Application of Project Management Tools in the Enterprise

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Abstract: To ensure the successful implementation of the project and the orderly progress of the project progress for more economic benefits, companies need to invest in resources, time, and other costs and join the scientific and technical guidance of the project progress management system theory. This paper focuses on the basic knowledge and related project management theories, with the critical path method, PERT and Time-cost trade as the tools. It systematically discusses how to forecast and control the project duration through project schedule management methods and supports achieving refined project management. Also, the tools in this thesis apply to the project management practices of enterprises in various fields.

1 INTRODUCTION

1.1 Project Management Research Background

With the development of the knowledge economy, the world's economy is changing from high growth to high-quality development, which requires enterprises to further develop and implement a more professional project management process. Scholars generally believe that a project refers to using limited resources and time to achieve specific goals for specific users according to a specific life cycle. Project management is the overall monitoring and management of activities related to realising a series of objectives (Liu 2020). Project management uses expertise, skills, tools and methods to plan, organize, implement and control project activities. The main challenge is the need to accomplish all project objectives within the established constraints. These constraints include project scope, completion time, quality, and budget (Tan 2019). Project progress management is the process of using the relevant theoretical knowledge of the project risk management, formulating the corresponding plans for the different stages and combining with the enterprise resources, and determining the corresponding objectives to monitor the progress project's objectives can be summarized into three aspects: progress, cost and quality, which jointly drive the project management process. Among them, the management of progress objectives is usually regarded as the priority objective in the process of project implementation, and the management of cost and quality objectives is often carried out based on the progress management system, such as earned value management and the determination of quality control points (Tan 2019).

At present, China's economy is in a critical period of transformation from high growth to high-quality development. Therefore, it is more necessary for enterprises to further explore and practice a more professional project management process.

To conclude, project management can be seen as a way to deal with the strategy of the organization, a means of survival and development in the changing and relentless market competition, and it should be more widely used. The realization of project management and the development of project management cannot be separated from the modernization of management ideas, management organizations, management methods and means, which is the inevitable trend of project management development. Facing the rapidly changing market

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and the fierce competition among enterprises, our only choice is to innovate and grasp the pulse of management.

1.2 Current Status of Project Management Research

There are many methods for risk analysis of engineering project progress. Still, the PERT (Plan Evaluation and Review Technology) based on CPM(Critical Path Method) Network technology is the most common use with the fastest development. From the original classic PERT network program to various improvements to the PERT approach today, the researchers remain unenthusiastic and applied to various engineering fields (Wu 2016). Network Planning Technology was introduced in the early 1960s by the famous mathematician Professor Hua Luogeng. In his book "Coordinating Method Translation and Supplement" (Hua 1965), PERT technology is introduced and dedicated to promoting PERT technology.

In 1981, Project Management Institute(PMI) launched the "Project Management Standardization" study, named PMBOK（Project Management Body of Knowledge）, and registered and published 15 years later. The Chinese Project Management Body of Knowledge (CPMBOK) is based on PMBOK (Ma 2013) and consists of 38 processes. However, the current situation of many project management knowledge systems also shows that project management is still a young discipline and is still developing and improving (Yin 2003).

Munns A K & Bjeirmi B F identify the overlap between the project and project management definition and discuss how the confusion between the two may affect their relationship. It identifies the different individuals involved in the project and project management and their objectives, expectations, and influences. It demonstrates how a better appreciation of the distinction between the two will increase project success (Munns, Bjeirmi 1996).

In "A Study on Project Cost Management System Based on Project Management Theory", Bi Xing pointed out that project management is different from general business management, with its unique characteristics: activity-oriented, non-repetitive, complex implementation and life-cycle risks, thus making project management more challenging. In addition, the definition and meaning of project cost management are explained (Bi 2007).

Zhou Yongjun, in "Research on the Current Situation and Development of Project Management", studies the development history of project management in China, points out the characteristics of engineering project management in China and makes suggestions for its scientific development (Zhou 2006).

In "Discussion on the use of modern project management theory in engineering management", Yang Guang proposes improvement methods for modern project management in the project management process to reduce costs (Yang 2021).

1.3 Thesis Organization

In this paper, we analyze a new product design and market launch project for a domestic company that plans to design and develop a new model of product and needs to move forward with the project as soon as possible to capture the current market share, win in the market and make a profit.

