CHAPTER

1. INTRODUCTION

1.1 (a) This is a mass production example. Standard windows are manufactured by special purpose equipment arranged according to the production process. The flow of material on the production line follows the routing of the product and each worker on the line performs the same operation on each unit of the product.

(b) This is a batch-oriented example. The one time order of 150 window assemblies is a batch that requires a special set up of the machines. In addition, the workers on the line will be performing specific operations in accordance with the unique design characteristics of the window subassemblies.

(c) This is a project-oriented example. The project is to design and build a facility that can supply 1,000 window assemblies per month throughout the year at minimum cost while meeting advertised quality standards.

1.2 Stage I Define location, food types, style (project)

Stage II Define goals and their relative importance: size, customer types, prices, opening hours, number of workers, cost, opening date (project)

Stage III Define performance measures: cooking time, serving time, cleaning time (project)

Stage IV a – Develop schedule
b – Develop budget
c – Design and plan
Cooking process
Serving process
Cleaning process
Design restaurant interior (division into kitchen area, serving area, etc.)
Furniture and décor
Decide on equipment
Decide on types of supplies and quantities
Plan advertisement

These are all part of a *project*

Stage V Integrate into project plan (project)

Stage VI Develop implementation plan: find location, begin interior construction; hire staff and train them; acquire equipment, furniture, décor; contract suppliers; develop advertising strategy (project)

Stage VII Monitor and control cost, schedule and technical process (project)

Stage VIII Run trials and evaluate (batch production)

Stage IX Open and run on daily basis (mass production)

1.3 Products:

1. Building blocks – needed by builders
   Alternatives: Wood, stone, metal.

2. Window drapes – privacy, blocks light
   Alternatives: blinds, shutters, tinted glass.

Services:

1. Express mail – communications
   A*lternatives*: messengers, fax, email

2. Buses – travel
   Alternatives: private car, taxi, train, airplane

1.4 Assumptions

1) The delivery company and driver have experience, both in delivery and predicting arrival times.

2) There are 2 drivers.

3) The truck will travel at an average speed of 41.7 mph MI/48 hr, including rest stops.

4) All roads from the origin and house are in good condition.

5 The truck will not encounter any traffic jams.

6) The truck is in good condition, and no mechanical failures will occur.

7) The truck will not be involved in an accident, etc.

If all of the above assumptions are true, then the truck will arrive on time.
If assumption 2 is false, then the arrival time will probably double.
If any of assumptions 3-7 are false, then there is no way to predict the arrival time.
If the shipment was by rail the assumptions are:

a) The material will be loaded on time.
b) The train will travel by continuously.
c) The truck traveling from the unloading point to the house will travel continuously.

Generally, the rail option increases the probability of on time arrival.

1.5 There are 3 factors affecting price:

1) Cost of materials
2) Cost of equipment
3) Cost manual work

I. If the house plans are available, then the cost of materials and equipment are known. The only uncertainty is manual work time. If the plumber is unable to predict this, then he lacks experience. Do not accept his proposal.

II. If the plans are not available then the plumber cannot predict the material, equipment and manual work time needed. In this case a $2000 reserve for unseen expenses is reasonable.

1.6 The following data were collected in 10 trials.

Trail, n	Driving time (min), t
1	7
2	9
3	15
4	8
5	9
6	7
7	10
8	11
9	9
10	7

Mean, $\mu = 9.2$
Standard deviation, $\sigma = 2.44$
Coefficient of variation, $\mu / \sigma = 0.215$

1.7

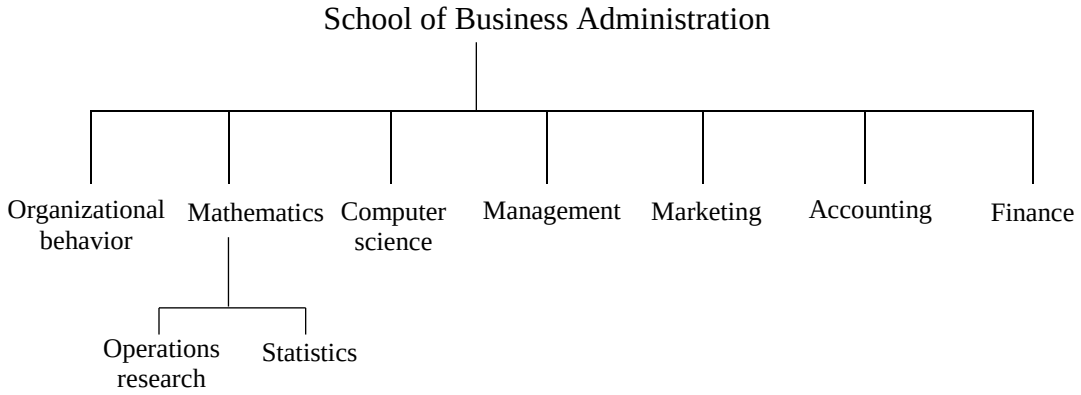
(a) Technological – availability of information; scheduling – time required to collect and process the information.

