Topic 7: Plan a Research

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Purpose of Research Planning (1)

- Clarify the objectives
- Define the dependencies and order of required activities
- Identify milestones to review research and check progress
- Estimate time required for activities

Purpose of Research Planning (2)

- Ensure the availability and effective use of resources
- Provide a guide for management towards successful completion on time
- A contingency plan to allow adjustment of research activities

Purpose of Research Planning (3)

- Keep in mind
  - The fewer the resources of time and money the greater the need for careful planning
  - In any research the key resource is always the student's own time
  - Planning is most necessary where the activities involved are non-routine

A Typical Process of Planning (1)

- Determine the objectives
- List the activities
- Draw a network plan
- Estimate the time for each activity
- Analyze the network
- Check the resources
- Re-plan as necessary

A Typical Process of Planning (2)

- Determine the aims
  - Aims influence activities
    - Complete a thesis in 2.5 years (119 weeks) as a full-time master candidate
- List the activities
  - Granularity of the activities
    - Depends on the length of the research and the stage which has been reached
  - If there exist difficulties, the research involves too much uncertainty and needs redefinition

A Typical Process of Planning (3)

Activity No.	Activity description	Estimated duration (weeks)
1	Written statement of concepts and theories	3
2	Fist draft of questionnaires for pilot study	6
3	Finalising questionnaires for pilot study	1
4	Decide likely methods of analysing responses to survey	4
5	Select participants for pilot	4
6	Acquire statistical skills	8
7	Attend course on use of standard computer packages	6

A Typical Process of Planning (4)

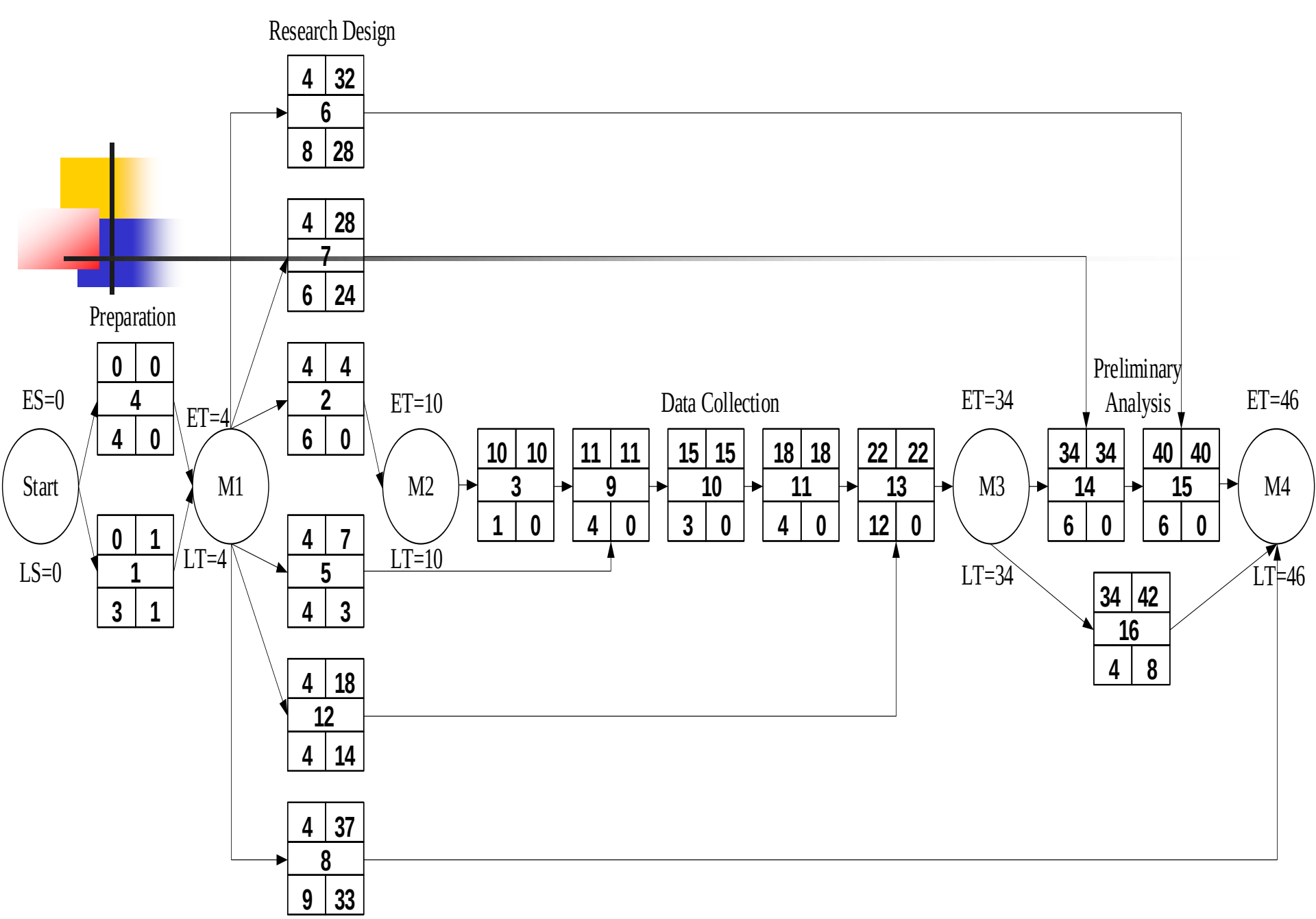
8	Write the first draft of an early thesis	9
9	Carry out the pilot study	4
10	Review the pilot study	3
11	Prepare the questionnaires	4
12	Determine the population and sample	4
13	Carry out the survey	12
14	Process data by computers	6
15	Explain the output by computers	6
16	Evaluate the nature and scope of the survey results	4

