterprise functions include raw and semiprocessed materials, parts, components, subsystems, and services (e.g., infrastructure, professional). A plan is needed for supply of any and all materials and services necessary for the production schedule.

Optimizing design of the supply chain for each major input can be approached by analyzing a discrete set of potential sources. Variables for each are compared, such as price buildup, optimal order quantity (see Chapter 2) and related ordering cost (may differ for domestic vs. foreign suppliers), technical specifications (quality), and reliability (price, flow).

Price forecasts differ for various types of suppliers. For example, unless moderated by international markets, supply price from an emerging market may be affected by projected changes in the country's currency exchange rate, which usually means that the price received for exports to an industrialized country will decrease as the local currency strengthens. Although quality standards are specified (see Chapter 9, the subsection "Standards"), the specifications from various sources may differ, with attendant benefits or disadvantages for the production process. Political or economic instability in a supplier country might threaten reliability of supply. Production standards in the supplying country are a factor (e.g., labor, environmental): If below international norms, compulsory adjustments could threaten reliability of supply. For raw materials, the extent of ore deposits may be a factor to consider (resource depletion).

Each of the factors can be assigned a weight and then each potential supplier rated on a point scale. Weights and points can be combined to optimize the selection.

Some resources require special considerations. One important factor is price elasticity for resources with little or no slack (current demand equal to or exceeding a relatively fixed supply). Superimposing the project's demand on the existing market may have a significant impact on prices. Intrusion of another major user could easily create a spike in prices if demand exceeds available supply.

For produce from agriculture, marine, or animal husbandry, if existing surpluses are insufficient to satisfy the project production schedule, new cultivation may be required, either integrated with the project or through grower contracts. Even if the input is currently, or has been, produced in the host environment, feasibility testing of production at the scale required by the project may be required (i.e., experimental production under representative conditions and pilot plant verification in some cases). It is very risky to base the project plan on availability of a crop that has not been previously produced in the area without experimental plantings on a commercial scale and testing of the crop to ensure its adequacy for the production process.

Sustainable yields and the cost of collection are major issues for marine inputs. The capacity of collection facilities (e.g., the fishing fleet) is determined by existing demand: It may be necessary for the project to provide its own facilities (marine vessels and staff) to augment harvesting capacity. Yields may be at or close to sustainable levels, so that additional harvesting

under prevailing conditions is not possible in the medium to long term. Harvesting levels may be controlled by domestic or international agreements; where quotas and control do not exist, prudence suggests independent analysis of sustainable yields in the light of project demand. Commercial farming of necessary marine inputs is one possible solution.

For required minerals, an existing survey, or one commissioned by the project, should provide details of the location, size, quality, uniformity of deposits, and composition. Processing details should be examined for the specific ore as mining, refining, and associated costs differ depending on composition and deposit characteristics. Pilot plant processing may be required to verify the suitability of minerals as input for the production technology selected.

Commodities such as metals, fuels, agricultural products, and livestock trade internationally. Prices generally fluctuate widely, depending on a host of economic and demand conditions (weather in case of agricultural production), usually too complex to analyze. Historical prices and trends may indicate a pattern, or perhaps can be analyzed statistically to determine a range of possible prices that can be considered in the project design. Some risk can be avoided if substitutes can be identified with more reliable pricing histories. Plastics, for example, have replaced metals in some products, but the market effect has to be carefully assessed. Another approach is to plan on futures trading to lock in prices, but there are associated costs that have to be taken into account (see Chapter 7).

Scarce capital can be allocated using an indicator such as net present value ratio (NPVR) as discussed in Chapter 3. From the economic viewpoint, shadow prices (see Chapter 5) reflect scarcity, but a similar approach can be employed at the project or enterprise level: What is the effect on the corporate objective(s) of applying some quantity of scarce capital to this project or to an alternative? A capital constraint can be relaxed with additional sources, but capital markets also reflect scarcity. Paying higher prices is one possible approach—for example, issuing a class of equity with preferential conditions (e.g., voting rights, dividends), preferred or convertible shares on favorable terms for investors, or tapping into debt markets employing one of the innovative financing schemes discussed in Chapter 4.

Strategic Project Planning

A *strategy* is a plan, or road map, for survival and progress toward the goal of project sponsors.[17] A good understanding of the current situation is essential for deciding how the project is to move from the status quo to the desired goal, both of which are states, or sets of conditions, that prevail at a given point in time. The overall strategy is the plan to make the transition

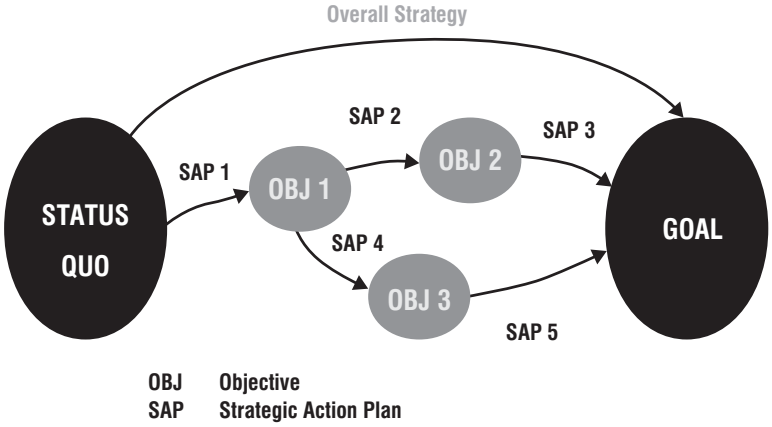


FIGURE 1.2 Strategy, Goals, and Objectives

from the status quo to the goal, which should define the desired state of the enterprise at some point in the future—for example, market share and profitability. *Objectives* are intermediate states. Objectives and goals are achieved through *action plans*, one or more actions or activities that will facilitate the transition. A particular objective may have precedent objectives, those that must be achieved before actions can be initiated to move toward the objective desired. The relation between strategies, goals, and objectives is illustrated in Figure 1.2. An example of precedent objectives is demonstrated by objective 3, which requires attainment of other objectives, namely carrying out strategic action plans (SAPs) 1 and 4, as prerequisites.

To put this in more concrete terms, consider a strategy for building market share for toothpaste. Objective 1 is attainment of brand recognition, and objective 3 is gaining the loyalty of young families with children in the household. The action plan for attaining objective 1 (SAP 1) includes a campaign to deliver small free samples through retail outlets in the target market area. For objective 3, the central theme of the action plan (SAP 4) is mass media advertising directed toward households with young children. The expenditure for each action plan is determined in accordance with quantitative targets.

During the project planning phase, and even after launch, the strategic concept may be in flux, evolving as more information feeds back into the decision process. Strategic decisions take into account the project as a system interacting with its internal and external environments; strategic features may change at irregular intervals as information and insights are clarified.[18]

Formulating a project strategy is one of the primary aspects of project design, relevant to enterprises large and small, its extent and complexity scaled to needs, commensurate with the range of project interactions.[19] If the project is undertaken by an existing enterprise, the project strategy should complement and be coordinated with the corporate strategy.

Importance and Utility of a Strategy For an operating entity such as an organism or enterprise, a strategy is the fundamental operational plan for securing survival and growth. In the private sector, strategic positioning is intended to achieve and maintain competitive advantage. For public-sector projects, strategies are directed toward optimizing the use of resources in the public interest. As a general principle, the strategic goal of the enterprise is attained through pursuit of a series of intermediate steps—long- and short-term intermediate objectives—with plans of action for their attainment. A core strategy[20] serves as a framework for functional strategies covering operational components—for example, marketing, production, procurement, human resources, research and development, corporate planning. Centralized coordination minimizes cross currents and inefficiencies. A strategy is fundamental to the design of the project, the framework for choice of design parameters—location, product features, capacity and production technology, and procurement channels. From the earliest stages, a preliminary or conceptual strategy serves as a guide to project configuration, such as setting up a joint venture with a foreign partner to secure export markets or achieving brand loyalty through outstanding product services. Alternative strategies for marketing and other project functions can be evaluated for compatibility and consistency with the core strategy.

Some Strategic Principles The strategy is intended to engender mutually reinforcing relationships between the enterprise and its external environment. A few principles are relevant for all types and sizes of projects:

- *Compatibility*. Design the project to be well integrated, and compatible, with the commercial and wider domains, so that enterprise creation and operations are supported, rather than opposed, by its external environment.
- *Focus*. Apply resources to strengths and avoid unpromising expenditures on weaknesses—in other words, focus on achievable objectives. Resources are best applied to areas of advantage, such as secure markets, competitive production, or superior technical skills.
- *Risk balance*. The adopted strategy entails risks associated with most, if not all, project elements, which can be managed (i.e., avoided, mitigated, or spread). The design is adjusted so that high risk associated

with some features (e.g., market, supply, technology, political environment) is reduced, perhaps by reallocating resources, while the risk of more secure features may be somewhat elevated. If project features are regarded as links in a chain, the weakest determines the chain's strength. Balancing risk in this way improves the overall strength of the chain. The area of greatest risk governs overall project risk (see Chapter 7, "Investment Decision under Uncertainty and Risk").

- *Cooperation*. A mutually beneficial strategy of cooperation with other individuals and entities avoids expenditure of time and resources to create all the facilities and skills required. Where possible, it is usually more productive than confrontation. The collaboration may be in the form of informal agreement, contractual joint venture, acquisition, or merger. Outsourcing of necessary components and services is advisable if the decision is based upon true competitive advantage rather than unsustainable exploitation of low-cost production factors, but for critical project inputs some form of cooperative venture with suppliers might offer greater security and price stability.

Formulating the Project Strategy Attainment of project goals in a dynamic operating environment is best served by finding the optimal combination of technical and economic features to produce the desired output, such as maximizing profitability and terminal value (at the planning horizon), or achieving or bettering cost and technical efficiency benchmarks at acceptable levels of risk.[21] Strategic orientation is conducive to selecting this best course of action. Project sponsors, designers, and management are encouraged to think dynamically, to study sources of inevitable change to be encountered, and to develop capacities and resources that are essential for survival and growth in a competitive environment.

The strategy encompasses offensive and defensive features, and temporal dimensions. Product and marketing innovation are overt attempts to reform the playing field. Building internal capacities—identifying and developing skills to match or better those of the competition—has more of a defensive nature. The strategy also identifies what must be done on a temporal scale: Quickly adjust the corporate culture to the needs of the market; enhance staff capacities over the next two years; increase production capacity to match anticipated market share within three to five years.

Design of the enterprise is predicated on its interdependence with its operational environment (Figure 1.1). Within the wider domain, the enterprise is viewed as an economic and social entity or organism that mediates the relationship between consumers and resources. As part of this environment it competes with other producers for resources (from suppliers) and consumers. Mutual dependence requires that the enterprise be designed to

adapt to environmental change and to results that do not follow precisely according to plan, and to influence or control change to exploit opportunities and minimize threats by being capable of assimilating and acting upon information about the forces underlying the process of change.

Project planners, once having formulated the strategy—what seems to be the best course of action—will almost inevitably be faced with new information that demands strategic rethinking. What appears to be the optimal plan at the outset may cease to be so tomorrow. As then General Dwight Eisenhower once said, "Plans are nothing, planning is everything." The corollary, "Strategy is nothing, strategic thinking is everything," emphasizes the dynamics of the environment. The strategic plan conceived during the planning phase will be influenced by the course of events, competitive reactions, and unanticipated environmental phenomena. Almost invariably, the strategy that is actually applied will differ from the original conception during planning and implementation and also during the operations phase.

So both project planners and the designed enterprise have to be adaptable to change, which for the enterprise can be promoted by staffing it with competent and flexible people and allocating resources to research and development (R&D).