Based on the initial data, this thesis plans to analyze the project duration and optimize it using the CPM (Critical Path Method), PERT (Plan Evaluation and Review Technology) and TT (Time-cost Trade-off) methods. In the first part of the thesis, project management research's background and current status are synthesized, the second part analyses each of the three methods used in project management, and the third part discusses the results. The fourth part concludes and explores the general applicability of the findings.

2 METHOD

The thesis intends to use a research method combining theoretical deduction, case induction method and quantitative analysis method to analyze theoretical analysis through literature collection and collation, to analyze the current situation of domestic and foreign research, to collect domestic and foreign research results on project duration risk evaluation and dynamic control, and to explore the theoretical application of engineering project duration risk management, especially engineering project duration risk evaluation and dynamic control. Identify the influencing factors of project duration risk, and then complete the research on project duration risk evaluation and dynamic control by combining with actual engineering projects. The specific technical route is as follows.

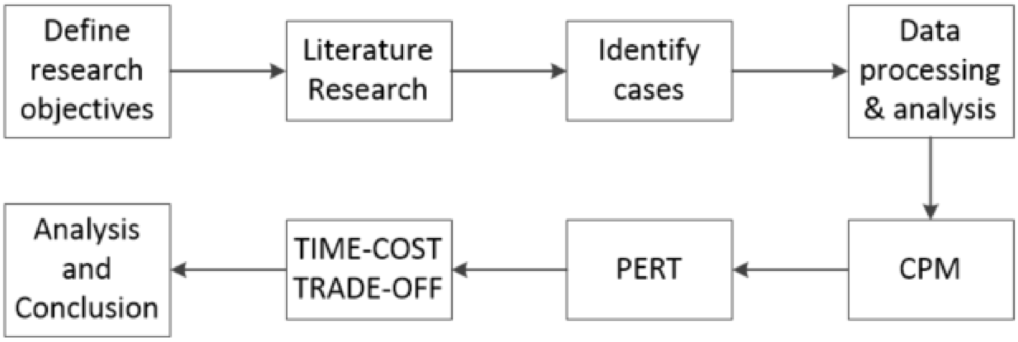

Figure 1: Method Roadmap.

2.1 Data

The case data of this thesis is provided by the project department of a domestic manufacturing company, and the private information of the company involved has been blurred to protect the company data. At present, the company plans to launch a new product. The project manager gives a description of the project, the activities and their time give estimates as shown in table 1, from which a network diagram can be drawn to find the critical path.

Table 1: Project Schedule Worksheet.

	ACTIVITY	Required Time/Weeks	Immediate Predecessors	Slack Time /Weeks
A	**Research and Manufacturing**			
A1	Project Launch Phase	**2**	**None**	**1**
A2	R&D Design	**5**	**A1, B1**	**0**
A3	Material Information Integration	**5**	**A2**	**3**
A4	Equipment Purchase	**6**	**A3, B6**	**0**
A5	Layout of equipment	**4**	**A4**	**0**
A6	Order external parts	**1**	**B10**	**0**
A7	Assembly and production	**5**	**A6**	**0**
A8	Produce products	**7**	**A7**	**0**
B	**Marketing**			
B1	Market Positioning	**3**	**None**	**0**
B2	Product introduction information	**10**	**B1**	**3**
B3	Product property protection	**10**	**B2**	**3**
B4	Identify promotional vendors	**3**	**B1**	**2**
B5	Trial Promotion	**4**	**A2,B4**	**0**
B6	Review & Decision Making	**4**	**B5**	**0**
B7	Price Analysis	**7**	**None**	**15**
B8	Define market strategy	**4**	**B7,C3,C4**	**3**
B9	Run test market	**8**	**A5,B3.B8**	**0**

Table 1: Project Schedule Worksheet (cont.).

	ACTIVITY	Required Time/Weeks	Immediate Predecessors	Slack Time /Weeks
B10	Evaluate sales data and revise	**5**	**B9**	**0**
B11	Promote strategy	**8**	**B10**	**5**
C	**Advertising and Promotion**			
C1	Determine the communication program	**4**	**B1**	**8**
C2	Evaluation& Decision Stage	**2**	**C1**	**8**
C3	Cooperate with promotional agencies	**5**	**B2,C2**	**4**
C4	Purchase promotion materials	**6**	**B2**	**3**

Considering the uncertainty of the project, the company also used a more accurate estimation method for each activity of the project - PERT. The corresponding Pessimistic, Most Likely, Optimistic time for each activity is given in Table 2 below, allowing for a more accurate project estimation.

