RESEARCH ON PROGRESS IMPROVEMENT OF PRELOAD SOFTWARE PROJECT MANAGEMENT

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RESEARCH ON PROGRESS IMPROVEMENT OF PRELOAD SOFTWARE PROJECT MANAGEMENT

Thematic Certificate

To

CHENG MINGYU

This Independent Study has been Approved as a Partial Fulfillment of the Requirement of International Master of Business Administration in International Business Management

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Declaration

I, CHENG MINGYU, hereby certify that the work embodied in this independent study entitled "PROGRESS IMPROVEMENT OF PRELOAD SOFTWARE PROJECT MANAGEMENT – STUDY ON LENOVO COMPANY" is result of original research and has not been submitted for a higher degree to any other university or institution.

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ABSTRACT

With the advancement of technology and the rapid development of the Internet, people's work, study, and life rely more on the convenience of computers and software, Lenovo, as the smart device manufacturer with the highest market share in the world, pays close attention to the needs of its customers and develops more convenient hardware and software to adapt to the rapid changes in the market. In this context, the company's preload software project management team is facing more challenges. There are many problems that often affect the efficiency of project managers and thus on-time delivery of software products, such as frequent changes in requirements, the need for project managers to undertake more projects than they can handle, unclear division of work within the team, and long processing time for bug limitation. The author used project management theory and software project schedule management theory to analyze and propose hypotheses to address the problems: use Gantt charts to set and manage key project milestones and monitor the impact of changes on the project schedule; add a Bug Manager and a SPM assistant roles to handle the duplicate workload of common bug and bug limitation to reduce the burden of all SPMs' and unclear division of labor; optimize the limitation process in the Bug Management System to improve the efficiency of handling Limitation. Through quantitative research method, the project manager was allowed to adopt the new methods during the one-year project management cycle. After the experimental verification, these methods greatly improved the efficiency of SPM, and the time saved was used for other project management work, thus ensuring the completion of the project schedule on time. We hope that the research methods and theories in this paper can provide valuable references and lessons for other pre-installed software management or software development companies.

Keywords: project, project management, software project schedule management, process optimization

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1. Introduction

1.1 Research Background

As a global leader in intelligent devices, Lenovo provides hundreds of millions of intelligent devices, including computers, tablets, smartphones, etc., to users worldwide every year, and was the world's No. 1 in PC sales in 2018.

In order to make it easy for the average user to use the computer, the ease of use of the computer will play an increasingly important role in the overall evaluation of the computer (Dai, 2004). Preload (Pre-installation) of common software for users will significantly facilitate their use by eliminating the need to select, install, and debug. It can be said that the preload software is the first step to improve the ease of use of the computer. In addition, software preload can also bring the user-visible benefits.

In today's highly competitive and fast-paced environment, the rapid creation and delivery of high quality products and services is critical to business survival. The management processes used in the past to enable the delivery of new products and services are no longer effective (Enzo & Dennis, 2002).

Preload SW team in Lenovo is facing unprecedented problems and challenges. It is urgent to use scientific and effective management methods, technologies and tools to carry out detailed project schedule management, effectively control the project duration, project input cost, and ensure the smooth completion and delivery of the project.

For decades, researchers and practitioners have been searching for a better way to manage projects. In the research domain, several researchers have proposed new tools and techniques (Leach, 1999; Kessler, 2000), while others have conducted extensive studies on, for example, process, success factors and dimensions (Pinto and Slevin, 1989; Shenhar et al., 2001), teams and leadership (Frame, 1999; Thamhain, 2004), and project typology (Wheelwright and Clark, 1992; Shenhar and Dvir, 2007). Even so, scholars and practioners have agreed that many projects are managed in an ineffective way and that such poor management leads to a tremendous loss in productivity, profitability, and employee morale (Williams, 2005).

1.2 Research Problems

1. With the upgrade of technology, there are more technical and software requirements for the product, and the new technology is prone to generate more problems and change requirements, resulting in the project schedule being affected.

2. According to customer demand, the company launches more new products, which makes project managers need to undertake more projects simultaneously, and the limited time and energy leads to the delay or poor quality of the project.

3. The division of labor among project managers is unclear because of the common bugs that exist among multiple projects, and they pass the buck to each other, resulting in the problems not being followed up and solved promptly, which affects the project schedule.

4. Handling duplication work of Bug LMT too much, taking up too much time of the project manager and processing is not timely handled will delay the project schedule.