Capacities that provide competitive advantage have to be identified—for example, product innovations, superior product quality, competitive costs, outstanding product services, or efficient distribution channels—that utilize existing and future market forces to advantage. To survive and grow in a competitive environment the enterprise needs to possess, acquire, or develop skills that confer advantage and provide for better performance than competitors, which may be vested in individuals or in organizational subdivisions. They are advantageous only to the extent that competitors are not easily able to replicate them.

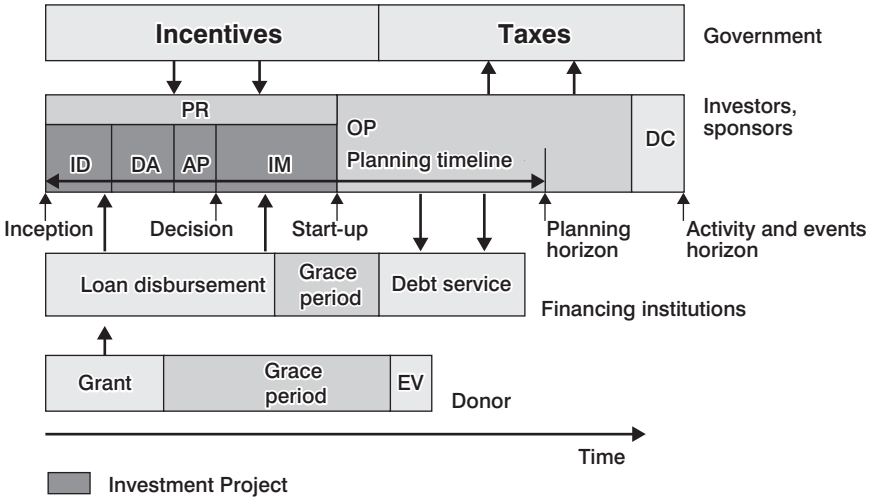
Process of Strategy Development A basic iterative process for developing the strategy consists of the following eight stages:[22]

1. Identify the vision, purpose, or mission of the project, its *raison d'être*, describing what needs are to be satisfied—that is, what markets are to be served (demographic, social, geographic)—and why the need for project output (goods and/or services) either exists or can be created.
2. Define project goals (increased earnings, improved market position, more efficient modus operandi, enhanced public image) and intermediate objectives necessary for their attainment.
3. Determine the project scope (products, markets, plant locations and capacities, distribution network) most conducive to achieving goals.

4. Consider positive and negative aspects associated with the overall plan and with each specific goal and objective:
   - Internal capacities (strengths, weaknesses).
   - External environment (opportunities and threats).
   - Competitor characteristics (strengths and weaknesses).
   - Skills required vis-à-vis actual or potential competitors.
   - Main advantages and constraints (e.g., resources, political, social, ecological).
5. Specify the approaches, or strategies, necessary to meet each project objective and goal:
   - Promising strategic options and preferences (e.g., low production cost, differentiation, plant location), rationale, and risks.
   - Cooperation: collaboration, joint venture, merger, acquisition.
   - Strategic mix: coordination between central strategy and substrategies related to project functions (e.g., management, administration, marketing, production, supply, finance, personnel management).
   - Strategic plan for project implementation (design, construction, and commissioning).
6. Identify and describe specific action plans necessary to achieve each objective and goal, for each functional area.
7. Define the system for implementing the strategy:
   - Coordinating and adapting strategic elements.
   - Assignment of responsibilities to functional areas and individuals.
8. Assess the overall strategic plan and associated risks (e.g., political, social, financial, environmental) in regard to the mission and goals, and decide whether the plan can be successfully carried out by the organization.

Comparative analysis of alternatives can be carried out essentially in one of two modes: If differences in alternative strategies are mainly in the details, variations can be considered within the structure as outlined; if the fundamental conceptual options differ considerably, better to analyze them independently and then compare assessments of each game plan to determine which is most promising.

Investment Cycle Capital investment has a cyclical character. The project is usually a component of an investment portfolio in which investments are planned, implemented, and carried out, then either terminated or liquidated, with residual capital reinvested in new projects. The investment cycle has relevance for project design and for longer-term planning, to contemplate postproject reinvestment possibilities at the planning horizon. Figure 1.3 illustrates project timelines and the investment cycle.



ID	Identification
DA	Design and analysis
AP	Appraisal
IM	Implementation
PR	Project promotion
OP	Operations
DC	Decommissioning, if applicable
EV	Evaluation

Planning timeline: Investors and other stakeholders consider activities within their particular time frame in assessing whether to participate in the project (this is the basis for appraisal).

Activities and events timeline: The full scope of activities envisioned as a consequence of investment in the project.

FIGURE 1.3 Project Timelines and Investment Cycle

Stakeholders have preferences that affect the time frame during which activities and events are counted in appraisal of the project from their individual perspectives, considering only those that occur up to the point in time relevant to their objectives and goals. For this reason, the *planning timeline* and its termination point, the *planning horizon*, differ for each of them. In any case, the timeline necessarily includes the investment period and a period of operations. Within the time frame up to the *activities and events horizon* are included all of the contemplated consequences of investment: the implementation project, operations, and possibly decommissioning after

operations are terminated (see the subsection "Decommissioning" later in this chapter). Some of these activities and events might occur beyond the planning horizon of a particular stakeholder.

At a point beyond the planning horizon, *evaluation*[23] of the investment, its operational performance, and conditions prevailing at that point will most likely determine future undertakings by each stakeholder, all of whom have the opportunity to improve their investment decisions with feedback on their appraisal methods.[24] This can be considered the termination of the current investment cycle. The purpose of evaluation is to assess what has transpired as a result of the decision to participate in the project and to plan for the future, the next investment cycle. Investors might conduct their evaluation at the planning horizon (see Figure 1.3), or earlier if results do not meet expectations; lenders, during or at the end of the repayment phase; the government, when the consequences of its participation (e.g., providing services or incentives) are apparent. For investors, such evaluation leads to a decision on the future direction of the enterprise, examining the effectiveness of the project and where to go from there—to continue existing operations, expand, change direction, or liquidate. For lenders, evaluation provides feedback intended to improve their ability to select projects and to rate the capacities of their credit officers. Governments use this information to update their development plans. A donor usually allows the project time to achieve the objectives and goals of the grant (a grace period) before assessing the project in relation to possible additional support or to improve project selection processes.

Completion of one cycle of planning, implementation, operations, and project evaluation after the plan has been executed leads to another, building on the experience of previous cycles.

The *investment cycle* is the description of the sequence of phases (and stages of development) from conception to the project's activities and events horizon. At the decision point the project is appraised, based upon the information developed during the design and study process and the criteria of participants. During the *investment phase* the project is implemented—the organization, facilities, supplies, and distribution channels are set up to begin production. Production and marketing plans are executed during the *operations phase*. Evaluation at the planning horizon gives rise to ideas about new opportunities and commencement of the next cycle.

For investors/sponsors, the planning timeline comprises the *investment project*, all or part of the *operations phase*, and possibly *decommissioning*. In most cases, the planning horizon is not commensurate with the expected life of the project, as investors and other stakeholders limit their planning to a time frame within their respective comfort zones—that is, where the determinant of the *planning horizon* is essentially the tolerance for risk

associated with forecasts of future developments. In assessing the project, performance indicators are predicated on projections only up to that point in time, and what is to occur beyond is essentially ignored.

The investment project includes stages of identification, design and analysis, appraisal, and implementation. Appraisal (see Chapter 8) is the process of comparing project design features and indicators of performance with criteria of stakeholders. Only when all necessary participants are convinced that their particular criteria are satisfied should the project be implemented. Project promotion—essentially a search for collaborators and funding, and securing tentative approval of relevant institutions and individuals (as distinguished from *product* promotion)—is an indispensable activity that commences at the conception stage and continues throughout the project, as long as needed to assure financial and other support necessary for its completion.

Bankers and other lenders are primarily interested only as long as credit that they have extended remains outstanding.[25] They supply credit during the implementation phase, may grant a period of grace during which only interest payments are normally due, expect the debt to be serviced according to a predetermined schedule, and essentially lose interest when the full amount of debt is repaid.

The project may require approval of government investment planning agencies, which are usually interested in the degree of conformance of project characteristics with their development plans (e.g., improving the economy of a particular region, technological advance, or employment creation). Governments may provide incentives in the form of capital or operating subsidies, guarantees, or tax holidays. A government's time frame for contributions and receipts in the form of direct and indirect taxes, as well as satisfaction of other nonmonetary criteria, determine its planning horizon.

The project may have the good fortune to receive a grant from a donor with interests in its projected outcomes—government agencies, nongovernmental organizations (NGOs, sometimes also called Civil Society Organizations), foundations, or private individuals. Eligibility requirements for a grant usually include submission of a proposal that is prepared according to guidelines issued by the grantor, which is then reviewed against other solicitations.

PROJECT DEVELOPMENT PROCESS

A well-designed project plan is a road map to successful investment. Without it the likelihood of taking a wrong turn is greatly elevated. Even for investors with extensive experience, many projects fail to meet expectations as a result of problems arising from one or more flaws in the project plan.

Compilation and analysis of relevant information, and then appraisal against criteria of investors and other stakeholders before committing capital to the project, determines whether it is a worthwhile investment. Promotion is usually needed either to attract investors or to acquire the necessary resources and other support. Project implementation—enterprise organization, construction, and plant commissioning—requires planning and management to develop an enterprise ready to carry out production, sales, and distribution.

Each investment project has unique characteristics that determine issues of concern. Objective and comprehensive study of how the project is to function in its environment in the short and long term helps to identify those issues that should be scrutinized and to identify appropriate project development activities and events pertaining to each project phase.

The project development process (PDP) comprises preoperational planning activities that first provide a basis for the investment decision, and then an investment phase during which the plant is constructed and commissioned and the enterprise organized. The planning process involves stages of design and analysis, increasing in depth as the project passes through progressively more rigorous screening. Although described as a linear progression of steps, in practice the process is iterative. In seeking an optimal project configuration, accumulated information at later stages is selectively fed back to earlier designs and decisions that are then modified in the light of that information. In fact, the sequence can be initiated almost at any point; only as information and ideas take shape can the entire project configuration crystallize.

Preinvestment Phase

At this point in the development process, quality of the project concept (see the later subsection "An Investment Opportunity") is of paramount concern (in the investment phase, time is of the essence to ensure that investment and cost projections are within acceptable bounds). Investors are well advised to avoid short-circuiting design and analysis, moving directly from project identification to a loan application. The time and effort expended in studying project alternatives to find the optimal design usually pays for itself many times over.

A project idea is conceived, from inspiration or perhaps from a general study of business opportunities in a country or region. Once the idea is germinated, investigation of its viability as an investment opportunity can begin. The project design normally goes through a number of iterations prior to becoming a reality.

In the course of investigating, designing, and promoting the project, each participant—investor, commercial bank, development finance institution, equipment and material suppliers, prospective clients, export credit

insurance agency, consulting firm, licensing authority—is a potential font of ideas and information.

The preinvestment phase commences with an opportunity identified. For an existing enterprise, the process may be initiated as part of the normal investment cycle, responding to a need for restructuring or rehabilitation, or to alter the trajectory of the existing enterprise. In any case, a perceived investment opportunity is developed starting with a preliminary profile of the project, which is progressively transformed to a comprehensive design that is feasible and optimal as the project passes through screening stages.

Project sponsors have something else to do, equally important as coming up with the project idea. As the project develops, a promotion effort is required to identify participants—investors, financiers, guarantors, suppliers—and their criteria of acceptability. Promotional effort is usually required throughout the preinvestment phase and may even extend to the investment phase.

