# Software Engineering Management

# Individual work

# The GPS Auto-navigation System Verification Project

【C1.1-Analysis Reports】

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# Contents

# Project Background

（Some are copied from the materials given by the instructors）Hangzhou AUTONAV, Inc. is an organization whose main business is the production of high reliability auto guidance and navigation systems for various customers, from both the government as well as the private sector. It has made a profit by following a philosophy of careful development and maintenance of a competitive strategy. The strategy has been to "produce the most technologically superior and most reliable electronics equipment in the world". They are known in the industry as excelling in technological sophistication and high reliabilibty products. As one customer stated, "Hangzhou AUTONAV, Inc. products are durable and exceed our expectations, leaving the competition well behind – the products work, work well, and continue working well."

In 1997 Spring, the company started development of a new product. The project for the development of that product was called IRIS. You came on as the Manager of Reliability Engineering under James TAN, the Director of Engineering. The company was doing well and the IRIS was thought to represent the transition of the company into a new market. The strategy for the IRIS was "first to market with technological superior and high reliability at a reasonable cost". This was a new strategy where costs would be as important as technological and reliability superiority.

The IRIS represented the movement by the company into very profitable and high growth areas of commercial navigation equipment. In this market cost were just as important as reliability and cutting edge technology. As one executive put it, "The IRIS represents the transformation of the company into a new line of products. These products must be cost competitive or we will not survive in the commercial markets". Needless to say the project was receiving a lot of attention from senior management. The company also had a reputation of producing high technology products that were developed on time, within budget, and to all performance requirements --- they operated on a project mentality and had been

quite successful.

# Requirement1-Project Organization

## 1.1 Project Charter

### 1.1.1 General Introduction of the project

Hangzhou AUTONAV Inc. is an organization whose main business is the production of high reliability auto guidance navigation system for various customers which is from both government and private sector. In 1997 we have started the development of our new product, which was in the project 'IRIS'. The target of such a project is to make a good profit and ensure the reliability and the technological superior of it.

### 1.1.2 Targets

Through "tear-down" process assessments and rigorous engineering design reviews, IRIS has proven to be a great system that can exceed all areas of reliability expectations.

In our words, we should try the best to avoid any potential product or manufacturing defects

### 1.1.3 Work List

➤ Develop the project plan and schedule.

➤ Making the reliability testing of the project system.

➤ Conducting the tear down audit and interpreting the results

➢ Make a final report of the project to Senior Management.

➢ Finish the whole project and give a final product.

## 1.1.4 Constraints

Senior management's instructions are that a full client briefing will take place within three weeks and senior management wishes to have at least one week prior to the meeting to brief the outcome and recommended actions in order to develop the company's position and strategy.

## 1.1.5 Team Structure

● Group Leader: *Zhang Yichi*(Me)

● Group Member: *Gail YU, Tom HUANG, Jesse LIU and Pete DONG*

## 1.1.6 Roles

| Participants | Role |
|---|---|
| **Zhang Yichi** | Project Leader and Manager |
| **Gail YU** | Manager of Quality Engineering |
| **Tom HUANG** | Manager of Design and Manufacturing |
| **Jesse LIU** | High Senior Engineer from Product Manufacturing |
| **Pete DONG** | Senior Engineer from Administration responsible for Component Purchasing and |

| | Incoming Testing of Materials |
|---|---|

### 1.1.7 Stakeholders

- Team Members mentioned before

- Inside: Senior Management

- Outside: Customers

### 1.1.8 Time Schedule of the project

| MileStone Task | DDL |
|---|---|
| A briefing in one week | Week1 |
| Meeting to develop the company position and strategy | Week2 |
| Primary tests results | Week 2 |
| A full customer briefing | Week 3 |
| Finish the tests | Week 3 |

### 1.1.9 Budget Management

Each member of the project team has access to whatever resources they need to support the project. It's the company's top priority, and you've been assured that you'll "get everything you need to complete the project because of the significance of the project.