A Typical Process of Planning (5)

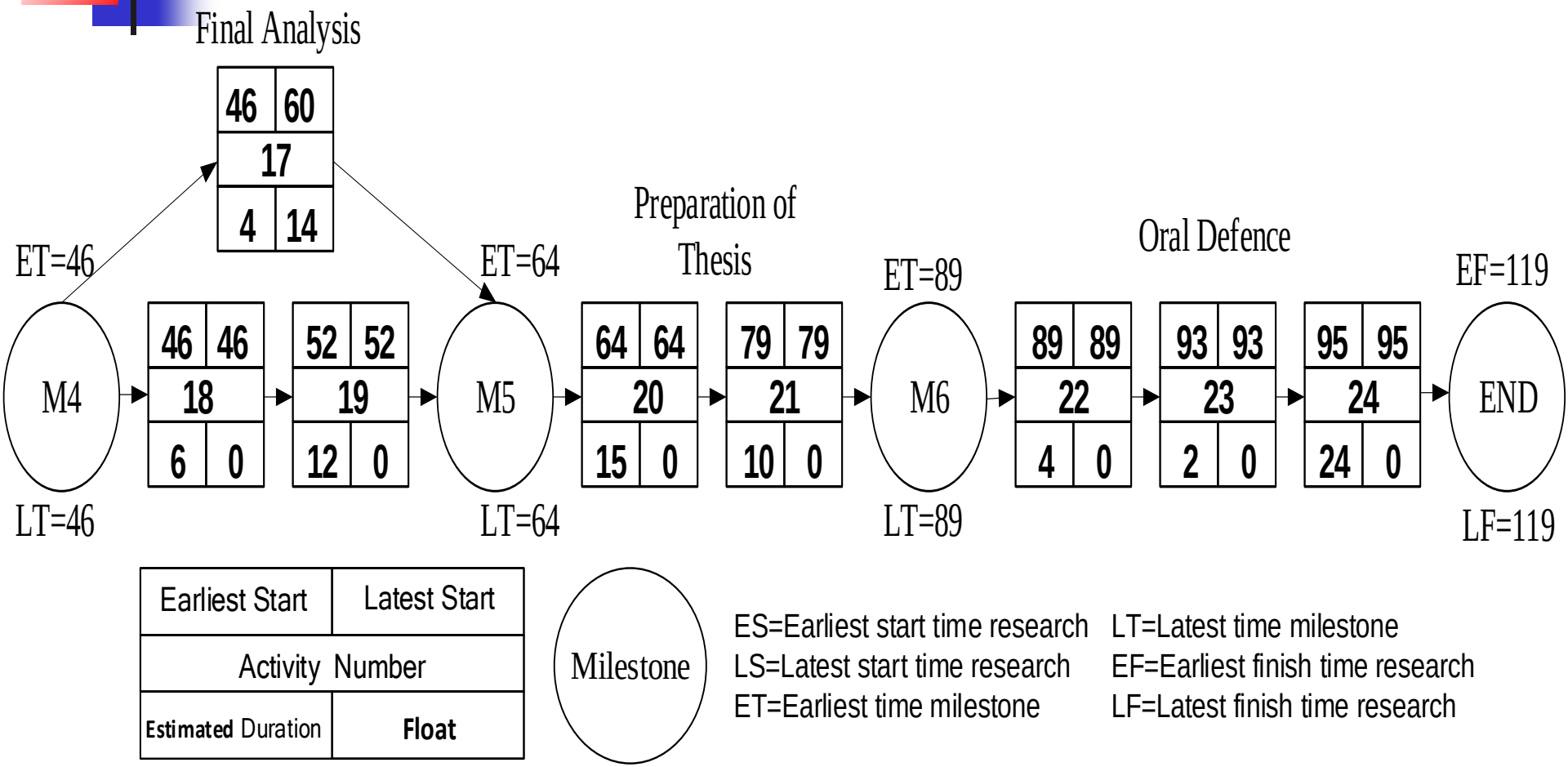
17	Write papers for conference	4
18	Connect findings with existing concepts, theories and hypotheses	6
19	Confirm and conduct the next analysis and study	12
20	Complete the first draft of the thesis	15
21	Review and edit the thesis	10
22	Revise and bind the thesis	4
23	Prepare for the oral defence	2
24	Allowance for holidays, job interviews, illness and general contingencies	24