(b) Technological – availability of information and equipment, scheduling, required activities and the duration of activities; cost – equipment, labor and transportation.

(c) Scheduling – traffic jams, mechanical problems, driving conditions.

(d) Cost – price not predictable; technological – quality and performances of the item.

1.8



The projects in this structure are research-oriented and undertaken by teams of professors from the various departments. The product is knowledge and the publication of research results. There are several customers including the students, the local and national business community, and funding agencies.

1.9 The functional structure is identical to the structure depicted in the solution to Exercise 1.8 for the different departments in a business school.

1.10 Job description

- Appropriate education
- Previous management experience
- Communication and negotiation skills for dealing with the community, local authorities, contractors, suppliers, experts, and workers
- A member of the community (desirably a parent)

Criteria

- Relevant college degree
- 5 years of experience in a related area
- A good interview

Candidate 1

Mechanical engineer
3 years of experience in mechanical engineering
Member of the community
No children
Hobbies: Basketball, hiking, stamp collecting

Candidate 2
Aeronautical engineer
7 years of experience managing in various computer-oriented small projects involving software development
A parent
Member of the community
Hobbies: gardening, building model planes

Candidate 3
Industrial engineer
5 years experience in the car industry managing R&D projects
A parent
Not a member of the community
Hobbies: skiing, music

Evaluation of candidates:

Candidate 1: Besides being a member of the community, this candidate's background does not match the rest of the job description. This candidate is not chosen.

Candidate 2: Although this candidate is qualified in most areas, the weak point is education and project management experience. The types of projects this candidate participated in did not involve communication negotiation and contracting skills. This candidate is not chosen.

Candidate 3: This candidate is not a member of the community and has not been involved in similar project. But his communication, negotiation and contracting skills will enable him to manage the experts needed and to carry out the project successfully. This candidate seems to be the best of the three.

1.11 The work content: Preparation of a thesis on the success of project management techniques including:

a. literature review (about 100 articles and 20 books) and preparation of research hypothesis (about 10)

b. preparation of a questionnaire (50 questions) based on hypothesis

c. interviews (200 managers in all 50 states)

d. statistical analysis of results (hypothesis testing ANOVA)

e. presentation of results to the customer (3 presentations)

f. preparation of a mailing questionnaire (to 100 companies)

g. distribution of mailing questionnaire (to 100 companies)

h. follow up phone calls (about 200 calls)

i. analysis of results

k. write up of thesis (about 100 typed pages, 30 tables and 20 figures)

l. revisions (3 major revisions, 10 minor revisions)

m. final production

Relevant criteria (and performance measure)

a. Ph.D degree in a related area (grade achieved)

b. at least 5 publications in related areas (number of publications)

c. good connections with industry (number of organization contacts)

d. high grades in English, writing (grades)

e. high grades in statistics (grades)

f. good knowledge of MS Word or a similar word processor (subjective evaluation)

g. living close by (distance)

h. has a computer and a laser printer at home (1 for both, 0.5 for computer only, 0 for none)

i. successfully completed other theses in the past (number of previous theses)

Required schedule

Task	Start time from project initiation, (months)	End time from project start, (months)
a	0	1
b	1	2
c	2	5
d	3	6
e	4	6
f	5	7
g	6	8
h	7	9
i	8	10
j	9	11
k	10	11
l	10	12
m	11	12

1.12 The best proposal will be selected based on a subjective evaluation of each candidate with respect to the relevant criteria and subjective weight given to each criteria. Each criteria will be measured on a scale from 0 (poor) to 5 (excellent). The weighted sum of scores will be the aggregate measure used for selection:

		Candidate		
Criteria	Weight	1	2	3
a	10%	3	4	3
b	5%	4	2	2
c	15%	4	4	2
d	15%	4	2	2
e	20%	3	5	3
f	5%	2	2	4
g	20%	1	4	3
h	5%	2	4	4
i	5%	4	2	2
	100%			
Weighted score =		27	29	25

Best candidate is number 2.