Project Identification Identification of investment opportunities is the starting point. Project ideas can arise within the enterprise, from business associations or promotion agencies, or from special studies conducted for identifying opportunities within a country or region. Initiatives leading to promising ventures (commercial, industrial, infrastructure) that will satisfy needs of potential consumers can be undertaken by private and public investors or groups or by promotion agencies that identify opportunities at the sector or enterprise level, usually by disseminating project profiles. Figure 1.4 illustrates the project identification process.

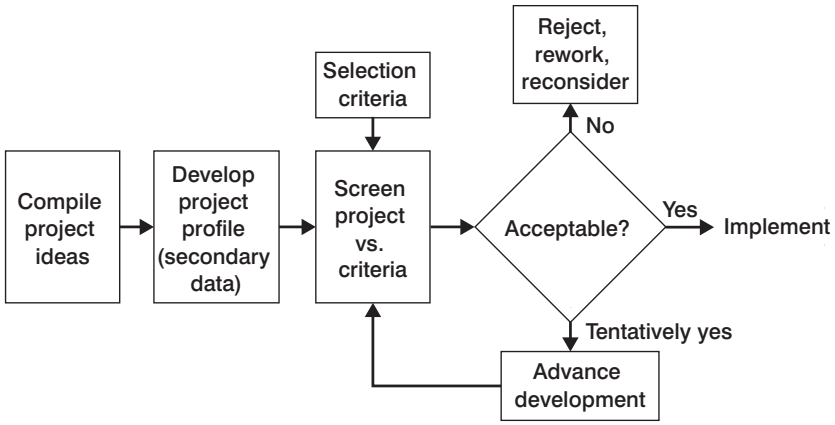


FIGURE 1.4 Project Identification Process

An Investment Opportunity At the outset, promising ideas have to be separated from unreasoned speculation.[26] Features to be examined in the process of identification include the following.

At the micro level:

- A *project* (*business*) *concept*—described in strategic terms considering the project's commercial environment and the wider socioeconomic and environmental domain (see the subsection titled "Strategic Project Planning"). The concept includes a *product or service* for which a need exists or can be created, and a *strategy* for production, marketing, and distribution that justifies prediction of survival and growth of the enterprise in its environment.
- *Investors*—willing and able to provide the necessary equity. Their history and qualifications must be adequate to organize the project and to qualify for any additional financing required.
- *Market*—people willing and able to buy or otherwise consume. In some cases, susceptibility of potential consumers to psychological transformations is necessary to engender a need for the product. Consideration of market includes determining a point in the product life cycle conducive to acceptance by sufficient numbers of consumers and a *market environment* supportive of the establishment of a new enterprise.
- *Resources*—available as needed for proper creation and functioning of the enterprise. These include managerial capacity and other labor; finance; raw materials and intermediate goods and services; a technology appropriate to the environment; land in a suitable location.

At the macro level:

- *Business climate*—a stable political environment; supportive industrial policies and practices; transparent, efficient, and even-handed legal and regulatory mechanisms.
- *Business cycle*—favorable for cyclical industries[27] if in the ascendant state.
- *Economic status and trend*—growing GDP and national income. A state of secular economic decline in the country or region does not generally bode well for a new business entrant, although economic adversity can enhance demand for low cost, basic goods.

Generation and Sources of Ideas Investment ideas arise from individuals —entrepreneurs, industrialists, enterprise managers—and from investment groups, business and trade associations, and commercial organizations (e.g., chambers of commerce) that have either performed general investment

opportunity studies or have accumulated ideas from members' experience. Information is usually preliminary or tentative.

Another type of source consists of broad-based sector studies, usually conducted under the auspices of international development organizations—for example, strategic sector studies sponsored by the Asian Development Bank.[28] They generally include a review of current economic conditions in potential host countries or regions, including structural problems faced in manufacturing or services and recommendations that can be very useful in project design.

Government investment promotion agencies (e.g., ministry of industry) and national development banks identify promising sectors through geographical area studies, resource-based studies, and industrial plans. They are conducted in both emerging economies and industrialized countries, and directly or indirectly identify possible projects that can then be subjected to further screening and promotion. These investment idea sources include:

- *Periodic reports* of industrial planning agencies on national or regional development plans, identifying industries to be promoted, incentives (e.g., tax breaks, subsidies, repatriation of profits), and special procedures for easing the permitting process for targeted industries.
- *Sector studies* of economic development agencies or educational institutions in areas of particular interest to government.
- *Local resource studies* by industrial promotion agencies. (A caveat: Sources of raw materials are relevant only if quality standards are compatible with product specifications acceptable to local or export market.)
- *Studies of natural resources* for potential exploitation. Such studies usually include information on quantity of deposits, quality, exploitation potential, and constraints (e.g., accessibility, environmental impacts). They may include analysis of the general level of demand, domestic and international, for the resource per se or for products for which the resource is a major component. A regional study might include a broader range of information in addition to data on natural resources (e.g., industrial profiles, infrastructure capacities, human resource availability, economic conditions).

Once interest is expressed in a particular project, a preliminary profile is prepared (often by the promotion agency) to quantify parameters, as the first step in developing the project idea into a proposal. Thereafter, the project requires study of increasing depth according to the level of interest of potential investors (see the "Preinvestment Studies" section later in this chapter).

One of the common sources of investment ideas is to follow the lead of others, a "me too" approach that is appealing for its simplicity. If one enterprise is successful producing widgets, then another will likely follow in its footsteps. This may be true if there is unmet demand and if the project is able to emulate the successful operating modes of its antecedents.

A much better approach is to study the characteristics of the environment to decide what needs exist or can be created for goods and services. Existing enterprises look toward expanding product lines. New investors survey the field for niches to fill. Innovators assess how their technology fits into the lifestyles or operating modes of clientele with no prior experience in using the product or service. Each sector of the economy—consumers, industry, agriculture, commerce—is scanned to detect what needs exist for different or additional goods and services. Some of these ideas can be rejected out of hand because it is fairly obvious that a key element is either missing or will not function in the environment.

Other sources of ideas include the following:

- Export potential predicated on international competitiveness, more promising without need for protection and/or subsidies.
- Unsatisfied or potential domestic demand based on projected demographic changes (e.g., population growth, age and income distribution, purchasing power, consumption patterns), nationally or by region.
- Gaps in backward and forward linkages for existing enterprises (i.e., vertical integration): currently procured inputs or products for which the enterprise is a consumer, or to exploit possible advantages that the enterprise might enjoy (quality, price, or security of supply) over downstream producers (alternatively, merger or acquisition involving existing suppliers or clients).
- Changing market conditions, such as demand/supply relationships, strengths and weaknesses of competition.
- Problems/constraints in economic development arising from shortages of essential facilities, services, infrastructure, or materials.
- Possibilities for import substitution of consumer or industrial goods. However, protections (if present) easily evaporate, particularly when provided for infant industries, so the question must be asked, how will the enterprise function in the absence of such supports?
- Incentives offered by government agencies—tax holidays, subsidies, grants for development in sectors or regions. (Caution: These must not be the sole basis for embarking on a business venture.)
- Technology developments: modernization of production and/or products; peripheral equipment for a product innovation (e.g., external

computer data storage media). Joint venture is a way to enter the business when the production technology is not otherwise accessible.
- Favorable costs of production factors.
- Substitutes for expensive or scarce products.
- Government policy initiatives (e.g., self-sufficiency in food production, energy generation).
- Replication of successful projects of another country in similar circumstances. Nuances of difference, including culture, have to be examined to ascertain if the experience is relevant.
- Delivery of an existing product at lower cost or a better product at the same price.[29]
- Review of international standard industrial classification (ISIC) lists or other lists of classified products.

Terms of reference for a study commissioned by the enterprise to identify investment opportunities should include at least the following items:

- Scope of opportunities to be investigated, including any or all of the possibilities listed earlier.
- Geographical area of interest.
- Socioeconomic environment, consumer demographics, disposable income.
- General business climate—economy and trends, government policies on commerce and industry.
- How information is to be presented—graphs, tables, formats, summaries.
- Accuracy and precision of surveys and secondary information.
- For each identified opportunity:
  - Estimates of capital investment and performance indicators.
  - Supply of major inputs—sources, quantities, qualities, prices.
  - Demand for outputs—unfilled or to be created.
  - Location analysis and site availability.
  - Infrastructure requirements and availability.

Investment Profiles An outline of the project, necessary for seeking partners and for other promotional purposes, contains all available information in concise form. For a potential stakeholder to seriously consider a project idea, a minimal amount of conceptualization is necessary, which usually can be developed from available data. A profile contains a skeleton description of an investment opportunity based on secondary information that outlines the basic business concept, technologies, markets, and preliminary estimates of investment and profitability.

Selection Criteria At the preliminary stage of project identification, selection is primarily an issue for prospective investors. Before other stakeholders enter the picture and more extensive project appraisal is undertaken, investors have to identify those projects that are to be pursued further. Preliminary *criteria* have to be defined, such as minimum size and growth rate of the market; minimum or maximum level of investment; leveraging potential; and approximate targets for a limited range of performance indicators. Minimum conditions may be specified regarding availability of local resources (quantities, qualities, and prices), availability of appropriate technology, the state of the economy in the region or country, infrastructure adequacy, and conformance of the project idea with industrial policy. In later stages, preliminary criteria are supplemented with definitive performance benchmarks, such as hurdle rate (return on investment), payback period, and breakeven.

Screening Profiles and opportunity studies are screened to sort out the most promising. The cost of investigation increases rapidly as projects are selected for more advanced study. Interesting opportunities can be classified systematically—for example, (1) worth further study if preliminary assessment reveals no obvious pitfalls and if there appears to be either an unfilled need for the product or service or one that can be created; (2) rejected outright because some feature will obviously not work in the environment (even these can be periodically reviewed to see if feasibility constraints have been removed); (3) recycled: projects that need some refining of major features before serious consideration; and (4) to be revisited at a later date*:* projects that are not currently timely but that could be implemented in the future after anticipated changes in the environment have occurred.

An effective method of screening is to rate projects according to the set of criteria using a point system. Each criterion can be weighted on a scale of 1 to 10 in terms of its significance or importance. Then each project can be rated for each criterion (on a scale of 1 to 5). The sum of products of category weights and ratings determines the points for each alternative. If a single project idea emerges for expansion of an existing enterprise, screening can be applied to alternative technologies and strategies, with the objective of utilizing planning resources in the most productive way.

Focusing attention on a limited number of project ideas with the greatest promise is a way to avoid wasting planning resources. Planners and investigators can do a better job when efforts are not diluted by having too much to do. There usually is a limit to the capital available for investment, so working on an excessively wide array of possibilities is unrealistic. Particularly where there are sufficient project ideas, it is better to quickly reject, or at least recycle, ideas that present difficult obstacles from the outset. These projects can be reconsidered at a later time. Meanwhile, attention can be

focused, and resources concentrated, upon the project that appears to be most likely to succeed.

Design and Analysis From the point that a project is selected for further development, it proceeds through a series of stages of design and analysis of more or less constant breadth and progressively greater depth (see the "Preinvestment Studies" section) as confidence in project viability increases. *Market research* addresses existing demand or the potential to create demand. The *marketing strategy* is an outgrowth of market study—how potential consumers will be attracted and how their needs can best be served. Together they provide information on expected sales revenues. *Engineering* defines the technology, production process and plant design, investment and operating costs, and human resource requirements. *Capital structure* defines the providers and proportions of debt and equity to finance the project. Analysis of *financial costs and benefits*, predicated on market analysis, engineering design, and capital structure, determines profitability for investors at market prices and other financial performance indicators. *Economic analysis* provides information concerning the project's social, economic, and environmental impacts.

