1.Write a note on perform sensitivity analysis.

Sensitivity analysis uses the financial model to answer “what if” questions by calculating the change in NPV corresponding to a change in the factors included in the model. Both internal and external factors influence project value. Internal factors are those over which the development team has a large degree of influence, including development program expense, development speed, production cost, and product performance. External factors are those that the team cannot arbitrarily change, including the competitive environment, sales volume, and product price. While external factors are not directly controlled by product development teams, they are often influenced by the internal factors.

Development Cost Example: As a first example, let us consider the sensitivity of NPV to changes in development cost. By making incremental changes to development cost while holding other factors constant, we can see the incremental impact on project NPV. For example, what will be the change in NPV if development cost is decreased by 20 percent? A 20 percent decrease would lower the total development spending from $5 million to $4 million. If development time remains one year, then the spending per quarter would decrease from $1.25 million to $1 million. This change is simply entered in the model and the resulting NPV is calculated.

Development Time Example: As a second example, we calculate the development time sensitivities for the CI-700 model. Consider the impact on project NPV of a 25 percent increase in development time. A 25 percent increase in development time would raise the time from four quarters to five quarters. This increase in development time would also delay the start of production ramp-up, marketing efforts, and product sales. To perform the sensitivity analysis, we must make several assumptions about the changes. We assume the same total amount of development cost, even though we will increase the time period over which the spending occurs, thus lowering the rate of spending from $1.25 million to $1.0 million per quarter. We also assume that there is a fixed window for sales, which starts as soon as the product enters the market and ends in the fourth quarter of year 4. In effect, we assume we can sell product from the time we are able to introduce it until a fixed date in the future.

2.How are the following problems attend in order to smoothly execute a Project?

i. Coordination mechanisms ii. Assessing project status

Coordination Mechanisms: Coordination among the activities of the different members of the team is required throughout a product development project. The need for coordination is a natural outgrowth of dependencies among tasks. Coordination needs also arise from the inevitable changes in the project plan caused by unanticipated events and new information. Difficulties in coordination can arise from inadequate exchanges of information and from organizational barriers to cross-functional cooperation. Here are several mechanisms used by teams to address these difficulties and facilitate coordination.

• **Informal communication:** A team member engaged in a product development project may communicate with other team members dozens of times per day. Many of these communications are informal; they involve a spontaneous stop by someone's desk, a telephone call, or e-mail to request or provide a piece of information. Good informal communication is one of the mechanisms most useful in breaking down individual and organizational barriers to cross-functional cooperation.

• **Meetings:** The primary formal communication mechanism for project teams is meetings. Most teams meet formally at least once each week. Many teams meet twice each week, and some teams meet every day. Teams located in the same work space need fewer formal meetings than those whose members are geographically separated. Time spent exchanging information in meetings is time not spent completing other project tasks. In order to minimize the amount of time wasted in meetings, some teams that hold frequent meetings meet standing up to emphasize that the meeting is intended to be quick.

• **Schedule display:** The most important information system in project execution is the project schedule, usually in the form of a PERT or Gantt chart. Most successful projects have a single person who is responsible for monitoring the schedule. On small projects, this is usually the team leader. Larger projects generally have a designated person other than the project leader who watches and updates the schedule regularly

• **Weekly updates:** The weekly status memo is written by the project leader and is distributed on paper, by e-mail, or even by voice mail to the entire extended project team, usually on Friday or over the weekend. The memo is usually one or two pages long and lists the key accomplishments, decisions, and events of the past week. It also lists the key events of the coming week. It is sometimes accompanied by an updated schedule.

• **Incentives**: Some of the most basic organizational forms, such as functional organizations that use functional performance reviews, may inhibit the productive collaboration of team members across functions. The implementation of project-based performance measures creates incentives for team members to contribute more fully to the project.

• **Process documents**: Each of the methods presented in this book also has an associated information system that assists the project team in making decisions and provides documentation.

Assessing Project Status: Project leaders and senior managers need to be able to assess project status to know whether corrective actions are warranted. In projects of modest size (say, fewer than 50 people) project leaders are fairly easily able to assess the status of the project. The project leader assesses project status during formal team meetings, by reviewing the project schedule, and by gathering information in informal ways. The leader constantly interacts with the project team, meets regularly with individuals to work through difficult problems, and is able to observe all of the information systems of the project. A team may also engage an expert from outside the core team to review the status of the project. The goal of these reviews is to highlight areas of risk and to generate ideas for addressing these risk areas.

