

# Chapter 1

## *Introduction*

**SECTION 1.1**

**1.1a** To plan for a football game, a visiting head football coach must:

- Make sure that his players and coaches understand the game plan
- Prepare his players physically and mentally for the game
- Study opposing team game films
- Understand strengths and weaknesses of the opponent
- Maintain the discipline of his players

To operate the team during a football game, a visiting head coach must:

- Continuously update his game plan based upon what the opposing team does
- Communicate these updates with his coaches and players
- Keep players physically ready to play
- Replace injured players with other quality players if at all possible
- Call the best plays that will score the most points and make victory most likely

**1.1b** To plan for a football game, the home team quarterback must:

- Practice drills and fundamentals
- Understand role in game plan
- Become familiar with pass receivers' skills and abilities
- Assume leadership role of team

The operating activities that a home team quarterback must do are:

- Operate coaches' game plan on the field
- Lead team against opposition
- Use skills learned in practice
- Minimize mistakes
- Relay plans from sidelines to all players in the huddle
- Win the game

**1.1c** To plan for a football game, the manager of refreshment vending must:

- Make sure all food, beverages, condiments, and paper supplies are ordered and stocked
- Hire employees to work the vending locations
- Pay suppliers
- Understand what refreshments field personnel will need during the game

The operating activities that a manager of refreshment vending must do are:

- Serve customers as efficiently and professionally as possible
- Restock vending locations whenever necessary
- Keep fans updated on game activities with televisions at vending locations
- Solve customer problems

**1.1d** To plan for a football game, the ground crew manager must ensure that:

- Lines are painted on the field
- Grass is mowed
- Damaged turf is replaced
- Necessary equipment for the teams is in its proper place
- Locker rooms are prepared for the teams

The operating activities that a ground crew manager must do are:

- Replace damaged turf, if possible, during the game if weather is bad
- Be ready for any grounds problems that may arise during the game

**1.1e** To plan for a football game, the stadium maintenance manager must:

- Examine plumbing fixtures to make sure they are operational
- Clean the stadium and pick up trash from the previous event
- Repair any seats or bleachers that are damaged
- Clean bathrooms
- Repair and replace any necessary audio or video equipment for the stadium

The operating activities that a stadium maintenance manager must do are:

- Respond to any equipment breakdown
- Respond to any plumbing breakdown
- Respond to any power outage

**1.2** Ten components of a football facility are:

- The stadium structure
- Parking lots around the stadium
- Vendor selling areas
- Maintenance components
- Grounds-keeping equipment and personnel
- Security
- Customers
- Athletic team personnel
- Locker rooms
- Vending equipment and supplies

**1.3a** Activities that would be involved in planning the location of an athletic stadium are:

- Marketing analysis: Is there a fan base to support the teams or events that will occupy the facility?
- Determining a suitable plot of land for the facility and its associated parking lots in terms of size and levelness
- Determine by what routes suppliers will supply the facility
- Determine if there are other facilities that will interact with the stadium and how the location of the facility will affect those interactions
- Determine if existing structures will need to be demolished to accommodate the new stadium and how those people or businesses will be compensated
- Determine the stability of the land that will be used to hold this structure

**1.3b** Activities that would be involved in planning the design of an athletic stadium are to determine the facility layout and systems and the material handling systems that are necessary to operate the facility. Items that need to be determined within the facility layout are as follows:

- Number of people it will need to hold
- Equipment is necessary to run this facility.
- How the facility can host multiple types of sports—the design must accommodate all of them
- Whether the stadium be an outdoor stadium or a domed stadium
- Artificial or natural turf
- Materials of the track surface be
- How and where upper-deck access will be
- Vending locations in the facility
- Where administrative offices of the facility will be
- How many restrooms there will be and their locations
- Where the locker rooms will be

Facilities systems that need to be examined are:

- Structural and enclosure elements.
- Power and natural gas requirements
- Lighting requirements
- Heating, ventilation and air conditioning requirements
- Water and sewage needs

Handling systems that need to be examined are:

- Material handling system
- Personnel required to operate the stadium
- Information systems required to operate the stadium
- Equipment needed to support the stadium

**1.3c** Activities that would be involved in facilities planning for an athletic stadium are determining the facility location and design, explained in greater detail in 1.3a and 1.3b, plus the ongoing maintenance and improvement of the facility.