A business plan (BP) is an outgrowth of study and the investment decision. The basic difference between the content of the BP and the design study is that the plan focuses on a specific approach to the business, whereas the study considers alternative configurations. In the project planning phase, the main utility of the BP is promotion—to attract investment capital and strategic partners, secure loans, and convince potential key employees of the viability of the enterprise. During the investment and operations phase the BP serves to communicate with enterprise personnel and other stakeholders, and as a management and planning tool. The BP basically demonstrates the viability of the business proposition. It builds on the information gathered from the study to answer all questions pertaining to finance, implementation, management, operations, and commercial viability. Appendix 1.2 is an outline of a typical business plan for a manufacturing enterprise.

Project Appraisal and Risk Project characteristics and performance indicators are compared with criteria of stakeholders. Appraisal by an independent consultant may illuminate issues beyond those otherwise identified. Appraisal is discussed in detail in Chapter 8.

Underlying appraisal is the element of risk, which arises when decisions are made in the face of uncertainties concerning predictions of the project's future activities and events. Each stakeholder considers risk factors associated with features and characteristics of the project with respect to particular objectives and goals. Risk can be handled in several ways (see Chapter 7):

adding a premium to criteria, effectively raising the barrier; determining variability in project parameters and how they individually and collectively affect predictions of outcomes; spreading risk among stakeholders; insuring against risk via either contracts or derivative financial instruments (e.g., commodities futures related to inputs and outputs—see Chapter 7). As in any other type of measurement, predicted operational characteristics and performance indicators can only be assessed in the light of uncertainties in both the project feature and the measuring instruments employed.

Decision A decision to invest is predicated on a positive outcome of appraisal. It means that criteria are satisfied, and the project is accepted and will proceed to implementation and operations. It also means that, in the opinion of investors, this is the best use of marginal uncommitted resources. Projects that do not meet criteria may be rejected, recycled, or modified (as described earlier).

Implementation Phase

The commitment to invest precipitates preparation and execution of the implementation phase (Figure 1.3), which commences at the time of the decision to go forward with the project, and comprises the following activities (see Chapter 9):

- Creating and staffing the implementation team.
- Enterprise formation, or creation of a responsible management entity (for an existing enterprise): organization, staffing, design of operating systems.
- Construction project: project management, detailed design engineering, procurement of capital items and start-up materials and services, construction and installations, performance tests.
- Plant commissioning and start-up.

A critical aspect of project development is the implementation plan, which specifies how these activities will be carried out. A disciplined approach to planning avoids the pitfalls of delays and overruns. One systematic methodology is the Logical Framework Approach (LFA), which employs a standardized framework document to identify inconsistencies.[30]

Operations Phase

A successful PDP leads to project operations—commencement of production and sales—as the organization attempts to fulfill planned goals and

objectives. Production and sales plans developed during the preinvestment phase are carried out during the operations phase. The quality of project study and design is a major determinant of success or failure—a plan based on inaccurate or inadequate information and assumptions is not conducive to success, no matter how well executed and operated. If operating forecasts or the strategies on which they were predicated turn out to be deficient, remedial measures (e.g., changes in financial structure, marketing approach, distribution channels) may be difficult and expensive.

Operating efficiency during the start-up period usually suffers from a combination of marketing and operational challenges. Marketing plans have to be fine-tuned to consumer needs, distribution, or product promotion. Workers' inexperience, problems with machinery and equipment, and uneven supply of all necessary inputs and factory supplies are early impediments to reaching production goals. Unforeseen operating problems may be related to errors and inadequate preparation during design and implementation phases. These factors have to be taken into account in formulating a realistic production plan.

At the planning horizon (the end of the relevant portion of the operations phase), stakeholders will face decisions concerning the future of the enterprise: whether to expand, rehabilitate, seek new markets and investment opportunities, or wind down operations. At the outset of the project, its future beyond the planning horizon can only be surmised, but it behooves sponsors and planners to try to keep one step ahead of the information at hand, at least to contemplate the future.

Decommissioning

It may be necessary to plan for decommissioning project facilities. A mining or energy project, for example, is often compelled by government authorities to clear the site and reclaim the land, returning it to its pre-project state or another state specified either by sponsors or by government authorities. Enterprises are usually required to safely dispose of hazardous materials. Plants may have to be dismantled and removed safely from the site. If the project has a defined life, some level of decommissioning may be required, with a plan required for financing and executing decommissioning as part of the overall project plan.[31]

PLANNING HORIZON AND PROJECT LIFE

The purpose of planning is to predict and control future events. The planning process integrates futuristic thinking and analysis of information and

assumptions to define the means of achieving desired outcomes. The planning horizon defines the period of time selected as the basis for project assessment. It may be the span of time that investors plan to retain control of the enterprise, the limit of time for which forecasts are considered reliable, or the economic life of the project. Based on product life cycle, the span might vary from 5 years (e.g., pharmaceuticals) to 15 or 20 years (e.g., standard production machinery) to 50 years (e.g., infrastructure, power plants). Economic life[32] (the period of time that the project is expected to continue generating acceptable benefits for investors) is related to several factors:

- Technological life of major plant, machinery, and equipment.
- Product or industry life cycle.
- Extent of raw material deposits.
- Rate of technology advancement.
- Capacity of technology to adapt to change (e.g., demand, operating environment).
- Regulatory constraints on exploitation of natural resource reserves, cumulative emissions.

Unless the plan is to exit in a shorter time, the most solid basis for the planning horizon is the reliability of forecasts and associated risk, which increases for estimates further out in time. The length of time to the planning horizon will affect performance indicators. A longer time frame usually results nominally in more favorable results, although this effect is mitigated or even nullified by time-related risk enhancement. Investors are well advised to select a planning horizon consistent with their investment objectives and not necessarily tied to intrinsic project characteristics such as economic life of major assets. For some types of projects potentially affected by cutting-edge technology, the increase in uncertainty over time limits the practical planning span to five years or even less. Consequently, the planning horizon is shorter than the possible project life.

How the enterprise fares in the future will be somewhat related to its flexibility in adapting to change in the business environment. However, project planning is inherently limited to the fairly predictable future. Anticipated changes are either included in the project plan or, at the very least, subjected to sensitivity analysis to measure their potential effects on the project's outcome.

PROJECT SCOPE

What is the extent of markets, the feasible geographical range of operations, the location and capacities of sources of supply and infrastructure? The

answers serve to define the project configuration that can be accommodated by the organization and its available resources; precisely what is to be done to plan, construct, operate, and (if necessary) decommission the enterprise; and what resources are to be employed in the process.

All of the functions of the enterprise and activities necessary for its creation have to be clearly identified. Facilities and activities within the scope of the project frequently extend beyond the plant site: effluents handling, treatment, and disposal; off-site transport and storage of inputs and outputs (including final products, by-products, wastes, and emissions); and offsite ancillary activities, such as housing, education, training, and recreation facilities. The project may also require primary offsite facilities such as marketing and distribution channels and public relations functions.

Defining the scope for expansion and rehabilitation projects can be particularly problematic. Resources associated with facilities and activities that are transferred from, or shared with, other enterprise functions not directly related to the project have to be identified and their costs and benefits allocated. To better understand the structure of the project, all facilities and activities within spatial and functional boundaries in each phase are identified—preinvestment, implementation, operation, and decommissioning (if applicable). One way is to break the project down into cost or profit units (centers) and then identify facilities and activities for each unit and for each phase. The process can be extended to several levels or stages of definition. For example, the production function can be divided into manufacturing, materials handling, and maintenance. Manufacturing, in turn, can be divided into machining, forming, forging, and quality control. This process provides a detailed conceptualization of the project and facilitates developing a preliminary implementation plan, which is a framework for estimating costs and benefits for each of the facilities and activities of functional subunits during each phase that can be aggregated to develop the complete picture.

During the planning process, functions may be identified that were originally not included in the project concept but that would logically fall within the project scope. Environmental analysis, for example, might lead to the inclusion of clean-waste technologies (e.g., closed-circuit processes) and environmental protection technologies (e.g., filters and systems for the removal of gases and particulates), either for business reasons or to comply with regulations. Upstream and downstream functions (e.g., agricultural production of project inputs that are not within the commercial scope) can be internalized to provide a more comprehensive and comprehensible economic analysis. At the study stage, make-or-buy decisions have an impact on the project's scope (outsource or manufacture). For very large projects that have regional or national impact, analysis might be carried out using a model

(input-output, economic base, multiplier, regional growth[33]) in which the scope is virtually the entire economy.

PREINVESTMENT STUDIES

Preinvestment study of industrial and commercial ventures has not been the rule throughout the world since the dawn of the industrial age. Failure to meet expectations often results from what appeared to be insignificant factors. Even in industrialized countries, direct investment is often undertaken in haste, avoiding the trouble and cost of investigation, but increasing the risk of failure. The weak link in the chain defines the fragility of the entire venture.[34] Hence, the need to study—to design all of the links so that they are of adequate strength, and to identify those that may be most subject to internal weaknesses or susceptible to external threats.

A project study has to provide synthesis (integration of project components operating as a system) and simulation (modeling to determine performance characteristics), explaining its design, how it will be implemented, and how it will function in the commercial and wider domains. If executed with due diligence, the study provides a solid foundation for decision making and for detailed design if the decision is made to go forward with the project. To enhance confidence, preliminary uncertainties identified in interim stages of study have to be clarified in later stages. For coherence of presentation, treatment of major issues is contained in the body of the study report (see Appendix 1.3); supporting materials (e.g., statistics, results of market surveys, detailed technical descriptions and equipment lists, plant layouts) are better presented as separate annexes.

One of the first issues concerning the magnitude and depth of a preinvestment study is its cost. Cost is a function of project type, complexity, and scope, which determine the time and effort required to collect and assess the necessary information. As the need for more detailed information increases, so does cost. If the level of uncertainty demands study out of proportion to the scale of the investment, it should probably be abandoned from the start.

For small to medium projects, the expected range of cost of study is approximately 0.5 to 3 percent of investment (fixed assets plus preoperational expenditures), increasing from preliminary investigation to comprehensive analysis; for large projects the range is from about 0.5 to 1 percent of investment. The percentage for large projects is generally reduced as a result of economies of scale for the main study and for support studies (e.g., markets or technology selection). Study costs are usually capitalized as part of preoperational expenditures.

Consultants' fees are a function of stature (experience and reputation) and the effort required to complete the study.[35] The study agreement usually covers travel and per diem, communications, design, and office expenditures. Other factors that enter into consultant fees are related to the work plan: consultants' workload and level of interest in the project, and the competency of project personnel to support the study.

Feasibility and Optimization

Study of an industrial investment opportunity involves both a feasibility and optimization process. *Feasibility* refers to what *can* be done but not necessarily what *should* be done. Rather, the most favorable, or optimal, of feasible configurations is to be sought, considering criteria of stakeholders.[36] There may be a number of feasible alternatives, which first have to be identified and then analyzed comparatively to find the most favorable choice. Detailed investigation of the range of alternatives—such as choice of technology, equipment, capacity, location, financing—may be problematic if carried along to more comprehensive stages of study.

Early screening for feasibility of alternative configurations avoids inordinate expenditure of time and resources. If a clear advantage does not emerge in early stages it may be advisable to study more than one configuration in detail—for example, two or three possible locations, or two production programs with different technologies. Once selected, a particular configuration has to be explained and justified as the best (optimal) solution considering objectives and constraints.