Table 2: PERT Original Data.

		TIME REQUIRED (WEEKS)		
ACTIVITY	**Predecessor**	**Pessimistic**	**Most Likely**	**Optimistic**
A1	None	3	2	1
A2	A1, B1	7	5	4
A3	A2	6	5	4
A4	A3, B6	8	6	4
A5	A4	5	4	3
A6	B10	3	1	0.5
A7	A6	7	5	4
A8	A7	9	7	4
B1	None	5	3	1
B2	B1	12	10	6
B3	B2	13	10	6
B4	B1	6	3	1
B5	A2,B4	6	4	1
B6	B5	6	4	2
B7	None	9	7	4
B8	B7,C3,C4	8	4	3
B9	A5,B3.B8	10	8	5
B10	B9	6	5	3
B11	B10	9	8	5
C1	B1	6	4	3
C2	C1	4	2	0.5
C3	B2,C2	7	5	3
C4	B2	8	6	3

In addition to the project duration estimation, it is necessary to use cost-effective methods to reduce the project duration to minimize project expenditures, considering that the earlier the project is completed. Below (Table 3) is the list of activities that potentially could be completed faster, together with the original and "crashed" time for each activity and the cost for crashing. Time and cost values between those shown may be estimated using linear interpolation. For example, the duration of A3 can be reduced by 1 week at the cost of $1050.

Table 3: TIME-COST TRADE-OFF Original Data.

Activity ID	Original Time(weeks)	Crashed Time (weeks)	additional cost	Slope	Maximum Crash Time
A3	5	3	2100	1050	2
A4	6	3	3900	1300	3
A7	6	4	7000	3500	2
B2	10	8	3200	1600	2
B5	4	3	1700	1700	1
B6	4	3	3400	3400	1

2.2 CPM

As a network planning technique, the critical path method cannot be ignored in practical project management. The critical path is the logical path in a design with the longest delay from input to output. Optimizing the critical path is an effective way to improve the speed of design work. Generally, the delay from input to output depends on the path with the largest delay through which the signal travels, independent of other paths with small delays. The critical path method can be used repeatedly in the optimization design process until it is impossible to reduce the critical path delay (Pan 2010). The critical path method is mainly a kind of network diagram based on single-point time estimation with strict order. It has emerged as an important aid for projects, especially for providing a graphical display of the project and its major activities. This quantitative information provides an extremely important basis for identifying potential project delay risks (Du 2007). Li-Li-Ping, Zhao-Xue in "Implementation of Critical Path Method" explained in detail how to get the earliest start time(ES), earliest finish time(EF), latest start time(LS), and latest finish time(LF) by using Forward Pass and Backward Pass (Li 2005), which will not be repeated in this paper. Tan Zetao explained the application of the critical path method in schedule management in detail in "Research on project schedule management based on critical path method" (Tan 2019).

In this thesis, under the condition that the initial data of the case is known, the critical path method is used to draw the network flow diagram and get ES、EF、LS、LF according to the principle that the SLACK of activity on the critical path equals 0. The project duration can be obtained for the subsequent optimization.

2.3 PERT

Planning review technology is another network planning technology that is basically consistent with the principles of the key path method. They all arrange their project plans as a network map. The main difference is the time estimation for each operation. In the critical path method, the estimated time of each operation is determined. Still, it is difficult to accurately estimate the duration of each operation in a project, such as some unheard of projects or during the project, uncertain due to other external factors, which will complicate the whole project. Planning review technology provides a good solution for this situation (Wu 2016).

In the classical PERT, the duration of each project operation is a random variable and cannot give its accurate time value, but its three time estimates can be given, namely optimistic estimated time a, most likely estimated time m and pessimistic estimated time b. The following assumptions are made: each operation is independent of each others with no correlation; the duration of the operation follows the slice distribution.