**1.4** Customers in the transportation, communication, and service sectors do have a need for facilities planners. Service facilities such as hospitals, restaurants, athletic facilities, and retail shopping establishments all can and do use facilities planners to optimize the facility layout, handling systems, and facility systems on a continuous basis.

The communications industry uses the world as its facility. Communication networks can be thought of as the handling systems of a communications customer. Due to the rapidly changing technologies found in the communications industry, these networks have to be continuously updated and improved, or new ones have to be created. Also, the equipment and personnel required to run multiple communication networks have to be considered as

well as where the communication points within the network will be located. Finally, the facilities required to house a communication hub or hubs must be located and designed, and a facilities planner is the optimal person to do this job.

Just like the communications industry, the transportation industry uses the world as its facility. Facilities planners can play an integral role in determining where airports, train terminals, bus depots, truck depots, and shipping docks are located and in designing them to accommodate the traffic that travels through them. Also, facilities planners can assist in determining the equipment and layout of those facilities as well.

Service industries such as retail shopping establishments, restaurants, hospitals, and athletic facilities all use facilities planners to lay out their buildings. Also, retail establishments and restaurants generally have warehouses in which product is stored before it comes to its point of use. Facilities planners play a large role in the location and design of warehouses of all types.

### SECTION 1.3

**1.5** Use the following criteria for determining the optimal facilities plan:

- Does the facility provide for the company's future storage requirements?
- Is there cost justification for the facility?
- Is the facility centrally located for suppliers or customers if it is a manufacturing facility; for manufacturing centers if it is a shipping warehouse; for fans if it is an athletic facility, etc.?
- Does it minimize receiving and putaway times while providing enough spaces for those functions?
- Does the product from the manufacturing operations flow smoothly through the facility?
- Are there enough dock doors for shipping and receiving functions?
- Is the material handling equipment proper for the product that is being moved? Is there enough space for the equipment to maneuver around the facility?
- Is the lease cost, property cost, or building cost cheaper than other alternatives?
- Can the manufacturing or warehouse facility accommodate sales forecasts?
- Does the plan minimize the cost of operation in terms of labor and equipment?
- Will scrap be minimized with this plan?
- Can the facility be expanded easily to accommodate growth?
- Is space being utilized to the highest extent?

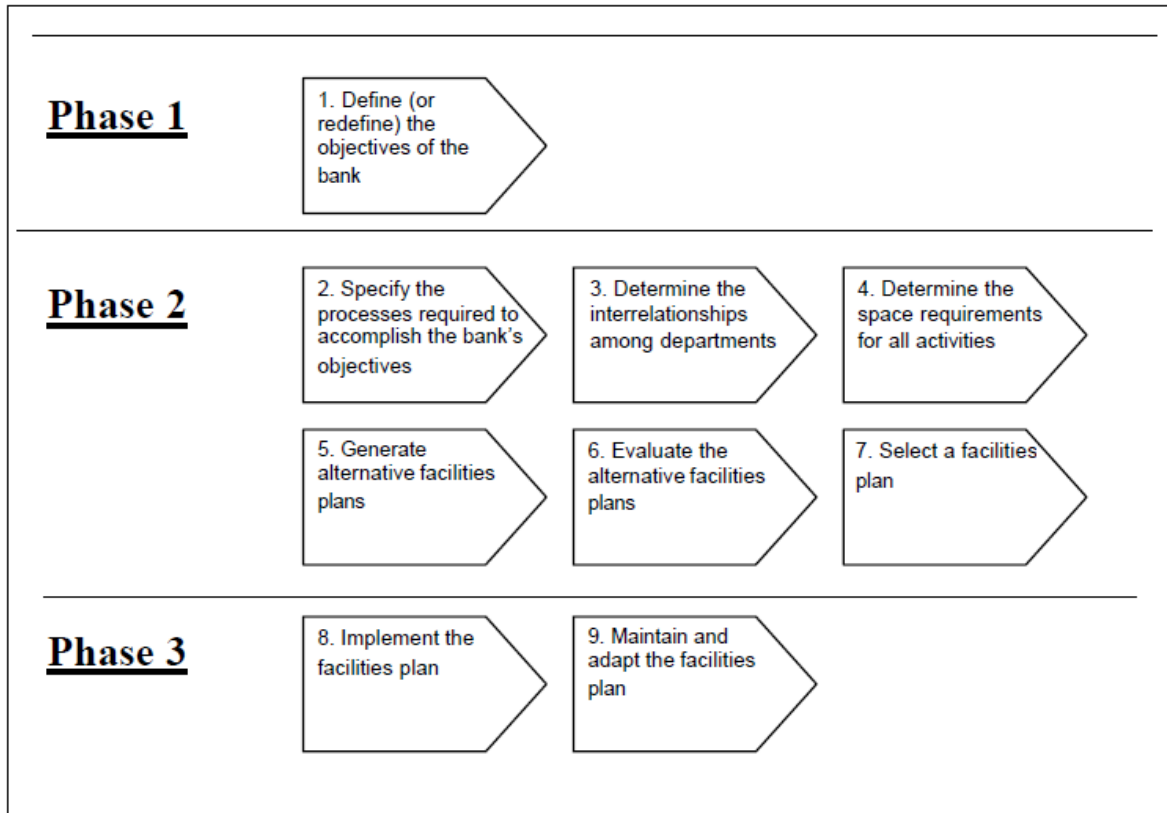
**1.6** This answer will vary from campus to campus, but some things of which the student should be aware are:

- Traffic patterns on campus
- Whether administration offices are easily accessible
- Handicapped accessibility to all buildings
- Whether areas mix high vehicle and pedestrian traffic
- What it would take to remove dilapidated buildings

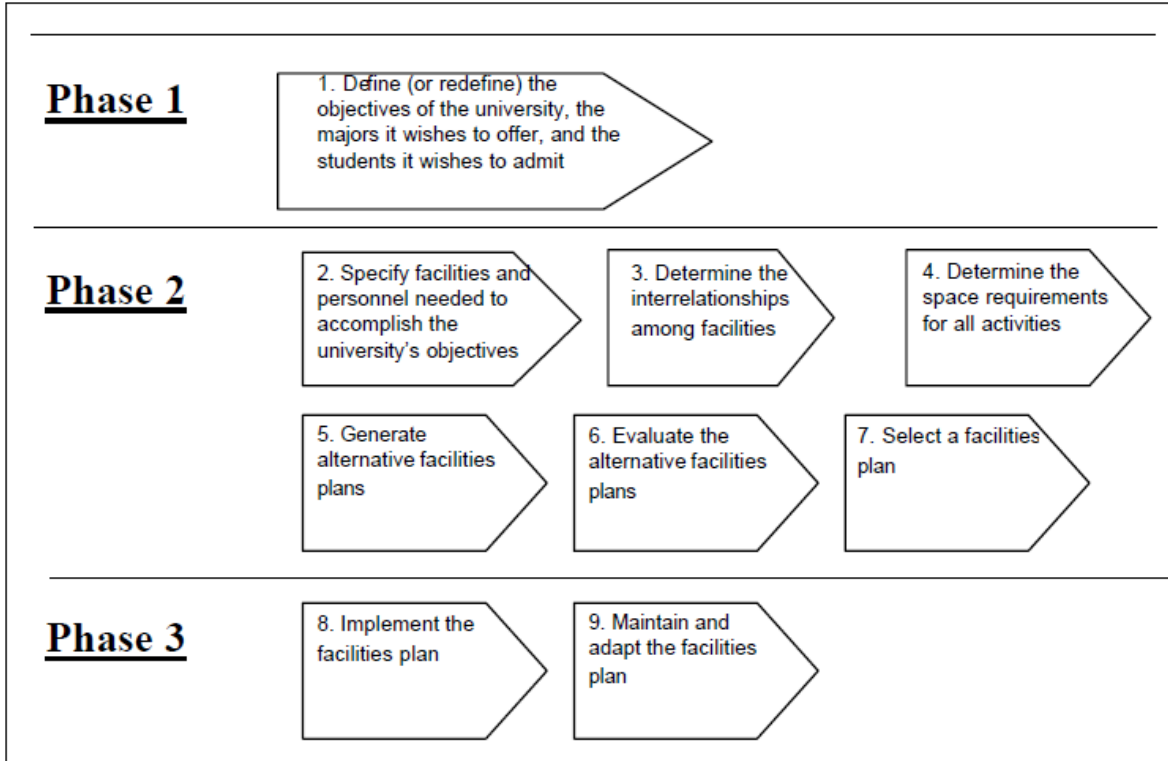
- The locations of certain buildings or functions if they are related to one another, e.g. financial aid should be close to the cashier’s office
- Maintenance facilities should be hidden from the main traffic areas
- Whether there are adequate parking facilities for students, faculty, and staff
- Whether there are adequate eating establishments, restrooms, etc.
- Whether adequate computer facilities are accessible to all students
- Whether there are adequate recreational facilities
- If there is room to expand in the future
- If there is room on or near campus for all students to live
- Whether there adequate security on campus