1.3 Objective of the study

How to improve the overall competitiveness of Lenovo in the market and how to improve the company's management power in software pre-installation, all need to optimize the project management system, in order to be able to solve the problems and deficiencies that constantly appear in the project management process, through scientific establishment of management systems, management processes and methods, adjust the organizational structure, the team's ability to play out, weaken the phenomenon of a person in the project management process, to avoid the emergence of product problems caused by differences in ability and improve progress of Preload SW project management to achieve project's target on time.

1.4 Scope of the study

This paper studies the project management improvement and progress optimization of preload software for Lenovo's notebook products. It provides an in-depth analysis of the project management schedule, identifies the key factors affecting the progress of preload software projects, and uses effective methods to improve them.

1.5 Research Significance

Nicholas (2012) stated that the future of project management tends to be difficult and complex, as product and service life cycles are shortening, budgets are tightening, and project teams are becoming more diverse and dispersed. But in contrast, better project management training and constantly updated project management support software also make project management easier. Silvius (2017) considers sustainability as one of the most important challenges of our time. It is recognized that projects play a key role in achieving more sustainable business practices, and a developing theme in project management research is the relationship between projects and sustainability.

In this paper, we study the process optimization of the company's project management, sort out the current problems in the company's project management process, and develop an optimization plan by combining project management theory and process theory. We are able to face the increasingly complex and changing needs of customers and improve customer satisfaction. Through the process optimization, we can also improve the efficiency of the company's internal operation, enhance the company's project management level, and improve the work ability and motivation of employees (Shen, 2020). It will improve the competitiveness of the company in the market and lay the foundation for the company's continued development, as well as provide a reference for research on project management and process optimization in the similar kind of industries.

2. Literatures Review

2.1 Theoretical Framework

Theoretical Framework is consisted of 5 parts: Project Management Theory, SW Project Schedule Management, Method, Analysis and Conclusions. Please refer to the theoretical framework graph (Figure 1) below for more details.