Project reviews, conducted by senior managers, are another common method of assessing progress. These reviews tend to correspond to the end of each phase of development and are key project milestones.

The Critical Chain method uses a novel approach to monitoring the project schedule. By simply monitoring the project buffer and the feeder buffers of the project (described briefly above), the project manager can quickly assess the criticality of each path and the estimated project completion time. If tasks consume the project buffer faster than the critical path is being completed, the project runs the risk of slipping the end date. A buffer report therefore provides a

concise update on the project status in terms of progress of the critical path and its feeder paths.

3.Discuss the set of guidelines for accelerating product development projects. Explain briefly.

Product development time is often the dominant concern in project planning and execution. The set of guidelines for accelerating product development projects are as follows:

->The first set of guidelines applies to the project as a whole.

• **Start the project early:** Saving a month at the beginning of a project is just as helpful as saving a month at the end of a project, yet teams often work with little urgency before development formally begins. For example, the meeting to approve a project plan and review a contract book is often delayed for weeks because of difficulty in scheduling a meeting with senior managers. This delay at the beginning of a project costs exactly as much time as the same delay during production ramp-up. The easiest way to complete a project sooner is to start it early.

• **Manage the project scope:** There is a natural tendency to add additional features and capabilities to the product as development progresses. Some companies call this phenomenon “feature creep” or “creeping elegance,” and in time-sensitive contexts it may result in an elegant product without a market. Disciplined teams and organizations are able to “freeze the design” and leave incremental improvements for the next generation of the product.

• **Facilitate the exchange of essential information:** Every task has one or more internal customers for the information it produces. For small teams, frequent exchange of information is quite natural and is facilitated by team meetings and colocation of team members. Larger teams may require more structure to promote rapid and frequent information exchange. Blocks of coupled tasks revealed by the DSM identify the specific needs for intensive information exchange. Computer networks and collaboration software tools can facilitate regular information transfer within large and dispersed product development teams.

->The second set of guidelines is aimed at decreasing the time required to complete the tasks on the critical path. These guidelines arise from the fact that the only way to reduce the time required to complete a project is to shorten the critical path.

• **Complete individual tasks on the critical path more quickly:** The benefit of recognizing the critical path is that the team can focus its efforts on this vital sequence of tasks. The critical path generally represents only a small fraction of the total project effort, and so additional spending on completing a critical task more quickly can usually quite easily be justified.

• **Aggregate safety times:** The estimated duration of each task in the project generally includes some amount of "safety time." This time accounts for the many normal but unpredictable delays that occur during the execution of each task. Common delays include: waiting for information and approvals, interruptions from other tasks or projects, and tasks being more difficult than anticipated.

• **Eliminate some critical path tasks entirely:** Scrutinize each and every task on the critical path and ask whether it can be removed or accomplished in another way.

• **Eliminate waiting delays for critical path resources:** Tasks on the critical path are sometimes delayed by waiting for a busy resource. The waiting time is frequently longer than the actual time required to complete the task. Delays due to waiting are particularly prominent when procuring special components from suppliers. Sometimes such delays can be avoided by ordering an assortment of materials and components in order to be sure to have the right items on hand, or by purchasing a fraction of the capacity of a vendor's production system in order to expedite the fabrication of prototype parts.

• **Overlap selected critical tasks:** By scrutinizing the relationships between sequentially dependent tasks on the critical path, the tasks can sometimes be overlapped or executed in parallel.

• **Pipeline large tasks:** The strategy of pipelining is applied by breaking up a single large task into smaller tasks whose results can be passed along as soon as they are completed.

• **Outsource some tasks:** Project resource constraints are common. When a project is constrained by available resources, assigning tasks to an outside firm or to another group within the company may prove effective in accelerating the overall project.

-> The final set of guidelines is aimed at completing coupled tasks more quickly.

• **Perform more iterations quickly:** Much of the delay in completing coupled tasks is in passing information from one person to another and in waiting for a response. If the iteration cycles can be completed at a higher frequency, then the coupled tasks can sometimes be completed more quickly

• **Decouple tasks to avoid iterations:** Iterations can often be reduced or eliminated by taking actions to decouple tasks.

• **Consider sets of solutions:** Iterations involve the exchange of information about the evolving product design. Rather than exchanging point-value estimates of design parameters, in some cases the use of ranges or sets of values may facilitate faster convergence of coupled tasks.

4.Write a note on Gantt charts and PERT charts.