The classical PERT approach assumes that all operations are independent with no correlation. Therefore, it does not consider critical operations on

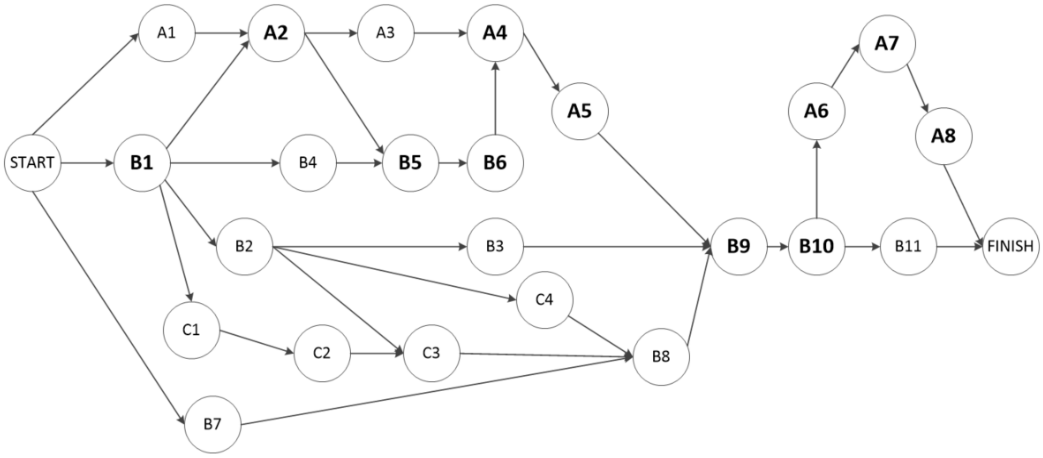

Figure 2. Activity-on-node Network.

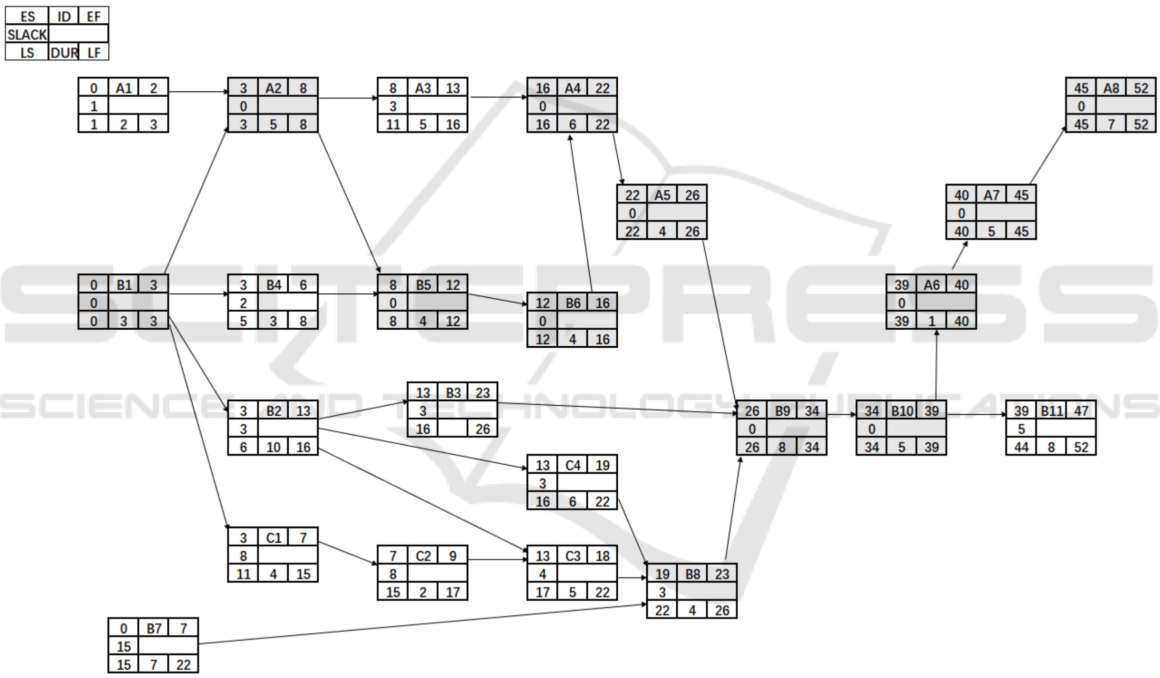

Figure 3: Activity-on-node Network with ES, EF, LS, LF.

non-critical operations and the expected mean D_{ij} for the duration of each operation. And the variance σ_{ij}^2 is calculated by the following formula.