1.13 *Conceptual design phase* (project initiation selection and definition)
Design a project
Estimating the life cycle cost
Getting customer's approval for the design

Advanced development (analysis of activities)
Developing the network
Advanced development (project scheduling)
Development of a calendar
Estimating activity duration
Advanced development (project budgeting)
Development of a budget

Detailed design phase (project organization)
Selecting participating organizations
Developing the WBS
Establishing the milestones

Production phase (project execution and control)
Execution of activities
Managing the configuration
Monitoring actual performance
Development of corrective plans

Termination phase
Recommending improvement steps

1.14

(a) 1. Learning car mechanics in order to be able to repair my car.
2. Bicycling to school

(b) 1. Building my own house
2. Repairing my old air conditioner

(c) 1. Getting a pilot's license
2. Buying a new car

(d) 1. Buying an apartment
2. Having a child

1.15

1. Development of a new robotic lab in the engineering school – this project is in the production phase. Most of the equipment has been purchased and installed, although some is still on order.
2. Moving to a new house – this project is at the conceptual design phase. The decision to move was made but the new house has yet to be selected.

1.16 NASA's Moon Landing Project

Risks (*cost*): Because many new and specialized devices were used, there were not a large number of suppliers to choose from. Also, because some of the technology was being developed at the time, it was impossible to pin down all the cost—the devices, components and subassemblies had not yet been made.

Technology: Much of the equipment was being developed and there had been relatively few manned space flights, and even fewer where the astronauts ventured outside the vehicle. Also, technology was not shared between the U.S. and the U.S.S.R. further reducing the knowledge base.

Schedule: Early in the program, the schedule was dependent on the adequate development of technology to enable a successful launch, landing, and re-entry of the spacecraft. After reaching a satisfactory technological level, a suitable window for launch was dependent on the position of the moon and the weather at Cape Canaveral. From the inception of the program, there was also an urgency brought on by political pressure to achieve these goals before the Soviets.

Resources: NASA had to choose how to divide its fixed budget to develop the technology for this mission as opposed to others, such as the development of a "space plane," which was shelved, only to be reincarnated years later as the space shuttle. Also, materials and systems, such as boasters, capsules, lunar landers, and fuel had to be designed, built, and paid for all within the available budget.

Uncertainties: NASA, as a government agency, has to have annual approval of its budget by Congress -- a political body whose membership is constantly changing. Questions such as: Would the technologies work? Would the weather cooperate? Would the astronauts perform adequately? all lend an element of uncertainty to the program.

Other projects:

1. The logistics operation before Iraqi Freedom – the objective of this project was to transfer the required USA forces to Saudi Arabia before Desert Storm. This goal was successfully achieved.
2. The election campaign of George Bush – the objective of this project was to get Mr. Bush elected as the US president; the goal was successfully accomplished in 2000 and 2004.

1.17 Some examples are:

1. The "Spruce Goose" – In 1942, industrialist Henry Kaizer and the pilot and innovator Howard Hughes won a government contract for a fleet of giant flying boats to be built out of wood. World War II ended and the contract expired before the prototype was completed. Hughes continued with his own money and in November 1947, the $28 million plane flew about a mile above Long Beach Harbor on its first and final voyage. This project failed because the end of the war marked the end of the flying boat era. In addition, advances in metallurgy and engine performance superceded the need for light-weight wood aircraft.

2. In 1980, Israel Aircraft Industries began to develop the Lavi fighter. This project was mostly financed by the U.S. government, and, by 1984, when the first prototype was ready, the Israeli government halted the project primarily for political reasons. The U.S. government withdrew financing because it felt that the Lavi would eat into the business of U.S. companies such as Boeing and Lockheed. The Israeli government, an annual recipient of U.S. foreign aid, was persuaded not to continue on its own.

3. Ballistic missile defense or "Star Wars" – This huge and costly project was initiated by Ronald Reagan in the late 1980s with the goal of protecting the U.S. from a nuclear attack by the former Soviet Union. The underlying technology was enormously complex, requiring lasers to be stationed on Earth-orbiting satellites and to be controlled through a sprawling computerized network of ground stations. The project was halted in the early 1990s when the U.S. congress failed to allocate funds for further development. Several reasons contributed to that decision including the collapse of the Soviet Union, widespread protests from respected experts who saw little hope of the system working, pressure to spend the funds elsewhere, and the failure of initial tests to achieve even a modicum of success. Nevertheless, in the early 2000s, President Bush reinitiated the project hoping to capitalize on new technologies and a favorable political mood in the congress.