**SECTION 1.4**

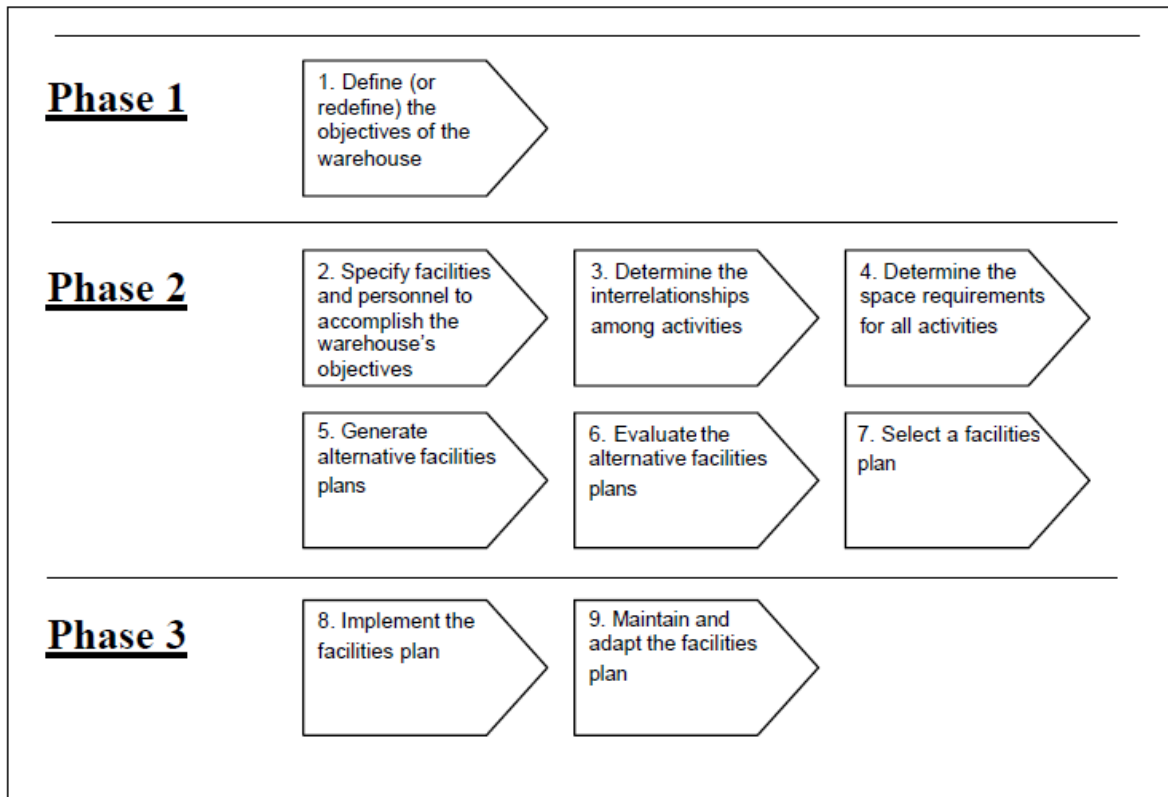
**1.7a** Facilities Planning Process for a Bank