## 1.2. Linear Responsibility Chart

| Task | Zhang Each | Gail Yu | Tom HUANG | Jesse LIU | Pete DONG |
|---|---|---|---|---|---|
| System Review | 2 | 3 | 2 | 3 | 4 |
| Develop the project plan and schedule | 1 | 3 | 2 | 2 | 3 |
| Conducting the reliability testing of the guidance systems | 3 | 1 | 1 | 2 | 2 |
| Conducting the tear-down audit and interpreting the results | 3 | 2 | 2 | 1 | 1 |
| Reporting the results | 1 | 2 | 2 | 2 | 2 |
| KEY | 1=Primary2=Support Work 3=Review &Check | | | | |

## 1.3. Stakeholder Analysis

### 1.3.1 Project Team

| Name | Group | Rule | Interest | Importance | Expectation | Exception Management |
|---|---|---|---|---|---|---|
| ZHANG EACH | Reliability | Manager | High | Very High | Finish the project | Work as a member of team |
| Gail YU | Quality | Manager | High | High | Make sure the | |

| | Eng | | | | quality of the product | |
|---|---|---|---|---|---|---|
| **Tom HUAN** | Design & Product | Manager | High | High | Finding and overcoming the shortcoming | |
| **Jesse Liu** | Product Manufacturing | Senior Engineer | High | High | To support the manufacturing of product | |
| **Pete DONG** | Component Purchasing and Income Testing of Materials | Senior Engineer | High | High | Component Purchasing and Income Testing of Materials | |

## 1.3.2 Other Departments in Company

| Name | group | role | interest | importance | expectation | exception MANAGEMENT |
|---|---|---|---|---|---|---|
| **James TAN** | Engineering Department | Director | High | High | The results and conclusions can support the reliability of the | Frequent update and engage in the important decision |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | product | |
| **George YU** | Engineering Department | Director | High | High | The project can be done successfully | Have meteting with other directors. |
| **Others** | None | Director | High | High | Make the results of the audit indicate to be right | Discussing the approach and results of the audit prior to ing with senior management. |
| **Senior Manger** | None | Manager | High | High | The project can be done successfully | Listen to the report from diectors and managers, etc. |

### 1.3.3 Customers

Robert HOU, Purchasing Department, Customer,

With High Importance

Expectation: full cooperation with Mr. HOU and his access to all data

procedure, testing and inspection of hardware

# Requirement 2-Network Planning for the Reliability Testing and Workmanship Auditing

## 2.1 Develop CPM Activity on Node Diagram
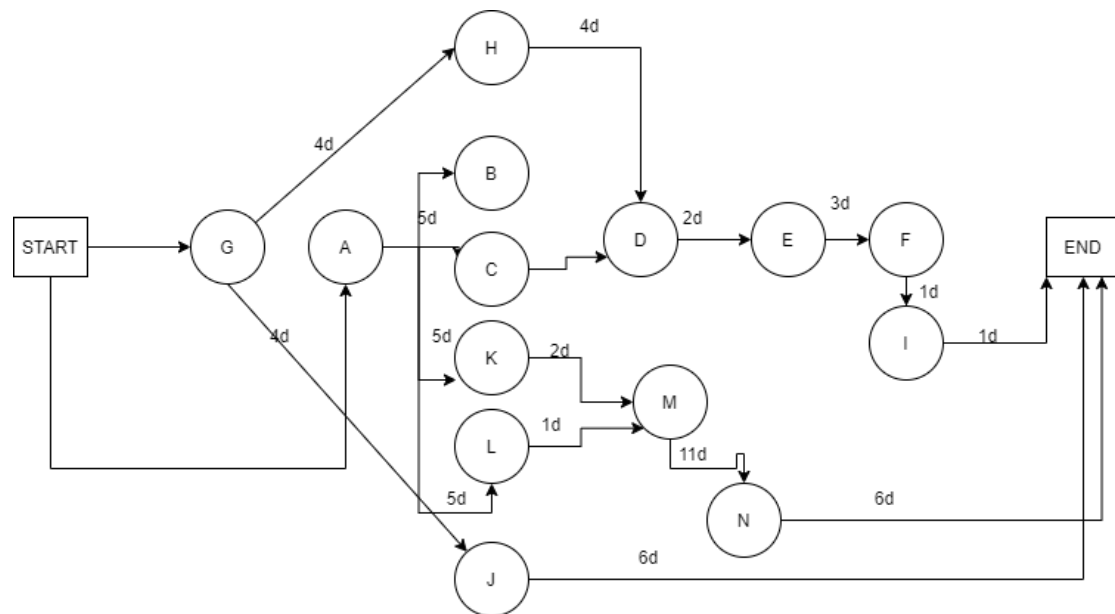


## 2.2 Develop CPM Activity on Node Diagram

In this diagram, we could easily find the critical path of this project is Start-A-K-M-N-End. So we need at least $5+2+11+3=21$ days

## 2.3 What conclusions can you draw from the CPM diagram?

- A and G should be done first because they are the ap requirements and we could start the other work after they are done
- Many of the task could be done in concurrence to save our schedule time

- The total cost is actually determined by the task M because it will take the longest time to finish, how to schedule task M is a key problem in the project schedule.