$$D_{ij} = \frac{(a+4m+b)}{6} \quad (1)$$

$$\sigma_{ij}^2 = \frac{(b-a)^2}{36} \quad (2)$$

The expected mean D_{ij} And the variance σ_{ij}^2 were calculated for each operation., The proposed method transforms the problem of uncertain construction period into a definite problem that can be solved by the CPM method. For a given line, the expected duration $E(T_n)$ and variance σ_n^2 are calculated.

$$E(T_n) = \sum D_{ij} \quad (3)$$

$$\sigma_n^2 = \sum \sigma_{ij}^2 \quad (4)$$

The completion probability $P(t \leq T_S)$ under the planned construction period T_S is calculated with the following formula.

$$P(t \leq T_S) = \int_0^{T_S} \frac{1}{\sigma_n \sqrt{2\pi}} e^{-\frac{1}{2}(\frac{t-T_S}{\sigma_n^2})^2} dt \tag{5}$$

Based on the initial data, PERT is calculated as follows.

Table 4: PERT Calculation Results.

		TIME REQUIRED (WEEKS)									
ACTIVITY	**Predessor**	**Pessimistic**	**Most Likely**	**Optimistic**	**Te**	**Var**	**ES**	**EF**	**LS**	**LF**	**SLACK**
A1	None	3	2	1	2	0.111	0	2	1	3	1
A2	A1, B1	7	5	4	5.16	0.25	3	8.166	3	8.166	0
A3	A2	6	5	4	5	0.111	8.166	13.16	11	16	2.833
A4	A3, B6	8	6	4	6	0.444	16	22	16	22	0
A5	A4	5	4	3	4	0.111	22	26	22	26	0
A6	B10	3	1	0.5	1.25	0.173	38.66	39.91	38.66	39.91	0
A7	A6	7	5	4	5.16	0.25	39.91	45.08	39.91	45.08	0
A8	A7	9	7	4	6.83	0.694	45.08	51.91	45.08	51.91	0
B1	None	5	3	1	3	0.444	0	3	0	3	0
B2	B1	12	10	6	9.66	1	3	12.66	6	15.66	3
B3	B2	13	10	6	9.83	1.361	12.66	22.5	16.16	26	3.5
B4	B1	6	3	1	3.16	0.694	3	6.166	5	8.166	2
B5	A2,B4	6	4	1	3.83	0.694	8.166	12	8.166	12	0
B6	B5	6	4	2	4	0.444	12	16	12	16	0
B7	None	9	7	4	6.83	0.694	0	6.833	14.66	21.5	14.66
B8	B7,C3,C4	8	4	3	4.5	0.694	18.5	23	21.5	26	3
B9	A5,B3.B8	10	8	5	7.83	0.694	26	33.83	26	33.83	0
B10	B9	6	5	3	4.83	0.25	33.83	38.66	33.83	38.66	0
B11	B10	9	8	5	7.66	0.444	38.66	46.33	44.25	51.91	5.583
C1	B1	6	4	3	4.16	0.25	3	7.166	10.25	14.41	7.25
C2	C1	4	2	0.5	2.08	0.340	7.166	9.25	14.41	16.5	7.25
C3	B2,C2	7	5	3	5	0.444	12.66	17.66	16.5	21.5	3.833
C4	B2	8	6	3	5.83	0.694	12.66	18.5	15.66	21.5	3
END	A8,B11	0	0	0	0	0	51.91	51.91	51.91	51.91	0

PERT has the same fundamentals from CPM in that CPM gives the determined duration of the operation, which determines the start and end time of each job, and determines the maneuver time on each line through the earliest start time and the earliest and latest end time, thus determining the key line and the key operation. However, PERT is based on some uncertainties in the project. Each job gives H time estimates, respectively optimistic time estimate 0, the most likely time estimate m, pessimistic time estimate A, and then calculates the expected value of the construction period according to the PERT calculation method, thus transforming into the CPM algorithm.

The advantages of PERT plan review technology are mainly reflected in the following aspects:

(1) PERT is an effective method of prior control;

(2) Head at all levels can, through the project time network analysis, not only can understand the whole project construction process, understand the task responsible for the status in the construction process, enhance the overall view, also can make them more clear their work focus, the mind on the key points that

need to take corrective measures, make the control work has better results;

(3) PERT is a planning optimization method (Xie 2015).