Types of Studies

A study commences at the time that a preliminary profile or other description of the project has been considered, and it has been decided to investigate further. A general principle is that the *breadth*, or scope, of study content is defined early in the project development process, with research and analysis of all aspects pursued from the start through stages of development as confidence in the project increases, modified as warranted by progressive understanding of the project and associated features. Study and analysis generally increases in *depth* as more resources are provided with increasing confidence of sponsors, with information and analysis at previous stages built upon, rather than discarded and begun anew.

The process of design and analysis of an investment project can be described in discrete stages but only to illustrate the progressive advancement of the simulation and synthesis that represents the project in the minds of stakeholders. The process is usually a continuum without clearly defined

stages. Alternative designs can be added or dropped from consideration at any stage, but to contain effort and cost, alternatives are investigated only to the point that it becomes clear that one or more configurations have superior characteristics. Interim reports may be necessary as the project progresses.

Ideally the project is studied without regard to the particular interests of various stakeholders, developing as complete a synthesis as possible within available resources. The following dilemma may surface for the designer: Professional judgment dictates the appropriate scope of study, but the client defines terms of reference that focus on a limited range of issues that are not considered sufficiently inclusive. The project can be declined (exited) or risks of an incomplete scope of responsibility can be explained (discontent voiced).[37]

The content and format of *study reports* respond to the particular needs and interests of stakeholders. Although it is costly and time-consuming (and avoided if possible), there may be a need for multiple reports as stakeholders commissioning studies have their particular areas of interest. For example, the financing institution may have its own report requirements that must be followed if the project is to be considered. Reporting requirements need to be sorted out as early as possible to avoid unnecessary duplication of effort.

Ultimately, stakeholders appraise the project. To support the decision process, and as a prelude to that eventuality, assessment of the strengths and weaknesses[38] of the business concept and alternative project configurations are included in the study report with increasing depth as the project progresses through stages of development.

The following breakdown of study stages is *for illustrative purposes only* and not intended to define discrete, indispensable steps in the process. In practice, these stages meld into a continuous process of refinement in project simulation and synthesis. The development of study and design of expansion and rehabilitation projects for an existing enterprise usually follows a similar pattern, except that recognition by management of the opportunity (or necessity) obviates the need for the most preliminary stages. An example of an expansion and rehabilitation project (Victoria Coke) is provided on our web site, www.wiley.com/go/investmentprojectdesign.

Opportunity Study Promising ideas are refined with a preliminary or *opportunity study* outlining basic features. A study at this level is usually based upon sketchy, readily available secondary information, often derived from similar projects or from the sponsor's knowledge. Refinement of the *business concept*, explaining why the idea should work in the proposed environment and its basic operating characteristics, distinguishes project study from identification of opportunities. Alternative approaches are investigated

regarding project variables, such as marketing (product, price, promotion, distribution), technology, location and site, and capital structure.

At this preliminary stage, information may be obtained from comparable existing projects, from commerce and industry organizations, from prospective equipment vendors and suppliers, and from trade statistics published by government commerce departments (e.g., import statistics of varying degrees of product specificity). Investment promotion agencies are potential sources (e.g., chamber of commerce, ministry of industry, regional and national development banks) that perform or sponsor specific project opportunity studies or general sector opportunity studies with the objective of stimulating industrial investment in a region or country. To be useful, these studies must contain a scope of information that reasonably explains the investment opportunity (a simple listing of product possibilities will usually not be very helpful). Information has to be more comprehensive than that developed during the identification stage (see earlier discussion).

Prefeasibility Study An intermediate stage of study is an effective means of clarifying the nature of the project before committing the considerable resources necessary for an investment decision, with the project idea elaborated in greater depth. Objectives of study at this stage are expanded from the preliminary (opportunity) stage to include the following:

- More rigorous confirmation of the logic of the business concept or project idea and strategy.
- Refined definition of the scope of the project.
- More thorough investigation of possible project alternatives and selection of the most promising for comprehensive study and analysis.
- Identification of critical features that may require in-depth study involving surveys, laboratory tests, or a pilot plant.
- More definitive calculation of financial performance indicators.
- Preliminary assessment of environmental, social, and economic impacts and their compatibility with standards and objectives.
- Identification of quantitative and qualitative stakeholder criteria.
- Preliminary assessment of projected performance versus criteria.

The project strategy, or corporate strategies in which the project has a role, are developed more fully and their logic tested. Alternative ways of approaching design features—product, technology, marketing and distribution, capital structure—are investigated. The strengths and weaknesses of each selected alternative configuration are compared in regard to implementation and operating characteristics. Feasibility of favorable alternatives is ascertained on the basis of available information.

At this stage the scope of the project is more clearly defined: Upstream and downstream linkages are identified, allocations of resources from other corporate activities are clarified, environmental impacts and mitigation measures are defined. Special support studies of critical features may be justified, such as laboratory tests of materials and components, pilot processes to test technical feasibility, or agricultural tests to confirm feasibility of commercial-scale production. Compatibility of the project with socioeconomic goals is investigated to an extent justified by the range and severity of impacts. Most information is derived from secondary sources, but compilation of primary data may be appropriate for the most critical factors (e.g., limited test marketing or survey for an innovative product).

Selection of the most promising alternative project configurations at an intermediate stage avoids inordinate costs of in-depth study required for an informed investment decision.

Feasibility Study At the *feasibility* stage the study provides a description of the project sufficient in breadth and depth for an investment decision. At this point, alternatives have been investigated to sufficient depth for a recommendation and analysis of the most promising approach. A *feasible* project can operate successfully in its operating environment. External constraints that may exist are manageable. The study is a detailed analysis of the project—in effect, a descriptive synthesis that clearly and in detail illustrates how it will function in the commercial (if applicable) and wider domain. The depth of investigation in all areas (commercial, technical, financial, socioeconomic, environmental) provides information adequate for potential investors, financiers, guarantors, and licensing agencies to decide whether to go ahead with the project.

If the study process has been properly carried out, the term *feasibility study* is a misnomer—a better designation is *optimization study*, as the proposed project design should be both feasible and optimal (the best way). Some characteristics of a feasibility study are:

- Description of a clear project concept and underlying strategy—how the project will successfully be implemented and operate in its environment.
- Well-defined project scope, with all onsite and off-site functions and their interactions identified.
- Justification for project configuration selected vis-à-vis feasible alternatives.
- In-depth study of critical features, including acquisition and analysis of primary data from surveys, laboratory tests, or pilot-plants tests; studies by qualified professionals of features requiring scientific expertise; detailed analyses of data with error and confidence intervals indicated;

checks, when necessary, against alternative sources to assure data consistency; and defensible conclusions based upon data and consistent with analyses.
- Critical information from reliable sources (e.g., tenders for major equipment acquisitions and construction).
- Comprehensive project design describing how project components will interact successfully, of sufficient depth to prepare detailed engineering plans, to develop the organization and distribution channels and to set up operations once the project is approved.
- Assessment of commercial, environmental, social, and economic impacts and their compatibility with standards, objectives, and criteria of stakeholders.

There is not a standard format, approach, or pattern that will serve all projects (or all stakeholders) of whatever type, size, or category. The composition and features of significance vary from project to project. For most industrial projects, the range of features outlined in the subsection "Content of an Industrial Investment Project Study Report" later in this chapter should serve as a guideline for the ground to be covered.

Estimates of performance indicators are meaningful only for the *project scope* defined to include all essential components and related costs. The scope needs to be documented with descriptions of all functions including preliminary design drawings, schedules, and procedures, to provide quantitative and qualitative parameter values that can serve to derive indicators and as supporting structure for more advanced project development.

Through all stages of development, the study follows an iterative optimization process, including simulation of all project elements and their functions and linkages, with feedback influencing changes that are necessary to correct design deficiencies. In principle, analysis of risk factors underlies every dimension of the study. Sensitivity of risky elements is examined through the range of potential variation (see Chapter 7). Risks associated with performance indicators and other characteristics are identified. If, in the light of analysis, insoluble problems render the project fundamentally unviable, this view needs to be expressed and explained. A study that averts an unwise investment avoids misallocation of scarce capital.

Assumptions underlying analysis are clearly explained and justified, and the foundations upon which the design is constructed are understood by stakeholders, and particularly decision makers. Identifying and correcting unfounded assumptions is facilitated when they are explicit. Virtually any project can take on a rosy hue if assumptions are sufficiently optimistic.

Caveat: An equipment or technology supplier may provide a so-called feasibility study free of charge, essentially a proposal to supply equipment,

emphasizing only those project features that support investment. As these studies are unrelated or ill adapted to the local business environment, they can be misleading and, if accepted at face value, result in an inappropriate investment decision. They may be no more than promotional instruments, describing operations under optimistic assumptions or ideal conditions and omitting risky or uncertain features. Production or sales estimates are based on conditions that might bear little relevance to the country in which investment takes place. Such expanded bids or sales supplements are offered widely, with only slight alterations specific to the operating environment for the prospective client.

Accepting a project on this basis might misdirect investment or lead to excess capacity. An investment proposal by an equipment supplier also has the disadvantage that typically no genuine alternative technology and equipment selection is considered. If equipment suppliers are to be the source of project proposals (not recommended in any case), they should at least be prepared under the same terms of reference to ensure that the so-called studies are comparable. The study must also relate to available production factors and local market and production conditions that permit a realistic assessment of potential benefits and costs.

The capital structure and commitment of investors and financiers are investigated at the earliest study stages and refined as the project nears the decision point, with detailed study proceeding only so long as there is reason to believe that financing will be made available when, and in the amounts, required. There is little sense in conducting a detailed feasibility study without reliable assurance that financing will be made available in the event of positive findings. Another factor is the cost of capital (see Chapter 4), which depends upon the capital structure and which has a direct bearing on project feasibility.

Support Studies Project elements that are vital to success and for which there is an unacceptable degree of uncertainty (information is insufficient, irrelevant, or otherwise unavailable) may require special support studies, highly focused, of limited scope, and providing a detailed technical analysis of sufficient depth to provide the necessary level of confidence in the results.

These studies are performed by technical experts, usually members of consulting firms specializing in the area of interest, or by testing laboratories. They are intended to answer key questions concerning the project's viability. For a project planning to exploit natural resources, for example, an expert might be called upon to assess the magnitude and quality of reserves and to identify any problems associated with their extraction and use.

Some types of special studies that may be required include:

- Market research—demand projections, analysis of competition.
- Marketing study—strategies for access, securing share, and penetration.
- Raw materials and other intermediate inputs—supplies, current and projected price trends.
- Laboratory (quality of material and component supplies) and pilot-plant (production process) tests.
- Location studies—evaluation of alternatives against criteria, such as minimizing transport costs.
- Environmental impact assessment (EIA),[39] particularly for projects involving hazardous materials or operations with significant environmental impacts (e.g., chemical plants; paper and cellulose mills; petroleum refineries; iron and steel mills; nuclear, thermal, and hydropower plants; and infrastructure projects).
- Economy-of-scale studies—to determine optimal plant capacity, a function of investment and operating cost.
- Technology selection—capital versus labor-intensive alternatives and degree of automation.
- Equipment selection studies concerning performance specifications and costs, particularly for large plants.[40] Special tests may be required if design specifications significantly differ from actual operating conditions; design adaptations may be necessary to deal with local operating conditions or with quality of available inputs.

Support or functional studies are conducted at any stage of project development. Judgment is required in deciding at what point it makes sense to devote resources to a special study. As these studies are concerned with vital aspects of the project, they must be designed for sufficient depth, with conclusions clear enough either to remove the issue as a bottleneck to subsequent stages of development or to verify infeasibility of the project in its current configuration.

Content of an Industrial Investment Project Study Report One of the first issues in determining the content of a preinvestment study report is the audience and its concerns. It makes no sense to produce a report that does not address issues of concern to the target audience; conversely, issues of *no concern* to the audience might be omitted (as potentially confusing), although discretion is necessary in deciding whether an issue has relevance even if it is not apparent to the stakeholder to whom the report is addressed.