- The total time depends on the longest path in the node diagram

## 2.4 Discuss the assumptions, limitations and implication for using the CPM as an approach for scheduling this project

### 2.4.1 Assumptions

➢ We can use CPM as a method to project schedule management when we need to evaluate a better time schedule for the project and the activities should have sequential relationship.

➢ CPM identifies the most important elements of the project.

➢ If we want to use CPM to manage the schedule of the project, we must assume that we know time and source used by each event and relationship among each event.

### 2.4.2 Limitations

➢ CPM operates on the assumption that there is a precise known time that each activity in the project will take.

➢ CPM can't be used as a dynamic controlling device.

➢ CPM time estimates aren't based on statistical analysis so it may be short in generalization.

### 2.4.3 Implications

➢ With CPM, we can know which tasks should be done first and which should be done at the same time, thus improving our efficiency. In addition, we can easily find the critical path of this project.

# Requirement 3- PERT as a Method to Schedule the Project

## 3.1 Develop a PERT Activity on Node Diagram for the project

### 3.1.1 Average Duration Table

| Task ID | AVG Durations | Optimistic Duration (days) | Most Likely Duration (days) | Pessimistic Duration (days) | Predecessor(s) |
|---------|---------------|----------------------------|-----------------------------|-----------------------------|----------------|
| A | 5 | 4 | 5 | 6 | -- |
| B | 2.9 | 1 | 2 | 8 | A |
| C | 1 | 1 | 1 | 1 | A |
| D | 2.9 | 1 | 2 | 8 | C,H |
| E | 4 | 3 | 3 | 9 | D |
| F | 1.7 | 1 | 1 | 5 | E |
| G | 4 | 3 | 4 | 5 | -- |

| H | 5 | 3 | 4 | 11 | B,G |
|---|-----|----|----|----|-----|
| I | 1.7 | 1 | 1 | 5 | F |
| J | 5.9 | 4 | 6 | 7 | A,G |
| K | 1.9 | 1 | 2 | 2 | A |
| L | 1.2 | 1 | 1 | 2 | A |
| M | 11 | 10 | 11 | 12 | K,L |
| N | 3 | 2 | 3 | 4 | M |