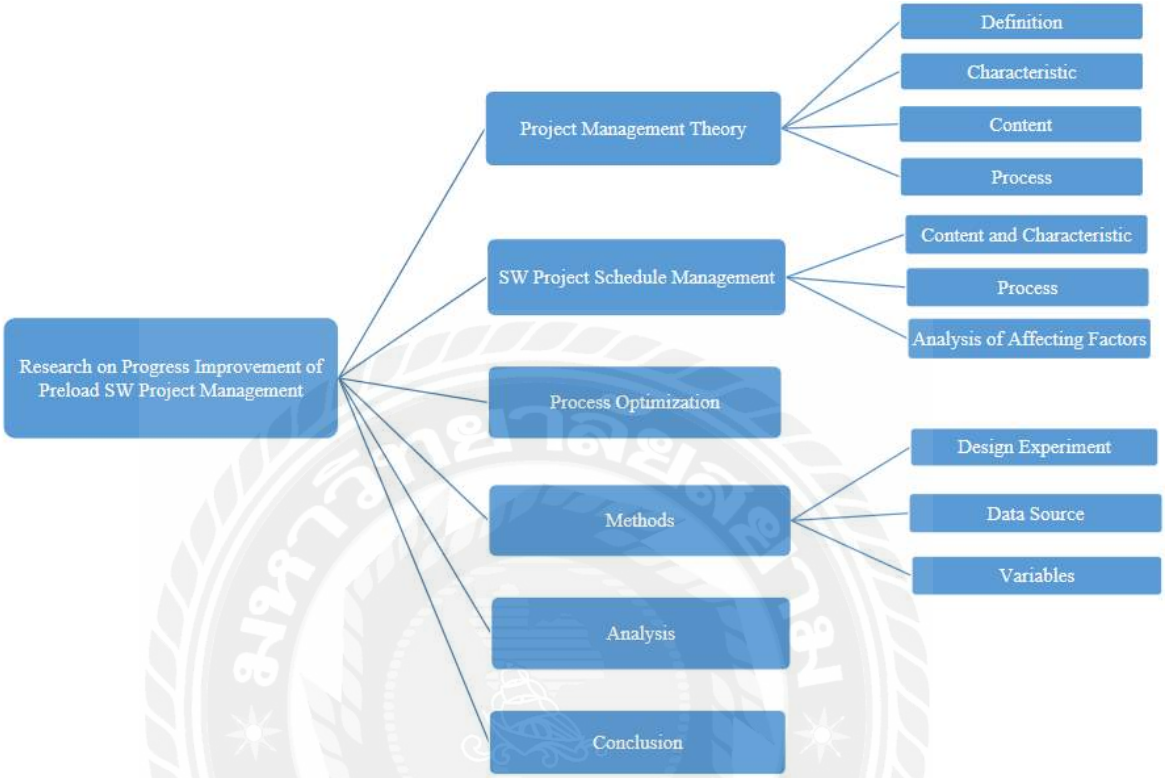

Figure 1 Theoretical Framework

2.2 Project

A project is a unique, complex, interrelated set of activities with clear objectives and specific resource constraints. These activities are constrained by time, cost, and resources, and are completed according to a plan. A project can also be described as an effort to achieve a goal, provided, of course, that the work is completed in a single effort (Xu, 2020).

Projects may be undertaken to generate revenue, such as introducing methods for improving cash flow, or be capital projects that require additional expenditure and resources to introduce a change to the capital base of the organization (Albert, 2014).

In a typical project, many tasks are performed concurrently with each other. Another key feature of projects is the existence of precedence relations between the tasks. These relations typically define constraints that require one task to be completed before another starts (Nicholas, 2012).

2.3 Project Management

Project management is the application of knowledge, skills, techniques, tools, etc. to a project. Project management is divided into processes such as project initiation, project planning, project execution, project monitoring, and project closure (Shen, 2020).

The use of project management as a business process goes back a long time. Indeed, the building of the Egyptian pyramids is believed by many to have been assisted by the use of simple project management principles. These successes were achieved for a fairly narrow range of applications. However, the potential for project management to be applied to a much wider set of applications gradually became apparent (Nicholas, 2012).

Project management approaches derived from best practices in the defence/aerospace, construction and pharmaceutical industries during the early 1970s have proven effective for managing small numbers of large projects in the relatively stable political, economic and technological context of the post-World War II period. However, the detailed, centralized planning, decentralized execution and centralized control of large projects that are the basis of these 'PM 1.0' methods and tools have proven burdensome and unresponsive for a new generation of workers who have grown up in a Web 2.0 world and who are now working on cutting-edge projects with rapidly evolving technologies in today's extremely dynamic global markets and political economies (Levitt, 2011).

The essence of project management is to use professional knowledge, tools and skills that are relevant to the scientific management methods and technology to complete the execution of project management. Its purpose is to make the project to run under the condition of limited resources and dynamic control processes to meet or exceed project objectives (Dong, 2020).

2.3.1 Definition of Project Management

Project management refers to the use of systematic and process-oriented management methods to effectively manage all the work involved in a project. This means planning, organizing, directing, coordinating, controlling and evaluating the entire process from the beginning of the investment decision to the end of the project in order to achieve the project objectives (Dai, 2004).

The results of study suggest that having a project portfolio management function within the organization improves the likelihood of assigning priority for projects and meeting quality expectations and project objectives (Vittal & Parviz, 2018). Dandage and Mantha (2017) argue that the success of project management is based on the effective management of project risks. Ahonen et al. (2015) examined the impact of effort factors on project management, established a literature-based hypothesis of project management effort ratios, and tested it with reported effort data from 117 software vendor projects. The results support most of the literature based hypotheses, but some of the hypotheses are not supported. The supported hypotheses are the correlations between project management effort, project size, and team size. The unsupported hypotheses are the necessity of spending at least some project management effort on a project, and the insignificance of contract type. Blackstone et al. (2009) conducted a study on project planning and the authors identified the scheduling of project buffers, unreasonable setting of individual task start and end times, and resource dependency as the root causes of project delays.

2.3.2 Characteristics of Project Management

1. Each project is unique. 2. Every project has a temporary nature. 3. The uncertainty of the project. (Xu, 2020)

Uncertainty is an unavoidable aspect of all projects (Gallstedt, 2003; Tatikonda and Rosenthal, 2000). It can come in a variety of forms, including uncertainty regarding the time to complete specific steps within a project, uncertainty regarding the availability of resources that might assist in project completion, and the uncertainty of impacts that other projects and associated managing parties might have upon the focal project (Verma & Sina, 2002).

2.3.3 Content of Project Management

Project general management; Project scope management; Project Time Management; Project cost management; Project quality management; Project Human Resource Management; Project communication management; Project risk management; Project procurement management (Liu, 2013).