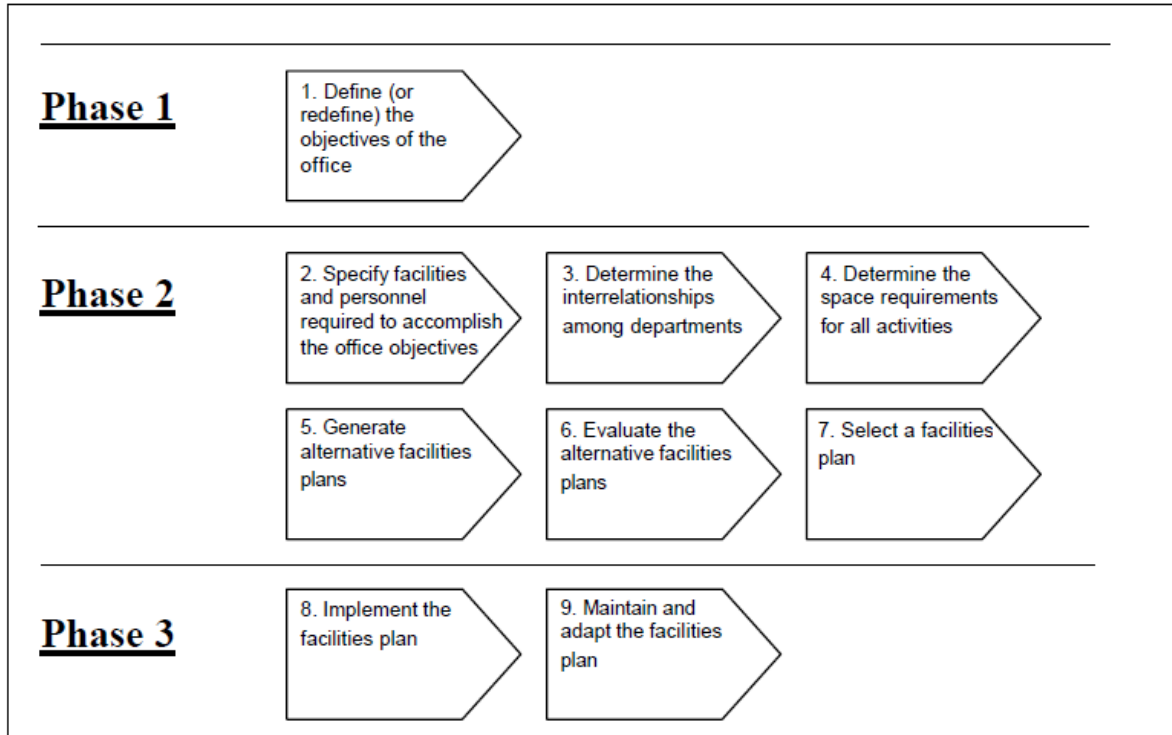
**1.7b** Facilities Planning Process for a University



**1.7c** Facilities Planning Process for a Warehouse



**1.7d** Facilities Planning Process for a Consulting Office



**1.8** The first task that needs to be accomplished is to determine the site of the library on the campus. Questions such as do existing structures need to be demolished, do roads need to be rerouted, do possible sites meet federal, state, and local codes need to be asked. Next, a determination of office space, book storage space, storage rack layout, and student study areas must be made so that the structural design of the facility can be created. Also, the power, gas, heat, ventilation, security, plumbing fixtures, and maintenance issues must be settled. Finally, material handling issues such as how to transport supplies and books, how to reshelve books, how to get from floor to floor, the information systems required to keep track of the locations of all of the books, and the personnel who will be required to maintain the library must be resolved.

**SECTION 1.6**

**1.9** Facilities planning is never completed for an enterprise. If facilities planners believed this, then numerous enterprises would be doomed to failure. New technologies, different enterprises would be doomed to failure. New technologies, different packaging methods, better storage methods, and more advanced material handling equipment make the process of updating and continuously improving facilities a must, or else the company will be left behind with antiquated structures, information systems, and storage and material handling mechanisms.

**1.10** Certain items to look for from this paper are that an architect is more involved with the design of the structure of the facility, the materials that will go into the structure, and the



location of items such as plumbing, lighting, HVAC systems, and electrical systems. The facilities planner will be consulted on the above issues, but is more likely to plan the material flow within the facility, how materials will be handled within the facility, how materials will be stored, how materials will be manufactured, the location of storage areas, the location of shipping and receiving docks, the location and types of manufacturing equipment, the types of material handling equipment required in the facility.

**1.11** The IIE description of Industrial Engineering is:

Industrial engineering (IE) is about choices. Other engineering disciplines apply skills to very specific areas. IE gives an opportunity to work in a variety of businesses. The most distinctive aspect of industrial engineering is the flexibility that it offers. Industrial engineers figure out how to do things better. They engineer processes and systems that improve quality and productivity. They work to eliminate waste of time, money, materials, energy, and other commodities. Most important of all, IEs save companies money. Industrial Engineering draws upon specialized knowledge and skills in the mathematical, physical and social sciences together with the principles and methods of engineering analysis and design to specify, predict, and evaluate the results to be obtained from such systems. “Facilities planning” could easily be substituted for the world’s “industrial engineering.” Clearly, facilities planning is concerned with the design, improvement, and installation of tangible fixed assets to achieve an activity’s objectives. While designing, improving, and installing these assets, the impacts on people, material, information, equipment, and energy are very important. It is also clear that facilities planning draws upon sciences, together with the principles and methods of engineering analysis and design to specify, predict, and evaluate the results on an activity’s tangible fixed assets. Therefore, it is clear that the profession most able to perform facilities planning is the profession of industrial engineering.