A Typical Process of Planning (6)

- Draw a network plan
  - Represent activities by boxes and orders by arrows linking the boxes
  - Advantages
    - Exhibit interlinks among activities
    - Avoid neglecting activities necessary for completing research
    - Parallel paths imply the key points where multiple activities can be performed at the same time


Research Design
4 32
6
8 28
4 28
7
6 24
Preparation
0 0
4
4 0
0 1
1
3 1
ES=0
LS=0
Start
ET=4
LT=4
M1
4 4
2
6 0
4 7
5
4 3
4 18
12
4 14
4 37
8
9 33
ET=10
LT=10
M2
10 10
3
1 0
11 11
9
4 0
15 15
10
3 0
18 18
11
4 0
22 22
13
12 0
Data Collection
ET=34
LT=34
M3
Preliminary
Analysis
34 34
14
6 0
40 40
15
6 0
34 42
16
4 8
ET=46
LT=46
M4

A Typical Process of Planning (8)



A Typical Process of Planning (9)

- Estimate the time for each activity
  - Suggestions from supervisor and classmates finished similar research
  - Contingency accounts for about 20% of the time required for the whole research
  - Some activities have standard time
    - It usually takes 10 hours to read a textbook not very thick
  - Self-estimating

A Typical Process of Planning (10)

- Analyze the network
  - Earliest Start (ES)
    - The earliest time to initiate an activity
    - Calculated by forward reasoning of the 'Earliest start time research'
  - Latest Start (LS)
    - The time when an activity must be initiated to obtain the 'Latest finish time research'
    - Calculated by backward reasoning of the 'Latest finish time research'

A Typical Process of Planning (11)

- Float
  - The free time between the ES and the LS
  - LS - ES
- Critical activity
  - The activity which the float is 0
  - Activity 4，2，3，9…

A Typical Process of Planning (12)