In the project management literature, studies with regard to strategy are limited even though projects are typically perceived as operations that will transform strategies into action (Cleland and King, 1983; Pellegrinelli and Bowman, 1994). Several researchers agree that having such a strategy helps a project manager adapt project management for better business results (Morris and Jamieson, 2005; Artto et al., 2008). Project strategy could be a mechanism to link the business strategy to project management (Peerasit, Shenhar, & Milosevic, 2012). Verma and Sinha (2002) describe cases in which human resource availability and priorities placed on projects drive performance both for the local project and for the overall project pool. Bendoly and Swink (2006) studied project communication management and noted that effective project management relies on the timeliness of information exchange about resources, schedules, costs, and profits. They designed and executed a controlled experiment designed to simulate aspects common in a multi-party project management environment.

2.3.4 Process of Project Management

Xu (2019) stated that in the project management process, the four functions of planning, organizing, coordinating, and controlling all have very important roles. First of all, project management places great emphasis on project planning. Second, the organizational function of the project manager plays a pivotal role in project management. Again, the multiple interests of project management, each with their own perspective, needs and interests. Therefore, it is necessary to balance the relationship between all parties, resolve conflicts, for which the coordination function is particularly important. Finally, project management requires a control function. In short, project management is the systematic application of management methods for efficient planning, organization, execution and control of new products, to promote the project in terms of time, cost and functionality to achieve the established goals. The choice of tasks incorporated in the work breakdown structure (WBS) is best made by the project team drawing on their combined experience or engaging in a brainstorming session (Albert, 2014).

There are five major processes in project management, which are: start-up process, planning process, execution process, control process, and closing process. These five processes interact, rely on each other, support each other, and together ensure the integrity of project management (Xu, 2019).

In recent years, there have been two significant methodological innovations in project management. Critical chain project management (Goldratt, 1997) was developed by the influential consultant and business writer Eliyahu M. Goldratt (1947-2011). In order to prevent the dispersion of slack time around the project, where it may become lost due to Parkinson's Law (Parkinson, 1958), slack time is collected into specific buffers. This converts the project management scheduling problem into one of buffer maintenance and management (Nicholas, 2012).

2.4 Software Project Schedule Management

Project schedule management refers to the management control of the degree of project progress at each stage of the project implementation process and the deadline for the final completion of the project. Its purpose is to ensure that the project completes its overall objectives while meeting its time constraints (Chen, 2019).

The schedule plan includes the planned start date and desired completion date for each specific activity. It can be presented in a summary "master schedule" form or in a detailed form, or in a tabular form, but is more often presented graphically. There are several types: 1) Project network diagrams with date information; 2) Bar charts, also called "Gantt charts"; 3) Milestone charts; 4) Project network diagrams with time scales (Xu, 2019).

2.4.1 Software Project Schedule Management Basic Process

1. Planning Schedule Management. It is the process of developing policies, procedures, and documentation for planning, preparing, managing, executing, and controlling the project schedule. Breaking down work into a hierarchy of activities, tasks, and work packages is called decomposition. Decomposition is important to the overall project plan because it allows you to estimate the duration of the project, determine the required resources, and schedule the work (Robert, 2002).

2. Define activities. Breaks down the work package into schedule activities and specifies the specific actions that need to be employed to complete the project deliverable. The work breakdown structure (WBS) breaks down a complex project into small projects that are specific, have clear responsibilities, are executable, and require time (Guo, 2014).

3. Sequence activities. Define the logical sequence between activities and arrange them in a logical relationship (Chen, 2019).

4. Estimate activity resources. Estimate the team resources needed to execute the project, as well as the type and quantity of materials, equipment, and supplies. The duration of an activity is influenced by the amount of resources scheduled to work on it. Adding more resources to hold an activity's duration within the planning limits can be effective (Robert, 2002).

5. Estimate the duration of the activity. Estimate the amount of time required to complete each activity regarding to the results of the resource estimate. Each activity should have an estimated time and cost of completion. Being able to do this at the lowest level of decomposition in the WBS allows you to aggregate to higher levels and estimate the total project cost and the completion date (Robert, 2002).

6. Develop a schedule. A Gantt chart is most useful as a method for showing and allocating resources. This can be shown graphically as a vertical bar or column (Albert, 2014). Milestones are descriptions of the start or completion time of some vital project completion points. Setting up milestones not only allows you to report to your superiors and clients at significant time points, but also allows you to grasp and adjust the project progress status through milestones (Chen, 2019).