**1.12** The articles read should relate to the strategic planning process and should draw parallels to the facilities planning process. An awareness of the true meaning of strategy should be demonstrated.

**1.13a** Strategic uses for an airport that must be addressed in facilities planning include:

- Location
- Types of planes that will be flying into the airport
- Type of air traffic control system
- Location of air traffic control tower
- Location of baggage carousels
- Location of ticket counters
- Number of hangars required for servicing airplanes and for safety inspections
- Employee skill levels for servicing airplanes between arrivals and departures and for maintaining airplanes
- Number of employees required to run vending services, ticketing, baggage claim, etc.
- Location of parking lots
- Many other items, including security control

**1.13b** Strategic issues for a community college that must be addressed include:

- Location of classroom facilities
- Location of administrative facilities
- Skill level of faculty in each major
- Majors that will be offered
- Location of roads and sidewalks through campus
- Skill level of students that will be admitted
- Financial aid distribution to students
- Services to be provided to the students and the fees charged to the students
- Level of athletic focus, if any
- Level of maintenance and the location of facilities

**1.13c** Strategic issues for a bank that must be addressed include:

- Types of services provided
- Skill levels of different types of employees
- Security system and personnel
- Interest rates for loans
- Types of loans granted
- Minimum borrower qualifications
- Interest rates for savings and money market accounts
- ATM machine on premises?
- How many drive-thru windows?
- Accounting procedures
- Vault size

**1.13d** Strategic issues for a grocery store chain that must be addressed include:

- Types of products to sell
- Arrangement of shelves within the store
- Locations of items on those shelves
- Parking area required
- Accounting procedures
- Skill level of employees
- Freshness qualifications for open-air food such as produce
- Amount of warehouse space where customers do not shop
- Location of grocery stores throughout the country
- Should stores have the same layout or should they vary?
- Number of shopping carts required
- Number of docks required for receiving purposes
- Unpacking methods
- Predicted sales volume
- Product pricing considerations

**1.13e** Strategic issues for a soft drink bottler and distributor that must be addressed include:

- Location of bottling facilities

- Distribution routes
- Number of trucks required for distribution
- Types of equipment required for bottling
- Number of bottles shipped per day
- Number of SKUs that have to be bottled
- Methods of conveyance through the facility
- Methods of loading and unloading trucks
- Material composition of bottles
- Location and type of liquid components of beverage to be bottled
- Skill level of employees
- Automation level
- Inventory control methods
- Storage requirements

**1.13f** Strategic issues for a library that must be addressed include:

- Location of the library
- Number of books that the library can contain
- Number and location of shelves to hold the books
- Skill level of employees
- Types of magazine and newspaper subscriptions
- Manual or automated system for finding items
- Types of reference materials
- From where will funding come?
- Amount of study area required
- Number of computers needed for public use
- Size of children's section within the library
- Types of annual special events

**1.13g** Strategic issues for an automobile dealership that must be addressed include:

- Parking area required
- Level of knowledge of automobiles that employees must have
- Number of salespeople
- Sales tactics, professionalism of salespeople
- Types of automobiles to sell
- Sales trends in the automobile industry
- Relationship with automobile manufacturer
- Service levels offered at the dealership
- Parts for cars offered at the dealership
- Number of service bays
- Storage area required for service parts
- Elegance of automobile showroom
- Relationships with lending institutions

**1.13h** Strategic issues for a shopping center that must be addressed include:

- Types of shops to be included in the center
- Number of shops and their sizes
- Location of shopping center
- Lease rates for tenants
- Public facilities for customers
- Parking area for customers, should it be decked parking, etc.
- Security
- Shopping center design, how elegant should it be?
- Will it be a strip mall or an enclosed shopping center?
- Finding possible investors in the shopping center

**1.13i** Strategic issues for a public warehousing firm that must be addressed include:

- Size of the warehouse
- Location of the warehouse
- Level of automation within the warehouse
- Number of warehouses
- Types of products that can be stored in the warehouse
- Material handling mechanisms within the warehouse
- Rental rates
- Policies for unclaimed product
- Number of racks required for the storage of the product
- Number of docks required for shipping and receiving of the product
- Will there be crossdocking capability?
- Skill level of employees