The report content conforms to the project scope, describing the design features of all operating units and how they are to function and interact,

internally and externally. At the same time, issues of particular concern to individual and institutional stakeholders have to be addressed; some may even insist on having information provided in a particular format. *There may be a need for more than one study report*, with each addressed to a particular audience or audience range. This does not mean that the range of issues studied is incomplete, only that some material may be either included in summary form or even omitted in a report for a particular stakeholder. A suggested comprehensive outline for an investment project study report for the general audience is provided in Appendix 1.3.

The *executive summary* is a synopsis of the project for decision makers, which identifies and provides concise analysis of critical issues presented in detail in the main body of the report, with emphasis on key indicators and major risks. The study content follows the project scope, describing the design features of all dimensions of the operating entity and how they are to function and interact, internally and with the external environment.

Information Flow for Investment Project Study The general flow of information for the formulation and analysis of an investment project study is illustrated in Figure 1.5. Details of the content of each step are contained in Appendix 1.4. The process can be adapted for private-sector and public projects of virtually any size by adjusting the scope and depth of analysis as appropriate. The linearity of the diagram is only an approximation; in practice the process is iterative and can commence at almost any point.

As backdrop for all other aspects of project planning, an indispensable step is knowledge of markets, demand for goods and services to be produced, along with knowledge of the capacities and strategies of alternative suppliers. Market research should also provide projections of market share (proportion of demand to be captured by the project, i.e. sales projections) and penetration (rate of market acquisition).

A marketing strategy for approaching and attracting buyers or other types of potential consumers is part of project planning, geared toward potential consumers' willingness and ability to pay, but non-revenue public service projects also have to assure that the target population is ready and willing to consume the project's output.

Regardless of strategic purposes, in the final analysis, consumers are the focal point for all investment projects, whether responding to a business opportunity or providing a public service. Identifying the market and its characteristics, and how to promote and deliver the project output to potential consumers, are important, if not essential, aspects of a well-planned investment project, and vital for determining its features, e.g. scope, production program, technology and choice of location.

A more thorough discussion of these issues is included on our web site—Market Research and Marketing.

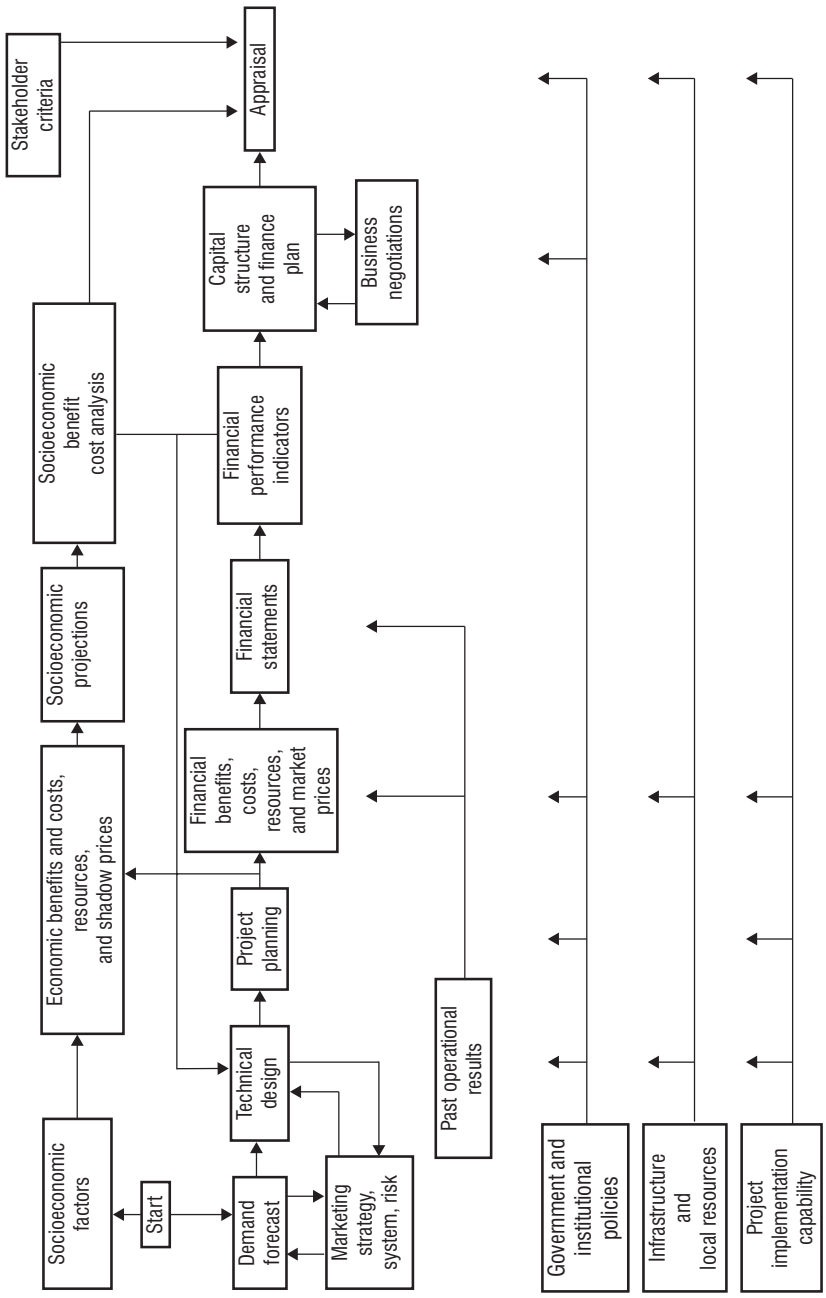


FIGURE 1.5 Information Flow for Investment Project Study
Source: Adapted from information flow diagram provided by Robert Youker.

The project plan is the foundation for financial analysis—estimates of revenues and costs and performance indicators. Formulation of the capital structure is an outgrowth of the identification of capital requirements and cost of capital, and is usually the subject of negotiations between financial institutions and venture partners.

For an existing enterprise, operating history is a useful backdrop for estimating the project's financial parameters and indicators and the implications of taking on the project for the organization (e.g., whether the project will strain the capacities of management or other resources). However, as a rule, extrapolation of historical operating data is not a reliable guide for predicting the future.

Characteristics of the external environment bear heavily on project formulation: Government and institutional policies have implications for engineering design (incentives related to location, technology choice); financial infrastructure determines, to a great extent, the project's capital structure (availability of equity, credit, subsidies, grants, tax policies, foreign direct investment policies); physical infrastructure capacities and policies influence design decisions (location, distribution channels); existing supply chains for local resources and their composition (quantities, qualities) affect production process and product design.

Analysis of economic, social, and environmental consequences parallels the development of market, technical, and financial analysis. Its purpose is to measure the impacts of the project on society, the economy, and the environment at the plant site, and to identify the need for accommodation and, in some cases, mitigation measures. Information is collected concerning elements of the wider domain (see Figure 1.1) and project activities that are linked economically or technologically. This information, combined with knowledge of resources to be generated and consumed, is the basis for some level of economic appraisal—anywhere from compatibility with the host operating environment for relatively small and environmentally benign projects to economic cost/benefit analysis (ECBA) with shadow (economic) pricing of inputs and outputs and measurements of other regional or national economic parameters and indicators (e.g., foreign exchange effect, shadow wage rate, efficiencies of resource applications) for projects with significant economic impacts (Chapter 5).

Overriding all of the information and analysis is the element of risk. Uncertainties and probabilities of occurrence related to markets, technical design, implementation, and financial and economic parameters are assessed quantitatively where possible, and qualitatively otherwise.

In the appraisal stage, characteristics and performance indicators are compared with stakeholder criteria, which have to be satisfied for key participants if the project is to go forward.

Conducting Studies

The expertise and composition of the team required to study and design the project depends on the complexity of the work to be done, employing specialists as required for investigations beyond the competencies of the team. The use of expert consultants can be expensive, but a wise investment if selected carefully on the basis of experience, ability, and need. Outside expertise, having no direct stake in the project, would be more objective in assessing project qualities than any of the potential stakeholders. An ounce of prevention is still worth a pound of cure.

A well-functioning design/study team under competent leadership, capable of coordinating disparate interests and viewpoints, is more likely to arrive at consistent, comprehensive, and logical conclusions concerning project viability.

The Project Design/Study Team Members of the team are selected to cover major areas, depending on project features. Examples include:

- Project economics—commercial and economic viability and optimization (preferably covered by the team leader).
- Markets (market analyst or marketing expert).
- Process engineering and technology (a specialist in the related field).
- Construction engineering—industrial, mechanical, civil.
- Organizational economics and management (structure and personnel).
- Finance and accounting.
- Environmental impact assessment.
- Social and political analysis.

The team is complemented, as needed, with expertise provided by other specialists (e.g., specialty markets, science and engineering). For example, the inclusion of an ecologist and/or sociologist (anthropologist) might be justified for a large project with significant social impacts. The team leader's responsibility, beside a possible role as specialist, is to plan, organize, direct, and supervise all activities of the team until the design/study is completed.

Accuracy and Precision of Design As the project progresses from conception through increasingly more refined stages of definition, the depth of analysis increases accordingly, with commensurate improvements in accuracy and precision of information and predicted results. Greater accuracy and precision implies greater cost. Rough approximations of the uncertainty or error to be expected in progressive stages of design development:

the combination of accuracy error (systematic error) and precision error (random error) is typically ±25 to 30 percent for an opportunity study based primarily on secondary information. For an in-depth study an error of ±10 percent might apply, a fairly tight level of uncertainty, which can be achieved only with reliable data sources. These error ranges apply most concretely to quantitative factors (e.g., size of the market, level of investment, cost of operations, return on investment), but qualitative aspects also contribute to error (e.g., uncertainties in personnel qualifications).

If errors are all on the same side (i.e., cumulative), the effect can be to produce a gross miscalculation of the anticipated performance of the project. However, errors generally tend to cancel one another, some on the high side and others on the low, so that the percentage can, in practice, be considered as applicable to each of the separate factors.[41]

However, these rough estimates of uncertainty are not a substitute for analysis of risk (probability of an undesirable outcome), which can be more accurately assessed with the more comprehensive approach related to uncertainties in specific parameters described in Chapter 7.

INVESTMENT PLANNING INFRASTRUCTURE

Assigning competent and qualified people to analyze and design the project is essential to successful investment. Availability of appropriately skilled designers and consultants in the host country is a function of the scope of industrialization, the quality of training and educational institutions, and the level of experience in the industry. For example, to assure international competitiveness, either a designer with experience in an export project, or consultants with appropriate competencies, are needed.

Savings in cost of implementation and more efficient operations usually justify expenditure on consulting fees in the preinvestment phase, and particularly if an ill-advised investment is avoided. A prudent approach is to develop the study in stages, with interim appraisals so that the high cost of a complete feasibility study is not wasted. Consultants can also pay their way by employing their expertise in negotiations with financiers and suppliers. With strong consultant services available to perform comprehensive and accurate investment studies, a good project can be approved on its merits, rather than relying on the creditworthiness of investors or on the collateral or other pledges to reduce lender risk.