Gantt charts:

- The traditional tool for representing the timing of tasks is the Gantt chart.
- The chart contains a horizontal time line created by drawing a horizontal bar representing the start and end of each task. The filled-in portion of each bar represents the fraction of the task that is complete.
- The vertical line shows the current date, so we can observe directly which task is behind schedule and which task is ahead of schedule. A Gantt chart does not explicitly display the dependencies among tasks.
- Task dependencies constrain, but do not fully determine, the timing of the tasks. The dependencies dictate which tasks must be completed before others can begin and which tasks can be completed in parallel.
- When two tasks overlap in time on a Gantt chart, they may be parallel, sequential, or iteratively coupled.
- Parallel tasks can be overlapped in time for convenience in project scheduling because they do not depend on one another.
- Sequential tasks might be overlapped in time, depending on the exact nature of the information dependency, as described below in the section on accelerating projects. Coupled tasks must be overlapped in time because they need to be addressed simultaneously or in an iterative fashion.

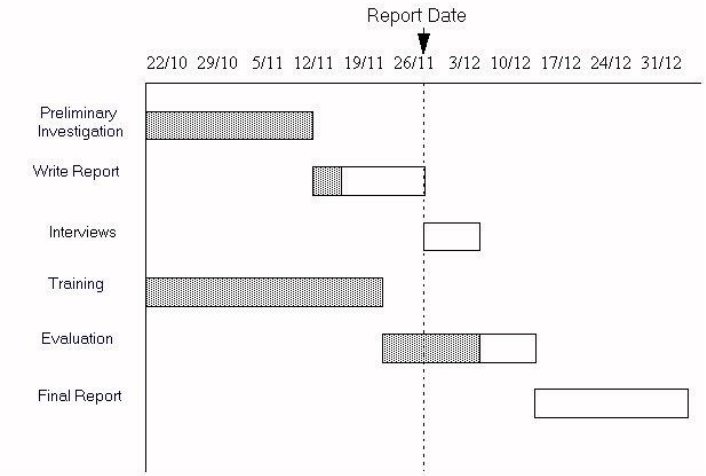

Figure 1: Gantt Chart

PERT charts:

- PERT (program evaluation and review technique) charts explicitly represent both dependencies and timing, in effect combining some of the information contained in the DSM and Gantt chart.
- While there are many forms of PERT charts, we prefer the “activities on nodes” form of the chart, which corresponds to the process diagrams that most people are familiar with.
- The blocks in the PERT chart are labeled with both the task and its expected duration. Note that the PERT representation does not allow for loops or feedback and so cannot explicitly show iterative coupling.
- The graphical convention of PERT charts is that all links between tasks must proceed from left to right, indicating the temporal sequence in which tasks can be completed.
- When the blocks are sized to represent the duration of tasks, as in a Gantt chart, then a PERT diagram can also be used to represent a project schedule.

5.Write a note on elements of economic analysis.

Economic analysis, which includes both quantitative and qualitative approaches, is useful in at least two different circumstances:

• Go/no-go milestones: For example, should we try to develop a product to address this market opportunity? Should we proceed with the implementation of a selected concept? Should we launch the product we have developed? These decisions typically arise at the end of each phase of development.

• Operational design and development decisions: Operational decisions involve questions such as: Should we spend $100,000 to hire an outside firm to develop this component in order to save two months of development time? Should we launch the product in four months at a unit cost of $450 or wait until six months when we can reduce the cost to $400?

Steps for Economic Analysis Process are as follows:

1. Build a base-case financial model: Constructing the base-case model consists of estimating the timing and magnitude of future cash flows and then computing the NPV of those cash flows.

2. Perform a sensitivity analysis to understand the relationships between financial success and the key assumptions and variables of the model: Sensitivity analysis uses the financial model to answer “what if ” questions by calculating the

change in NPV corresponding to a change in the factors included in the model. Both internal and external factors influence project value.

3. Use the sensitivity analysis to understand project trade-offs: The near linearity of many sensitivity analyses allows the team to compute some trade-off rules to inform day-to-day decision making. These rules take the form of the cost per unit change in the internal and external factors.

4. Consider the influence of the qualitative factors on project success: Many factors influencing development projects are difficult to quantify because they are complex or uncertain. We refer to such factors as qualitative factors. For most project teams, the most appropriate qualitative analysis method is simply to consider and discuss the interactions between the project and the firm, the project and the market, and the project and the macro environment.