**1.13j** Strategic issues for a professional sports franchise that must be addressed include:

- How does the ownership manage the franchise?
- Location of a facility in which to play
- Rent a facility or own one
- Team colors, name, logo
- Advertising methods
- Determining the makeup of the fan base
- Ticket prices
- Revenues from luxury suites
- Training facilities
- Selection criteria for choosing players and coaches
- Salaries for players and coaches
- Revenues from licensed sportswear sales
- Player and coach discipline if they break the rules
- Management's role in determining the direction of the team

**1.14a** When there are many critical short-term problems that a company has to solve at once, it is generally due to a lack of good strategic planning. Many times, critical problems such

as not enough storage space, too few material handlers, improper storage techniques, and too much work-in-process inventory all result from poor strategic facilities planning. Strategic facilities planning is important when there are many “critical” problems to solve because planning itself will generally solve many of the problems.

- 1.14b** Everyone needs to have a say in the strategic planning process. However, if critical individuals are too busy to do some sound strategic facilities planning, they will always remain too busy because the problems that result from poor strategic planning will keep these individuals busy attacking short-term problems. Furthermore, there are consulting firms that specialize in this type of work, so not as much time would have to be taken by these individuals who are too busy, but their input would still be required while the consultants are working on the problem.
- 1.14c** A good facilities plan will be flexible enough to change with future events. For example, a company that supplies the automobile industry builds a warehouse during a downturn in automotive sales. If good strategic planning has occurred, the company will not build the warehouse based on the storage requirement of the sales volume during the downturn; instead, the company will build on some large percentage of the maximum sales volume they had during an upswing in the economy and on the forecast of automotive sales over some time frame. Otherwise, the supplier could run out of storage space in the new facility and have to add on or build another warehouse before it has the financial capacity to do so.
- 1.14d** This is a response of laziness. It takes much work and research to determine what alternatives are available besides the one the company is using. Data collection is needed to determine product throughput, production flow, storage capacities, and inventory control procedures so that the proper facility size and alternative control systems can be determined. Development of labor standards and evaluation of material handling methods is needed to look at different alternatives. If this information is gathered and certain types of vendors are brought in to look at the problem, numerous alternatives for a facility can be generated. Those that apply must meet scientific and financial criteria that are determined at the beginning of the project.
- 1.14e** Strategic facilities planning is an ongoing process. Technologies come and go, and a good facilities plan will enable a company to adapt to rapidly changing technologies as well as to discard those that will not help the company achieve its goals. A strategic plan is a plan for the future, not the present. Do not incorporate technologies into a facility for the present product mix—incorporate those technologies that can be used to produce the future product mix. However, a facilities plan cannot take into account technologies that have not yet been created; if a company creates a strategic facility plan that incorporates technologies that have not been created, there is no guarantee that the technology will be available when the company is ready to implement the facilities plan and it will be doomed to failure.
- 1.14f** One cannot get an exact dollar figure on the cost of a strategic plan implementation and the savings it will generate. However, examination of past trends and the prices of

different types of technologies can give the strategic planner a good estimate of the costs and the savings. The only way to get exact costs is to get quotes from vendors, and the only way to determine the exact savings is to implement the facility plan. This should not stop a company from doing strategic planning, however. Sometimes the plan may be infeasible and may not be implemented, but a company that does not engage in strategic planning will not get a return on an investment because the investment will never be made, or there will never have been a determination on how much money the investment would make or lose.