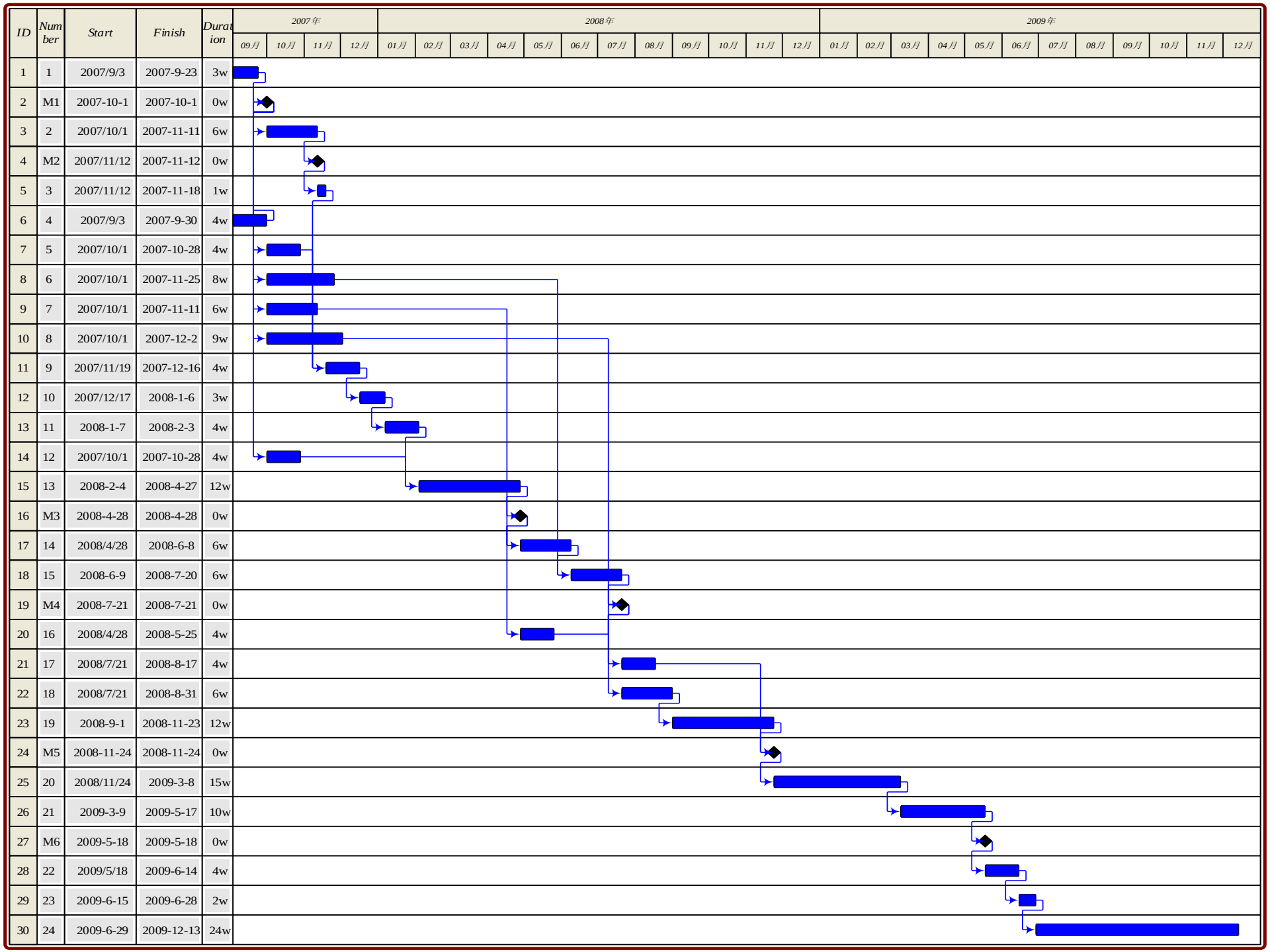
- Critical path
  - The path composed of critical activities
  - 4-〉2-〉3-〉9->10->11->13->…
  - If any activity on the 'critical path' exceeds the 'estimated duration', the only way to complete the research on time is to shorten the 'estimated duration' of the next 'critical activity'
- It takes 119 weeks to complete the entire research without considering resources and can meet the goal of completing the thesis in 2.5 years

A Typical Process of Planning (13)