2.4 TIME-COST TRADE-OFF

First, the time cost is the cost of not reaching a specific agreement, and it is also the loss of market opportunity during the waiting time. If a project does not have a good time-cost trade-off, it is very likely that the project will not achieve the company's expected results, which makes time cost trade-offs particularly important.

Next, we discuss the time cost trade-off method, combining the critical activity in CPM with the crashed time and additional cost of the trade-off activity, following the following pattern"1" prioritize the critical activity with the lowest single-day addition cost
"2" Prioritize the critical activity with the longest trade-off time. "3" prioritize the critical activity that has the least impact on the critical path of the entire project process.

These three priority principles are used to analyze and trade-off the entire project process and carefully select the critical activities that are needed and worth trade-offs to ensure the optimal solution for the trade-off costs.

As we all know, the process and schedule of a project is never static. Perhaps there is no process in our project that can satisfy the priority principle "3" so that in our time-cost trade-off process, the number of critical paths will most likely increase as the time of some critical processes changes, which means that in our step-by-step analysis process, we need to simultaneously This means that the number of processes that need to be traded off will also increase as we move through the analysis. This means that the number of processes that need to be traded off at the same time increases as we move through the analysis. Therefore, when there are too many processes in a project, and the processes are too closely linked, we can create an Excel spreadsheet to trade off the project day by day, process by process.

We list all the paths and the time required for the paths in the table, bold the font size of the critical paths, and record the extra cost and the duration of the tradeoff according to the priority principle mentioned earlier. And observe whether new critical paths appear.

For this tradeoff, we chose the A3 process that followed all three priorities and reduced its time by 3 wks.

Table 5: TIME-COST TRADE-OFF Step 1-3.

Paths	Length
A1-A2-A3-A4-A5-B9-B10-A6-A7-A8	48
A1-A2-A3-A4-A5-B9-B10-B11	43
A1-A2-B5-B6-A4-A5-B9-B10-B11	46
A1-A2-B5-B6-A4-A5-B9-B10-A6-A7-A8	51
B1-A2-A3-A4-A6-A7-A8	32
B1-A2-A3-A4-A5-B9-B10-A6-A7-A8	49
B1-A2-A3-A4-A5-B9-B10-B11	44
B1-A2-B5-A4-A6-A7-A8	35
B1-A2-B5-B6-A4-A5-B9-B10-A6-A7-A8	**52**
B1-A2-B5-B6-A4-A5-B9-B10-B11	47
B1-B4-B5-B6-A4-A6-A7-A8	33
B1-B4-B5-B6-A4-A5-B9-B10-A6-A7-A8	50
B1-B4-B5-B6-A4-A5-B9-B10-B11	45
B1-B2-B3-B9-B10-A6-A7-A8	49
B1-B2-B3-B9-B10-B11	44
B1-B2-C3-B8-B9-B10-A6-A7-A8	48

Table 5: TIME-COST TRADE-OFF Step 1-3 (cont.).

Paths	Length
B1-B2-C3-B8-B9-B10-B11	43
B1-B2-C4-B8-B9-B10-A6-A7-A8	49
B1-B2-C4-B8-B9-B10-B11	44
B1-C1-C2-C3-B8-B9-B10-A6-A7-A8	44
B1-C1-C2-C3-B8-B9-B10-B11	39
B7-B8-B9-B10-A6-A7-A8	37
B7-B8-B9-B10-B11	32

Steps	**Alternatives**	**Decision**	**Extra Cost**	**New Duration**
1)	**A4,A7,B5,B6** **1300；3500；1700；3400**	**Crash A4**	**1300**	**51**
2)	**A4,A7,B5,B6** **1300；3500；1700；3400**	**Crash A4**	**1300**	**50**
3)	**A4,A7,B5,B6** **1300；3500；1700；3400**	**Crash A4**	**1300**	**49**

Note: In a project, the benefit of weighing one process alone may be less than weighing multiple processes at the same time, so we can achieve time-cost trade-offs by weighing different processes in different critical paths.

In this figure, we can see that if we want to shorten the project duration, we can choose to trade-off A7 or both B2 and B5. In the comparison table between the trade-off process and its additive cost

We can find that the extra cost needed to weigh B2 and B5 at the same time is smaller than the extra cost needed to weigh A7. To follow the first priority principle, we choose to weigh B2 and B5 at the same time and record the duration of the weighed items and the extra cost needed for this tradeoff at the bottom of the table.