- 1.15** Doing facilities planning for a manufacturing facility is a positive exercise for a company in terms of its competitiveness. The production flow can be examined by simulation, and potential bottlenecks can be smoothed. Also, a facilities plan for a manufacturing facility outlines the skill levels of employees required to operate the equipment on the manufacturing floor, and it discovers the latest and best equipment to make the product. Companies that do not engage in facilities planning usually end up having uneven production flows, improper labor skills, too much or too little labor on the floor, and outdated equipment that must be heavily maintained. These problems as well as many others that could be eliminated by facilities planning cause companies to lose their competitive edge.
- 1.16** Using strategic planning to assist with your career allows you to evaluate where you are compared with the goals you set for yourself. If you have fallen short of your goals, it allows you to easily evaluate why and determine how you intend to correct the shortcoming, if it is possible. Furthermore, it can show you if your career is at a dead end and where you need to go to make a change in your career. Strategic planning gives you a path to follow once the plan is in place. However, this plan should be continuously updated just like any other strategic plan or you will lose your competitive edge over others on the same career path.
- 1.17** Automation, if planned properly, can have a positive impact upon facilities planning. If there is a large product throughput, automation can reduce costs by reducing labor requirements, improving quality, and perhaps improving product throughput. However, many things could go wrong, and a facilities planner needs to be aware of them. First, the automation may not justify itself. If the throughput required to meet sales is 1,000 units per day and automation equipment is purchased that can produce 20,000 units per day, cost justification probably will not occur. Also, is the automated equipment flexible enough to handle changes in product design or production methods? While the first example showed the automation that could produce 20,000 units per day had too much excess capacity and therefore was not cost-justifiable, when a process is automated, there needs to be extra capacity built into it so that it is not obsolete when the manufacturing requirement increases to meet future sales. Also, the automated process needs to be able to make product of higher quality than if it was made manually or with a cheaper automated process. It does no good to have a machine that can produce 5,000 units per hour to meet production requirements of 4,000 units per hour when only half of the pieces pass a quality inspection. Finally, it is necessary to examine how the automated process will fit within the existing facility and how much rearrangement will have to

occur so that production will continue to flow smoothly. Automation is a wonderful way to improve the quality and throughput of a product, but only if it is done properly. Automation that does not do what it is supposed to do ends up giving manufacturing personnel more problems than the process it replaced.

**1.18** Issues that should be addressed during strategic planning for warehousing/distribution include:

- Number of shipping and receiving docks
- How the product will be shipped from the warehouse to the customer
- Product that will be stored
- Number of SKUs
- Size of the product that will be stored
- Storage cube requirement
- Pallet rack, flow rack, bulk storage, conveyor requirements
- Inventory turns per a specific time
- Warehouse staffing levels
- Inventory investment levels
- Material handling procedures and equipment
- Building size
- Will refrigeration be necessary?
- Inventory control methods
- Inventory control equipment
- Building and rack layout
- Power requirements

The primary customer service consideration for a warehouse/distribution strategic plan is that the faster the turnover from receipt of an order to shipment to the customer, the better. Also, proper product storage and product shipment will reduce the amount of damaged product that a customer receives. Finally, the better the inventory control system, the easier it is to determine when there are stockouts and where all of the inventory is, thereby making it easier to fill a customer's order in less time.

Cost implications are that if excess inventory has to be carried due to inaccurate inventory control data, then a larger facility has to be built, more rack has to be installed, more labor has to be used to find the inventory in a larger building, capital is tied up in inventory rather than earning money or being used in a more productive way, and more inventory will have to be thrown away because it is outdated. Facilities planning can reduce or eliminate all of these problems, thereby reducing a company's warehousing costs, which can result in product being shipped at a cheaper price to customers, which will result in more sales and revenues.

**1.19** All of the requirements for success in Supply Chain Synthesis are directly linked to the facilities planning process. A proper facilities plan will enable a company to achieve synthesis much more quickly than a competitor who does not use facilities planning. Strategic facilities issues in manufacturing such as smoothing the production flow,

eliminating bottlenecks, using the proper amount of labor that has the appropriate skill level, using the proper equipment that can meet or exceed throughput at a high level of quality will help reduce manufacturing costs, enable manufacturing and marketing to work together to achieve sales goals, reduce lead-times, reduce setup times and production lot sizes, reduce work-in-process inventories, simplify process, balance the production flow, adapt to changing product and technologies, reduce uncertainty, increase quality, and reduce process failures. Also, reducing problems in the manufacturing process will increase the number of happy employees and encourage them to become team players. This will allow every part of the manufacturing process to become integrated and facilitate not only a greater understanding by the employees of the entire manufacturing process and how to achieve synthesis, but also an understanding of the company's goals and directions.

- 1.20** The main difference between strategic planning and contingency planning is that strategic planning is a *proactive* process in which problems are being eliminated before they occur, while contingency planning is a *reactive* process in which plans are made to eliminate problems as or after they occur.
- 1.21** Facilities planning is not a thing that can be rushed or done halfway because the personnel have “more important things to do.” If facilities planning is done that way, the cost of implementation will increase because all alternatives may not have been examined, or errors will have been made in calculations. In order for facilities planning to be done properly, sufficient lead-time in the implementation project must be granted. The amount of lead-time is never the same for two different projects because each project has a different level of complexity.