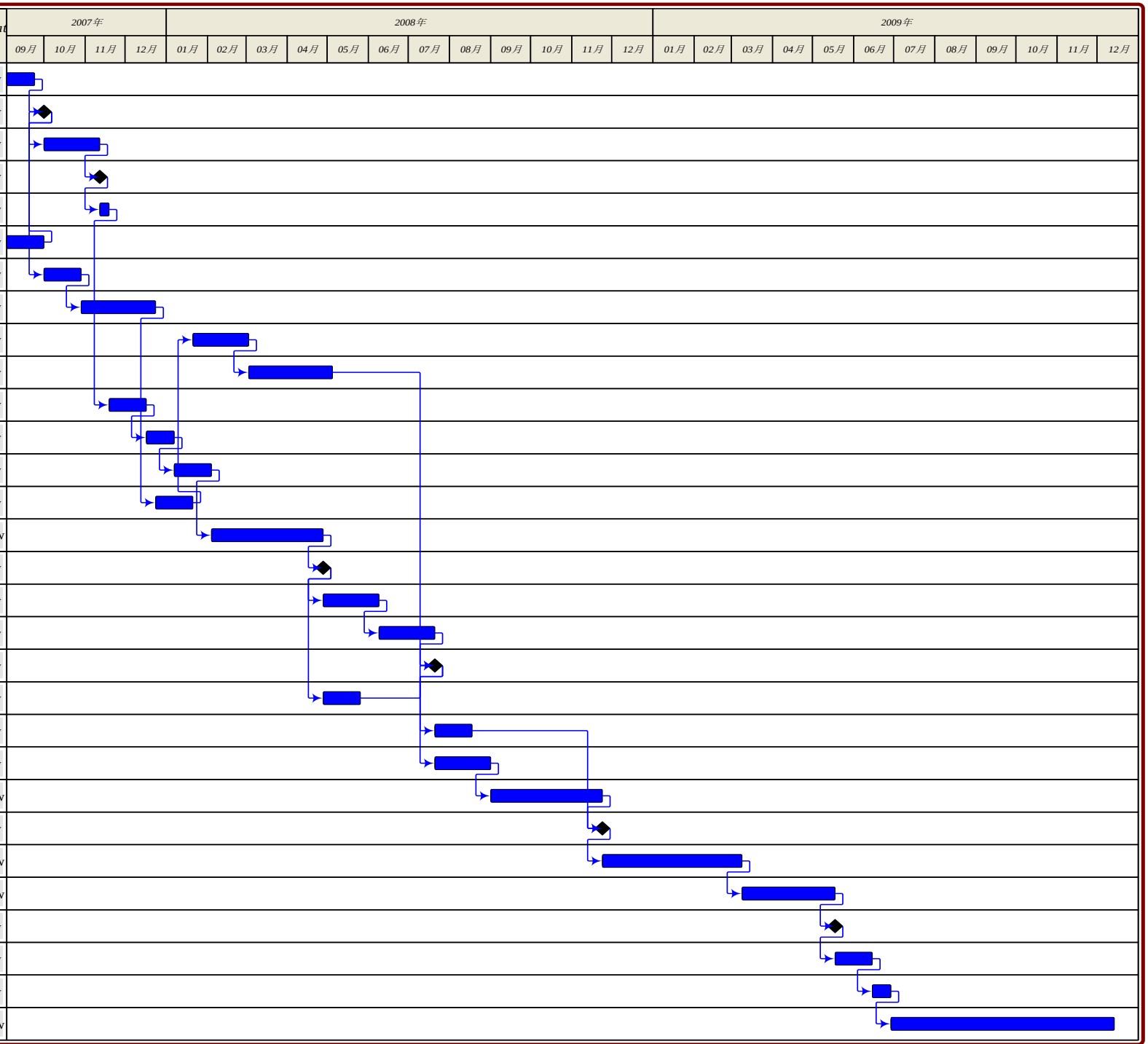
- Check the resources
  - In the situation where resources (including time) are scarce, activities that could have been carried out in parallel would have to be performed in a serial manner

A Typical Process of Planning (14)

- Draw the bar chart (Gantt Chart)
  - An activity is represented by a rectangle starting at the ES and as long as its 'estimated duration'
  - 'Float' is represented by a long line after a rectangle
  - It is very short of the line after the rectangle representing a critical activity
- Clearly expressed 'Float' offers the possibility to balance resources
  - It is possible to arrange the activities numbered 5, 6, 7, 8, and 12 serially