Let's skip to the last tradeoff.

Table 6: TIME-COST TRADE-OFF Step 6.

Paths	Length					
A1-A2-A3-A4-A5-B9-B10-A6-A7-A8	48	47	46	45	44	
A1-A2-A3-A4-A5-B9-B10-B11	43	42	41	40		
A1-A2-B5-B6-A4-A5-B9-B10-B11	46	45	44	43	42	
A1-A2-B5-B6-A4-A5-B9-B10-A6-A7-A8	51	50	49	48	47	46
B1-A2-A3-A4-A6-A7-A8	32	31	30	29	28	
B1-A2-A3-A4-A5-B9-B10-A6-A7-A8	49	48	47	46	45	
B1-A2-A3-A4-A5-B9-B10-B11	44	43	42	41		
B1-A2-B5-A4-A6-A7-A8	35	34	33	32	31	30
B1-A2-B5-B6-A4-A5-B9-B10-A6-A7-A8	**52**	**51**	**50**	**49**	**48**	**47**

Table 6: TIME-COST TRADE-OFF Step 6 (cont.).

Paths	Length					
A1-A2-A3-A4-A5-B9-B10-A6-A7-A8	48	47	46	45	44	
A1-A2-A3-A4-A5-B9-B10-B11	43	42	41	40		
A1-A2-B5-B6-A4-A5-B9-B10-B11	46	45	44	43	42	
A1-A2-B5-B6-A4-A5-B9-B10-A6-A7-A8	51	50	49	48	47	46
B1-A2-A3-A4-A6-A7-A8	32	31	30	29	28	
B1-A2-A3-A4-A5-B9-B10-A6-A7-A8	49	48	47	46	45	
B1-A2-A3-A4-A5-B9-B10-B11	44	43	42	41		
B1-A2-B5-A4-A6-A7-A8	35	34	33	32	31	30
B1-A2-B5-B6-A4-A5-B9-B10-A6-A7-A8	**52**	**51**	**50**	**49**	**48**	**47**

3 RESULTS AND DISCUSSION

3.1 CPM

Analyzing the network diagram, we can find out the critical path according to SLACK=0 and get the project cycle time of 52 days. The activities on the critical path will affect the completion time of the whole project, so we can optimize the activities on the critical path to advance the project completion time.

3.2 PERT

Various risk factors in the construction of the project are identified and given sufficient analysis. We can better prevent and control the construction period delay.

For this project, the subsequent analysis for probability of completion of construction period before node D and deviation value of normal distribution Z are calculated using the formula of normal distribution.

$$Z = \frac{(D-\mu)}{\sqrt{\sigma^2}} \tag{6}$$

$$D = \mu + Z\sqrt{\sigma^2} \tag{7}$$

It can be calculated that the time required to complete 90% of the project cycle is 121.973074; the proportion of projects that can be completed within 130 days is 0.999878867.

3.3 TIME-COST TRADE-OFF

When we find that there are no more processes to be weighed after a tradeoff, or that the processes to be weighed are no longer critical activities, the tradeoff ends. The sum of the extra costs under each table is calculated, which is the total extra cost needed for this time cost tradeoff. The item at the bottom of the penultimate table duration is the total duration of the project after the time cost tradeoff.

In the case of this project, we can find that it is not common to find a critical path that can satisfy all three priority principles at the same time, so we ranked the three priority principles following their importance in the time cost tradeoff at the same time, priority principle 1 is more important than priority principle 2, and priority principle 2 is more important than priority principle 3.

Table 7: TIME-COST TRADE-OFF Results.

Number of weeks by which the project can be shortened	Decision	PROJECT DURATION /Weeks	EXTRA COST
		52	
1	A4	51	1300
2	A4	50	2600
3	A4	49	3900
4	B2&B5	48	7200
5	A7	47	10700
6	A7	46	14200

3.4 Discussion of Improvement Points

In view of the above research results, we can find that the company still has room for optimization and improvement in the process of project implementation, and first put forward the following suggestions:

3.4.1 Equipment Purchase Cycle Is Long

In the project start stage, after the project team is established, and the project objectives, scope and basic data are concluded, the project procurement leader can be invited to intervene, fully understand the specific needs of the project, and arrange experienced professional suppliers to intervene in advance from the existing qualified supplier database according to the situation. If the resources are insufficient in the existing supplier information database, the procurement leader shall conduct high-quality supplier sourcing and evaluation selection. According to the project needs, the procurement leader develops potential suppliers through various ways to form the Supplier Situation Survey Form.