Organizations and individuals either having direct experience or that have commissioned similar projects can be helpful in selecting qualified and competent consultants:

- *National and regional investment promotion agencies*. In many countries, government-sponsored development organizations (e.g., ministries, planning agencies) have primary responsibility for identifying and attracting investment projects. Ideas are documented in the form of project profiles or opportunity studies, and prospective sponsors or promoters are sought in-country and abroad. Some of these promotion agencies offer consulting services for preparing preinvestment studies and monitor projects during investment and operations phases.
- *National and regional finance organizations*. Development banks and some commercial banks offer consulting services for their clients. Although they consider investment projects as a rule from the point of view of creditworthiness of sponsors and collateral rather than performance characteristics developed through study, perceived risk reduction from employment of a competent and well-regarded consultant may be sufficient inducement for a commercial bank to support the project. It could also foster close cooperation between development and commercial banks, providing project sponsors access to the complementary services of each type of institution.[42]
- *National consultants*. In some developing countries, expansion and strengthening of consulting capacity has advanced through initiatives of regional and national authorities, which seek to stimulate economic growth by this means. The intervention usually targets development of management skills and technical expertise to foster an indigenous consulting capacity offering comprehensive services, thereby reducing the need for expatriate consultants. Government development agencies (e.g., ministry of industry and commerce) either support or provide consulting services in some countries. Universities also provide a consulting base, applying the skills of faculty in economics, business management, and engineering to form the nucleus of consulting services for local industries. Senior students are employed to carry out studies designed by faculty, receiving academic credits for their work and gaining professional experience.
- *International development organizations*. Organizations such as the Overseas Private Investment Corporation (OPIC) and other government-sponsored private investment promoters[43] either provide or finance consulting services for their clients: Food and Agriculture Organization (FAO), the International Labor Organization (ILO), the United Nations Industrial Development Organization (UNIDO), and the World Bank Group.
- *International consultants*. Availability, type of services, and qualifications of international consultants may be difficult to discern, a situation exacerbated by cultural factors and divergent views on the nature of

study required. For these reasons, clear and precise language and unambiguous conditions are essential in *terms of reference* (agreement to perform the study), to assure that the study addresses issues that are relevant to design and appraisal of the enterprise, provides supporting data and analysis, and proposes recommendations based upon the evidence. Especially close coordination between project sponsors and the international consultant in drafting the agreement provides a sound basis for determining consultancy fees and assurance that the study is consistent with project needs.

APPENDIX 1.1: ELEMENTS OF COMMERCIAL AND WIDER DOMAINS

Commercial Domain

Product

- Design features, technology.
- Substitutes.
- Packaging.

Markets

- Domestic and international.
- Structure, segments.
- Characteristics: cultural, social, economic.
- Purchasing power.
- Trends.

Prices

- Domestic and traded outputs and inputs.
- Market interventions (tariffs, quotas).
- Monopoly and monopsony (buyer's monopoly).

Competition

- Strengths and weaknesses.
- Production capacity.
- Market share.

Distribution Channels

- Structure.
- Price buildup.
- Strength.

Production

- Technology, automation, innovations in pipeline.
- Cost and trends.
- Materials.
- Raw materials, factory supplies, components, subsystems.
- Energy sources.
- Utilities (e.g., water, waste disposal, industrial gases).
- Recovery, reuse, recycling.

Infrastructure Services

- Communications.
- Transportation (vehicular, rail, air, marine).
- Water supply.
- Sanitation.

Finance

- Capital market for equity and credit.
- Short-term finance availability.
- Cost of capital.

Wider Domain

Socioeconomic

- General economic, macro-level conditions.
- GDP, national income, and growth rate.
- Personal income, disposable income.
- Economic cycles—frequency, intensity.
- Monetary and fiscal status and policies.
- Balance of payments and trade.
- Inflation.
- Foreign exchange rates, trends, interventions (e.g., currency controls).
- Employment.
- Investment policies and trends.
- Domestic and foreign investment.
- International trade—blocs, protection.
- Capital markets—domestic and international.

Culture and Society

- Social norms and mores.
- Kinship and family structure.

- Aesthetics.
- Value systems.

Social Goals and Objectives

- Work ethic.
- Thrift, spending, saving.
- Leisure-time behavior.
- Level of trust.
- Property rights.
- Attitude toward change.
- Social and religious organizations.

Political Status and Structure

- Form of government.
- Political leadership—structure and status.
- Political parties, orientation, membership.
- Legal framework, transparency, efficiency.
- Legislation and regulation of commerce and industry.
- Social legislation and labor laws.
- Status of labor unions.

Physical Infrastructure

- Roads, bridges, airports, seaports.
- Ecological.

Physical Environment

- Climatic conditions.
- Geology.
- Land features and sites.
- Land, air, and water qualities.

Natural and Other Resources

- Exploitable: location, type, quantity, quality.
- Other resources affected by the presence of the project.
- Cultural, historic, or scientifically significant sites.
- Flora and fauna, habitats.

APPENDIX 1.2: OUTLINE OF BUSINESS PLAN FOR A MANUFACTURING ENTERPRISE

Executive Summary

- Vision, mission, and goals.
- Key elements of project design for successful investment.
- Playing to strengths and overcoming weaknesses.
- Fending off threats and seizing opportunities.
- Summary of projected performance indicators.

Enterprise Description

- Sponsors.
- Organization—management team and key personnel.
- Production processes and technology.
- Investment plan—costs and schedule.

Products and Services

- Descriptions.
- Relation to rest of industry.

Market Analysis

- Segments and strategies.
- Demand.
- Competition, market share.

Strategy

- Basic strategic concept.
- Strengths and weaknesses vis-à-vis competition.
- Marketing strategy and sales forecast.

Management

- Key management personnel and responsibilities.

Financial Plan

- Basic assumptions and risk analysis.
- Capital structure, sources of finance.
- Pro-forma income, cash flow, balance sheet.
- Financial ratios, breakeven point.
- Projected financial indicators.

APPENDIX 1.3: OUTLINE OF DESIGN/ STUDY REPORT

Executive Summary

- Synopsis of the project for decision makers, with concise analysis of critical issues:
  - Project goals and strategy.
  - Scope.
  - Projected performance.
  - Analysis of critical risk factors.

Project Background and Concept

- History and sponsorship.
- Basic project (business) concept.
- Project and functional strategies.
- Role of the industry in the national economy.
- Market analysis and marketing concept.

Analysis of Market Research

- Description of product and/or services.
- Demand and growth rate forecasts, major determinants and indicators; reliability of market projections.
- Structure and characteristics of the market.
- Industry: growth rates, estimated future expansions, geographical dispersal, capacities and strengths/weaknesses of competitors, major problems and prospects, quality of products currently offered.
- Imports and trends, volume and prices.

Marketing Strategy, Sales Forecast, and Marketing Plan

- Description of the marketing concept, targets, and strategies for market segments.
- Location of markets and distribution issues.
- Competition—domestic and foreign.
- Sales program.
- Estimated annual sales revenues from products and by-products (domestic and foreign).
- Estimated annual costs of sales promotion and marketing (budget).
- Design of marketing organization and operating plan.
- Analysis of market risks.

Project Engineering

- Project scope (functions and activities).
- Engineering design (technology, process, plant):
  - Product analysis and specifications.
  - Technology description, rationale for selection (analysis of alternatives).
  - Technology acquisition and cost analysis, intellectual property.
  - Plant capacity (economy of scale).
  - Production program (products, by-products, wastes—including estimated annual cost of waste disposal).
  - Supplies program (sources, channels, reliability, cost)—domestic and imported material inputs and price trends: raw materials, processed industrial materials, components and subsystems, auxiliary materials, utilities (e.g., electricity, water, natural gas), factory supplies, spare parts, tools.
  - Plant design (analysis and layouts), including materials handling and storage.
  - Machinery, equipment and special tools—production, auxiliary, and service (quantities, specifications, installation details, costs).
  - Cost estimates for technology, machinery and equipment, installations.
  - Analysis of risks associated with technology, equipment selection, supplies, construction.

Organization, Human Resources, and Overhead Costs

- Enterprise structure (organization chart): functional divisions (e.g., management, production, sales, procurement, administration).
- Human resources requirements:
  - Classifications and skills, quantities, both domestic and expatriate.
  - Availability of human resources.
  - Estimated annual human resource costs, including wages and benefits, social services (e.g., housing, recreation, schools).
- Overhead costs
  - Cost or profit centers and identification of related cost elements.
- Analysis of organization and human resource risks.

Location, Site, and Environment

- Location analysis.
- Site selection.
- Site engineering:
  - Layout of civil engineering works, arrangement and description of buildings and construction features.

  - Site preparation and development.
  - Other site facilities (e.g., wells, substations, loading docks).
  - Off-site construction and installations, special civil works.
- Identification of social and economic impacts.
- Environmental regulations and impact assessment (EIA).
- Cost estimates for site engineering works (domestic and foreign), environmental mitigation, social compatibility measures.
- Analysis of risks associated with location, site and environment, social impacts.

Implementation

- Construction project:
  - Planning.
  - Special studies.
  - Detailed design and engineering.
  - Project management and staff.
  - Implementation schedule.
  - Cost estimates for construction project (design, consultancies, studies, management).
  - Analysis of implementation risks.

Enterprise Formation

- Organization.
- Staffing.
- Legal procedures (e.g., charter, incorporation, licenses, registrations).

Investment

- Fixed assets.
- Preoperational expenditures.
- Initial and operational working capital requirements.

Project Finance

- Capital structure.
- Capital sources, disbursement schedule, domestic and foreign exchange.
- Cost of capital.

Financial Analysis

- Estimate of production cost and cost of goods sold.
- Financial statements (income, balance, cash flow).
- Financial indicators—static (payback period, ratios, breakeven).

- Financial indicators—dynamic (net present value, internal rate of return, dynamic payback).
- Financial criteria.
- Criteria versus indicators.
- Sensitivity and risk analysis—rates, inflation, exchange rates.

Economic Analysis (Economic, Social, and Ecological Impacts)

- Compatibility with host environment.
- Benefit/cost, value-added analysis:
  - Supplementary economic indicators (e.g., efficient use of scarce resources).
  - International competitiveness.
  - Foreign exchange effects.
  - Employment effects.
- Externalities (economic, social, ecological).
- Conformance with local, regional, and national objectives.
- Sensitivity and risk analysis.

Project Appraisal, Conclusions, and Recommendations

- Major strengths and weaknesses, opportunities and threats.
- Projected performance versus criteria.
- Recommendations (e.g., further study, risk alleviation, extension or contraction of scope, change in capital structure).

APPENDIX 1.4: INFORMATION FLOW DETAILS

See Figure 1.5 for a graphic depiction of the general flow of information.

Technical Design

- Product mix.
- Location, site.
- Size, scale, timing.
- Technology.
- Physical inputs.
- Physical outputs.
- Technical risk.

Socioeconomic Factors

- Economy and trends.
- Social milieu.

- Economic and technological linkages.
- Ecological setting.
- Shadow prices (regional or national parameters).

Economic Benefits and Costs: Resources and Shadow Prices

- Generated resources (products).
- Consumed resources (operations):
  - Land.
  - Labor.
  - Capital.
  - Foreign exchange.

Socioeconomic Benefit/Cost Analysis

- Economic internal rate of return, net present value, benefits/costs ratio.
- Foreign exchange impact.
- Efficiency of resource consumption.
- International competitiveness.
- Ecological benefits and costs.
- Socioeconomic sensitivity and risk.

Project Planning

- Strategies.
- Engineering.
- Procurement.
- Contracting.
- Construction.
- Start-up.
- Commercial (inventories, sales, etc.).
- Marketing.
- Organization and human resources.
- Training.

Financial Benefits/Costs, Resources, and Market Prices

- Sales revenues.
- Operating costs.
- Fixed assets.
- Working capital.
- Preproduction.
- Implementation project costs.

Financial Statements

- Income statements.
- Funds flow: sources, uses.
- Real and financial flows.
- Balance sheets.