ID
Number
Start
Finish
Duration
2007年
2008年
2009年
09月 10月 11月 12月 01月 02月 03月 04月 05月 06月 07月 08月 09月 10月 11月 12月 01月 02月 03月 04月 05月 06月 07月 08月 09月 10月 11月 12月
1 1 2007/9/3 2007-9-23 3w
2 M1 2007-10-1 2007-10-1 0w
3 2 2007/10/1 2007-11-11 6w
4 M2 2007/11/12 2007-11-12 0w
5 3 2007/11/12 2007-11-18 1w
6 4 2007/9/3 2007-9-30 4w
7 5 2007/10/1 2007-10-28 4w
8 6 2007/10/1 2007-11-25 8w
9 7 2007/10/1 2007-11-11 6w
10 8 2007/10/1 2007-12-2 9w
11 9 2007/11/19 2007-12-16 4w
12 10 2007/12/17 2008-1-6 3w
13 11 2008-1-7 2008-2-3 4w
14 12 2007/10/1 2007-10-28 4w
15 13 2008-2-4 2008-4-27 12w
16 M3 2008-4-28 2008-4-28 0w
17 14 2008/4/28 2008-6-8 6w
18 15 2008-6-9 2008-7-20 6w
19 M4 2008-7-21 2008-7-21 0w
20 16 2008/4/28 2008-5-25 4w
21 17 2008/7/21 2008-8-17 4w
22 18 2008/7/21 2008-8-31 6w
23 19 2008-9-1 2008-11-23 12w
24 M5 2008-11-24 2008-11-24 0w
25 20 2008/11/24 2009-3-8 15w
26 21 2009-3-9 2009-5-17 10w
27 M6 2009-5-18 2009-5-18 0w
28 22 2009/5/18 2009-6-14 4w
29 23 2009-6-15 2009-6-28 2w
30 24 2009-6-29 2009-12-13 24w

ID	Number	Start	Finish	Duration
1	1	2007/9/3	2007-9-23	3w
2	M1	2007-10-1	2007-10-1	0w
3	2	2007/10/1	2007-11-11	6w
4	M2	2007/11/12	2007-11-12	0w
5	3	2007/11/12	2007-11-18	1w
6	4	2007/9/3	2007-9-30	4w
7	5	2007/10/1	2007-10-28	4w
8	6	2007/10/29	2007/12/23	8w
9	7	2008/1/21	2008/3/2	6w
10	8	2008/3/3	2008/5/4	9w
11	9	2007/11/19	2007-12-16	4w
12	10	2007/12/17	2008-1-6	3w
13	11	2008-1-7	2008-2-3	4w
14	12	2007/12/24	2008/1/20	4w
15	13	2008-2-4	2008-4-27	12w
16	M3	2008-4-28	2008-4-28	0w
17	14	2008/4/28	2008-6-8	6w
18	15	2008-6-9	2008-7-20	6w
19	M4	2008-7-21	2008-7-21	0w
20	16	2008/4/28	2008-5-25	4w
21	17	2008/7/21	2008-8-17	4w
22	18	2008/7/21	2008-8-31	6w
23	19	2008-9-1	2008-11-23	12w
24	M5	2008-11-24	2008-11-24	0w
25	20	2008/11/24	2009-3-8	15w
26	21	2009-3-9	2009-5-17	10w
27	M6	2009-5-18	2009-5-18	0w
28	22	2009/5/18	2009-6-14	4w
29	23	2009-6-15	2009-6-28	2w
30	24	2009-6-29	2009-12-13	24w



A Typical Process of Planning (17)

- For most research, it is appropriate to work 40 hours a week on average
- It is always wrong to invest 100% of any type of resources (including time) in research
- Other resources affecting a research plan are out of control of students
  - Curriculum time, specific devices are only available during holidays, the availability of supervisor, etc.

A Typical Process of Planning (18)

- Only if the actual progress is slower than expected do we need to increase working hours
  - In the case of unavoidable overtime, both the 'estimated duration' and the number of occurrence should be limited as much as possible
  - Appropriate rest should be arranged after overtime

A Typical Process of Planning (19)

- Re-plan as necessary
  - Once the research is initiated, the plan changes from a planning tool to a control tool
  - If the research is very complicated, two results are inevitable
    - The actual duration of an activity exceeds the 'estimated duration'
    - The sequence of activities that have not been performed needs to be adjusted

A Typical Process of Planning (20)

- Spend time on re-planning consciously
  - Cannot push the research forward immediately
  - Completing the research on schedule successful instead of failed

Discussion

- Read the proposal of the case and explain whether it meets the purpose of research planning
- Draw up a plan for your research using the network plan and the Gantt chart