The procurement leader shall organize demand department/project responsible department, quality control department and other relevant departments to conduct a joint review of potential suppliers, focus on their basic situation, enterprise matching degree, quality management, technical ability, delivery ability, cost control, sustainability, etc., conduct objective and comprehensive evaluation, form a complete New Supplier Review Report and signed by the joint review team, and be listed as potential qualified suppliers.

The project leader shall formulate a project plan, confirm key nodes, responsibilities, track and monitor the supplier performance under agreed terms and standards, implement positive and negative incentives to motivate suppliers to cooperate actively to improve performance level to avoid penalty; the project team shall obtain management approval to avoid supplier loss or form negative reputation of illegal operation.

3.4.2 Equipment Assembly Time Is Lengthy

After project acceptance and delivery, the procurement leader shall timely organize the relevant core team and departments to conduct a performance evaluation of suppliers, including quality management, cost control, technical ability, sustainable development, delivery ability, etc., make comprehensive, specific and objective performance evaluation scores for suppliers, and form supplier performance feedback, communicate with the senior level of suppliers and make targeted project summary and improvement. As an important part of the supplier information database, 2, supplier performance evaluation should form closed-loop management, continuous dynamic update, and form a qualified and preferred supplier database. At the same time, develop and develop supplementary quality suppliers according to the situation, with a virtuous cycle.

The value of procurement lies in building an efficient supply chain, ensuring timely delivery of purchased raw materials/production equipment by quality, ensuring smooth production, realising price reduction of the product life cycle, and succeeding by making other departments succeed. Supplier management covers many aspects of supply source search, contract management and supplier relationship management. It is the main task of procurement involving supplier base rationalizations, supplier selection, coordination, performance evaluation, potential development and long-term collaboration where appropriate.

3.4.3 Project Input into the Preliminary Market Work Needs to Be Optimized

Specific optimization directions are given as follows.

(1) Opportunity Studies. Seek investment opportunities and identify the investment direction

(2) Preliminary feasibility study. Determine whether the project has vitality, macro necessity, construction conditions, profit, etc. Project proposal: implementation necessity and basis of the project; product plan, proposed scale and construction site; preliminary analysis of resources, construction conditions, cooperative process and equipment; investment estimate and financing plan; schedule; preliminary estimate of economic effects and social benefits

(3) Detailed feasibility study. Detailed technical and economical demonstration, select the optimal scheme based on multiple comparisons. The project feasibility study is based on the project proposal and the approval documents: whether technical feasibility; whether significant economic and social benefits; whether financial profit, human, material and natural resources; how long the construction is required; how much investment is required; whether to raise funds, etc.

(4) Economic evaluation and decision-making. Reduce and avoid investment risks, give full play to investment benefits, and improve investment decisions' scientific level. Financial evaluation is an

important basis for investment decisions, loans and approval for national economic evaluation. Based on the current financial system, current prices and relevant regulations, predict the investment project, solvency, and foreign exchange balance financial status and determine the project's financial feasibility.

3.4.4 Promotion Test Has a Large Room for Improvement

The application of emerging social software and the new product launch attempts held on the field can be used as a new direction of promotion to reduce the unnecessary time and capital cost brought by traditional promotion methods.

In the preparation stage, I divide the material into several directions; prepare 3-5 materials and art for each direction. Select 3 materials from each direction, three materials in each direction; prepare a landing page for each direction or a general landing page. During the test stage, each direction should ensure a univariate test; more than three accounts in the same channel. In the re-test stage, the test results in a good direction, optimize the corresponding landing page, expand more materials, try different copywriting, other colleagues with good test results. Finally, through the review, the reasonable and promotion of publicity.

4 CONCLUSION

This thesis utilizes three tools, CPM, PERT, and TT, which are used in the project management process to predict and manage the cycle time of a case project. It can be found that these three tools can contribute to a great extent to the development and advancement of projects.

In addition, the project management methods discussed in this thesis are universally applicable. Whether it is the launch of a new product in the food industry, the development of a new product in the industrial manufacturing industry, or the implementation of a construction project, the methods and tools discussed in this thesis can be used for effective project management in all industries.

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