## 3.1.2 Diagram
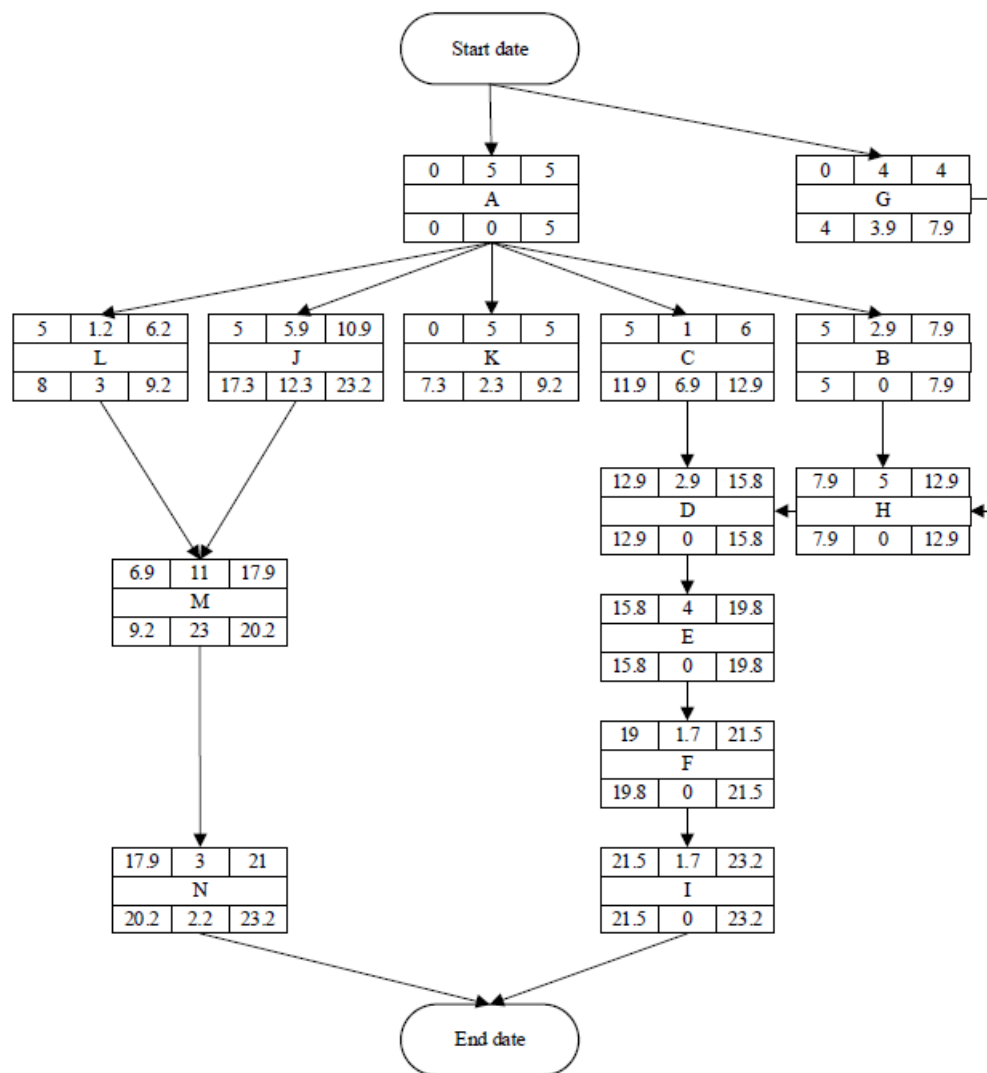
### 3.1.3 Critical Path

The critical path of this project is **start–A–B–H–D–E–F–I–end** and we need at least 23.2

## 3.2 Construct a Table

| Task | Duration | Early Start | Early Finish | Late Start | Late Finish | Slack | Activity Standard Deviation |
|------|----------|-------------|--------------|------------|-------------|-------|------------------------------|
| **A** | 5 | 0 | 5 | 0 | 5 | 0 | 0.3 |
| **B** | 2.9 | 5 | 7.9 | 5 | 7.9 | 0 | 1.2 |
| **C** | 1 | 5 | 6 | 11.9 | 12.9 | 6.9 | 0 |
| **D** | 2.9 | 12.9 | 15.8 | 12.9 | 15.8 | 0 | 1.2 |
| **E** | 4 | 15.8 | 19.8 | 15.8 | 19.8 | 0 | 1 |
| **F** | 1.7 | 19.8 | 21.5 | 19.8 | 21.5 | 0 | 0.7 |
| **G** | 4 | 0 | 4 | 3.9 | 7.9 | 3.9 | 0.3 |
| **H** | 5 | 7.9 | 12.9 | 7.9 | 12.9 | 0 | 1.3 |
| **I** | 1.7 | 21.5 | 23.2 | 21.5 | 23.2 | 0 | 0.7 |
| **J** | 5.9 | 5 | 10.9 | 17.3 | 23.2 | 12.3 | 0.5 |
| **K** | 1.9 | 5 | 6.9 | 7.3 | 9.2 | 2.3 | 0.2 |
| **L** | 1.2 | 5 | 6.2 | 8 | 9.2 | 3 | 0.2 |
| **M** | 11 | 6.9 | 17.9 | 9.2 | 20.2 | 2.3 | 0.3 |
| **N** | 3 | 17.9 | 20.9 | 20.2 | 23.2 | 2.3 | 0.3 |

## 3.3 What can you conclude about the project duration from analysis of the PERT network diagram?

➢ Some of the tasks can still be finished in concurrence to save our time

➢ The critical path now changes to ABHDEFI, so we need to finish the task on this path first.

➢ The nodes on the critical path has a zero slack time.

➢ If we want a shorter schedule time, we need to think a method to cut down the critical path or optimize the schedule.

## 3.4 What are the primary concerns that a PM must consider in using PERT for Project Scheduling?

● The critical path is the primary concern for the project

● Knowing the working process of the project and make better description

● PM should divide the whole project work into small pieces to make better effect.

# Requirement 4-Risk Management

## 4.1 Discuss the statement made by James TAN

James is partly right because risk management reduces the negative impact of potential project failures. As we know, project risk management is an important aspect of project management and is one of the 10 knowledge areas that project managers must know.

However, we should not become superstitious about risk management.

Nothing in the world is absolute. Admittedly, risk management can greatly reduce the possibility of project failure and has some stop-loss capability in case of failure, but it does not completely eliminate project failure, because there will always be unexpected situations

## 4.2 Identify primary sources of risk inherent in the project

➢ Bad tests which lead to project failure

➢ A coming DDL which makes team members don't have enough time

➢ A bad requirement analysis which introduce many awful requirements into the project.

➢ The team members are not skillful in this area or just in green hand.

➢ The customers are not satisfied with the final product.

## 4.3 Develop and discuss the role that risk management can play in successful accomplishment of this project

■ Ensure the stability of the management

■ Build a better understanding over the difficulty of the project

■ Reduce the project cost

■ Create a safe and stable production environment

■ Avoid the task risk of loss and have a good checkpoint

■ Improve workers' enthusiasm and creativity