Financial Performance Indicators

- Liquidity.
- Breakeven.
- Payback.
- Static indicators (rate of return, ratios).
- Dynamic indicators.
- Financial sensitivity and risk.

Capital Structure and Finance Plan

- Debt.
- Equity.
- Sources.
- Cost of capital.

Appraisal

- Strategies.
- Technical.
- Commercial.
- Managerial.
- Organizational.
- Financial.
- Economic
- Social.
- Ecological.
- Implementation plans.
- Risk assessment.

Past Operational Results

- Physical units.
- Financial statements.
- Financial analysis.

Infrastructure and Local Resources

- Institutional (private and public sectors).
- Internal.

Project Implementation Capability

- Planning.
- Scheduling.
- Construction and start-up.

NOTES

1. Two examples: Locally procured replacement nozzles for a grain processing plant were found to be inadequate because the alloy used in their fabrication could not bear the erosive effects of high-velocity flows; imports proved to be problematic because foreign exchange was not available. A plan to procure locally available coke for a steel plant was later undermined by unforeseen impurities that rendered the coke unsuitable for the process.
2. Aesthetics is now an aspect of the commercial domain, with investment potential, viz. landscape, cityscape, or other elements of cultural heritage, not to mention product design attractive to potential buyers.
3. No listing of this type can be complete; it should be considered as no more than a guide to possible issues to be addressed in designing the project. Some can be discarded out of hand as inapplicable for a given type of project. Others may gain in importance, as the project configuration is progressively refined.
4. In recent years, by Donella H. Meadows, Jorgen Randers, and Dennis L. Meadows, in their books *Limits to Growth: The 30-Year Update* (White River Junction, VT: Chelsea Green, 2004) and *Beyond the Limits* (1992).
5. After the end of the cold war, changes occurred in the world economy, characterized by the Washington Consensus, which essentially promoted standards for international trade and development. As a consequence of more liberal trade policies adopted by the industrialized countries, the significance of national borders is diminished, as capital and other production factors flow across them with more frequency and ease. Trade deficits are balanced with increased capital flows and, in the case of the United States, by external purchases of national debt. The structure of the labor force has changed dramatically, as outsourcing of services and manufacturing have given new impetus to emerging economies.
6. The Aral Sea, located in the Central Asian republics of Kazakhstan and Uzbekistan, was once the world's fourth largest lake, but is now only 30 percent of its original size. Excessive diversion of its feed waters for irrigation projects degraded the entire sea basin: It greatly reduced fish production, increased salinity and pollution, led to violent sandstorms, diminished fresh water supplies, and increased human health problems.
7. Recent economic developments indicate that corporate social responsibility, which includes environmental and ethical considerations, is positively correlated with corporate financial performance.
8. In the United States, courts have frequently overruled exclusions of the Comprehensive Environmental Response, Compensation and Liability Act of

1980 (CERCLA), which absolves property owners of liability if unaware of preexisting pollution. For example, Aviell Services was not allowed to recover unanticipated cleanup costs of a property it had purchased (see "Supreme Court Rules on Case Involving CERCLA Recovery Costs," *Pollution Engineering*, December 23, 2004, www.pollutionengineering.com/Articles/Regulation_Update/f654f9afefd68010VgnVCM100000f932a8c0).

9. *Absorptive capacity* refers to productive use of investment funds, particularly in developing countries. Project implementation requires not only financial means but also competent contractors, capable of implementing the project on budget, on schedule, and to specified quality standards. A country lacking this capacity is less attractive for investment—one possible consequence is that the project would require foreign contractors, which would increase the investment and diminish the attractiveness of the project. An indicator of capacity deficiency is disparity among skills categories, with wages for scarce skills a multiple of those for nonscarce skills.
10. James Heintz, Robert Pollin, and Heidi Garrett-Peltier, "Infrastructure Investments and the U.S. Economy," http://www.infrastructureusa.org/wp-content/uploads/2009/07/aam_investments.pdf.
11. Francisco Rodriguez, "Have Collapses in Infrastructure Spending led to Cross-Country Divergence in per Capita GDP?" background note for World Economic and Social Survey of the United Nations Department of Economic and Social Affairs, 2006, www.un.org/esa/policy/backgroundpapers/rodriguez_1.pdf.
12. See Jeff Rubin, *Why Your World Is About to Get a Whole Lot Smaller: Oil and the End of Globalization* (New York: Random House, 2009). Although the dire energy scenario depicted by Rubin is disputed by many analysts, depletion of easily mined fossil fuels will almost certainly raise the relative cost of energy, assuming it does not so adversely affect global economic activity that demand is significantly reduced.
13. Organisation for Economic Co-operation and Development, *The Knowledge-Based Economy* (Paris: OECD, 1996), www.oecd.org/dataoecd/51/8/1913021.pdf.
14. See Poirier (1999).
15. At least one analyst of global trade believes that the current system is unsustainable and that supply chains will become much shorter in the near future. See Rubin (2009).
16. From 1980 to 2009, global exports as measure in U.S. dollars increased by a factor of 6. See World Trade Organization (WTO) statistics database, http://stat.wto.org/Home/WSDBHome.aspx.
17. Just as an individual grows in intelligence, an enterprise can grow by doing things better, more intelligently, and using resources in more creative ways to produce more value-added. It is not necessary to utilize more resources to grow.
18. A strategic concept may appear cast in stone, with brick and mortar in place, but even then prudence demands that nothing remain sacrosanct if new information prescribes a change in direction.
19. An example of project and marketing strategies is provided in Cambria Yarns Project (see our web site).

20. For an existing enterprise, the basic project objective and strategy are coordinated with corporate objectives and strategies.
21. A number of models and systems have been developed to provide structure to the strategic planning process. Of greatest relevance to project planning are operations research, a discipline in which mathematical models are used to seek optimal decisions, applicable to some complex project design decisions (e.g., production, distribution, multicriteria optimization; analysis of political, economic, social, and technological (PEST) factors; brainstorming, which is a loosely structured group activity to promote creative thinking; scenario planning, meaning strategy derived from analysis of a limited number of scenarios concerning future developments and how they affect the project; force-field analysis, in which driving and restraining forces in the operating environment concerning cultural and economic factors are presented diagrammatically; and Kepner-Tregoe Matrix, a systematic approach to decision making, similar to SWOT analysis. Some models are more applicable to strategic dynamics of an operating enterprise: for example, real options theory is an approach to adapt management decisions to market developments.
22. Alternative processes for developing the strategy are primarily related to orientation or focus: concentration on issues arising from SWOT analysis; alignment of goals and organizational resources; organic development based on organizational culture, vision—in other words, doing what comes "naturally."
23. The term *evaluation* is distinguished from *appraisal:* evaluation is ex post, whereas appraisal refers to preinvestment assessment.
24. Evaluation by financial institutions such as the World Bank and its affiliates is intended to determine the effectiveness of the projects that they finance. It is normally conducted when the consequences of investment in the project have been sufficiently manifested. "The goals of evaluation are to learn from experience, to provide an objective basis for assessing the results of the Bank's work, and to provide accountability in the achievement of its objectives." (World Bank Group, Global Environment Facility, Monitoring and Evaluation, http://web.worldbank.org/.)
25. This is usually not true for development banks, whose mission is economic improvement. Their interest may continue beyond cancellation of debt, focused on evaluating their involvement in the project relative to their continuing efforts to stimulate economic progress.
26. Most of the characteristics of a business opportunity apply as well to a public-sector opportunity.
27. Cyclical industries generally provide durable products (that provide services for an extended period) for which demand varies according to the state of the economy. Examples are automobiles (products) and producer equipment maintenance (services).
28. These types of studies are conducted by a number of international finance organizations. As an example, see "Baseline Surveys and Sector Studies in Bangladesh's Engineering, Agribusiness, Textiles and Apparels Sectors," sponsored by the International Finance Corporation (IFC), Southeast Asia Enterprise Development Facility (SEDF): "To achieve higher growth IFC SEDF

intends to help the SMEs producing better quality products, attain more productively, adhering to environmental and social compliance standards with a better understanding of their markets." (www.dgmarket.com/tenders/np-notice.do~3707369.)

29. This is the impetus for much foreign investment in Central and Eastern European markets in the early twenty-first century.
30. The Logical Framework Approach (LFA), also called Objectives Oriented Project Planning (OOPP), is a project design methodology that imposes a logical discipline on the project design team. The idea is to devise a relatively complete and workable project plan, so that implementation will proceed without incurring delays and cost overruns. The technique employs the Logical Framework document (*logframe*), a 4 by 4 matrix, each cell of which contains text that describes the project's most important features. The logframe is intended to identify deficiencies in the project design. See *The Logical Framework Approach, Handbook for Objectives-Oriented Planning*, 4th ed. (Oslo: NORAD, 1999); or see *AusGUIDEline: The Logical Framework Approach* (Australian Agency for International Development, June 2003), http://portals.wi.wur.nl/files/docs/ppme/ausguidelines-logical%20framework%20approach.pdf.
31. The nuclear power plant at Stade, Germany, was commissioned in 1972 and shut down in 2003. A decommissioning project was undertaken that includes completing dismantling of all facilities by 2015. The reason for the shutdown was economic, as the plant produced only 630 megawatts, about half the capacity of most of Germany's other power plants, and also was subject to a state levy on cooling water from the Elbe River. Decommissioning costs are in the order of €660 million, considerably higher than initially anticipated. Had the full amount of decommissioning costs been taken into account, it is likely that the plant would have been considered commercially unviable at the time of the initial investment. The high decommissioning costs would most likely have resulted in unacceptable, or at least ambiguous (e.g., more than one IRR—see Chapter 3), financial performance indicators.
32. The *efficient* (optimal) economic life minimizes long-run average costs of production. It is easier to estimate for smaller projects.
33. For example, see Robert L. Mansell and Robert W. Wright, "A Neoclassical Model Evaluating Large-Scale Investment Impacts on the Regional Economy," *Growth and Change* 9 (1) (January 30, 1978): 23–30 First published online by John Wiley & Sons, July 3, 2006. (http://onlinelibrary.wiley.com/doi/10.1111/j.1468-2257.1978.tb00356.x/full.)
34. After a steel plant commenced operation it was discovered that plentiful domestically available coke contained impurities that were incompatible with the quality specifications for the product for which the factory was built. A plant was constructed to produce nonfoaming detergent soap for the local market, neglecting the local preference for natural soaps with high foaming action. A plant for producing high-quality wooden spindles faltered because it did not have a sufficient source of convertible currency to purchase the necessary spare parts.

35. As a rule of thumb, the range of effort required, from the opportunity stage to a comprehensive study, is from 2 to 3 person-months to 12 to 15 person-months, applicable for most medium-scale industrial investment projects.
36. The relationship between feasibility and optimality is further described in Chapter 5 in the section titled "Economic Pricing Principles."
37. The dilemma is expounded upon in D. L. Weimer and A. R. Vining, *Policy Analysis: Concepts and Practice*, 3rd ed. (Saddle River, N.J.: Prentice Hall, 1997), after A. O. Hirschman: voice (criticize), exit (decline), disloyalty (sabotage). The last option is not considered in the text!
38. See the section on SWOT analysis in Chapter 8.
39. Required by some international financial institutions as a condition for financing.
40. Equipment procurement—invitations for bids, evaluation, contracting, and delivery—is a critical factor for large investments, in which the structure and economics of the project depend heavily on the type of equipment, related production cost, and price.
41. The theoretical justification for this assertion is explained in Malinvaud, E., "First Order Certainty Equivalent," *Econometrica* 37 (4) (1969).
42. In some cases commercial banks co-finance projects in cooperation with development finance institutions.
43. See Directory of Development Organizations, http://www.devdir.org/.

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