Finally, control the progress. Using deviation analysis, trend prediction and other methods, monitor the project status to update the project progress and manage the process of schedule baseline changes (Chen, 2019).

2.4.2 Analysis of Factors Affecting Software Project Schedule Management

Factors affecting software project schedule management include: project plan, requirement changes, customer and industry risks, technology and tools, skill risks, personnel motivation, team building and communication, control and management of the process and so on (Chen, 2019). (1) Project planning is an important part of the software life cycle and an essential aspect of project management. (2) Requirements' changes will have a significant impact on the project schedule. Requirements' changes will repeat the cost of time and staffing and other expenses so to be in the project implementation needs to focus on controlling requirements changes. (3) Customer and industry risks. Customer risk is often more remarkable due to differences in customer characteristics, technology and understanding. Reducing risk requires an in-depth study of the industry in which the customer operates. (4) Technology and tools. To focus on potential technical risks, the choice of platform is essential and must be suitable for the project and meet the needs of users. (5) Skills risk. Technical staff efficiency, programming level, team adaptability and other qualities impact on the project development progress. Among them, technical level is the critical factor so we should pay attention to the technical level of project members. (6) Personnel motivation. Understand the needs and expectations of project participants and try to meet their needs and expectations to ensure the timely delivery and successful completion of the project. (7) Team Building. Project development is team-oriented, and good team communication will get twice the result with half the effort. (8) Process control and management. An effective monitoring and checking mechanism during software development and effective version management will make the project run smoothly (Zhai, 2004).

2.5 Process Optimization

Many software organizations engage in software process improvement (SPI) initiatives to increase their capability to develop quality solutions at a competitive level. Such efforts, however, are complex and very demanding. A variety of risks makes it difficult to develop and implement new processes (Jakob & Peter, 2004).

There are various ways of process optimization. Based on the sorting of various processes, optimization can be accomplished by process transformation. For processes that are less efficient in process optimization, the process can also be overturned as needed and new processes can be redesigned to optimize the project process (Yan, 2020).

Process transformation often takes the following measures when it is difficult to adopt people to optimize the process. First, delete all unnecessary work parts and contents. Second, make sure the work that is necessary and can be merged is merged. Third, the reasonable rearrangement of the program. Fourth, simplify the necessary work links. After the process optimization, for the links left behind if not merged, then the simplification can be simplified, the purpose is to optimize the process simultaneously, simplify all the remaining unnecessary processes (Wei, 2020).

In projects with tight deadlines, or those that experience delays at the execution stage, a standard technique is crashing, i.e. expediting, tasks. In practice, crashing can be accomplished by a variety of means, for example by overtime, by the application of additional resources, or by the subcontracting of tasks (Nicholas, 2012).

Two standard approaches that are widely used to make crashing decisions are PERT and Monte Carlo simulation. However, PERT requires problematic and potentially biasing assumptions (Schonberger, 1981), whereas there is considerable resistance among project managers to the use of Monte Carlo simulation (White & Fortune, 2002). In these situations, modern robust optimization techniques (Bertsimas & Sim, 2004; Goh & Sim, 2010) may be useful. Such techniques can be used to develop linear decision rules that convert information that is revealed over time into decisions (Nicholas, 2012).

3. Finding and Conclusion

We performed the experiment in 2021 by 10 SPM on 10 different projects. After one year, researcher did a survey and collected the specific data.

3.1 Procedure

1. Participants: 10 SW project managers, 5 men and 5 women.

2. Scope: 10 projects in 2020 and their corresponding follow-on projects in 2021 to compare.

3. Compare: In 2020, all SPMs used his own project management experience to manage his project while in 2021, they took Gantt diagram to set milestones to control project, added resources bug manager and SPM assistant, improved bug system on LMT process.

3.2 Interpret Results

1. Figure 2 shows SPM workload on common bugs and limitation bugs. Based on previous analysis in method chapter, common bugs and limitation bugs cause much duplicate time and energy for SPM to take. Take A2 project for example, there are 63 bugs in all, in which 32 are common bugs, each common bug takes SPM half an hour on average to run so Emma spend 16 hours on common bugs. There are 20 bugs need to do limitation process and each one takes 1.5 hours on average to run so Emma spend 30 hours on limitation bugs. After improvement on bug and limitation system, it takes only 1 hour on average to handle limitation, saved 10 hours on A2 project. For all products and SPMs, total time on common bugs are 164 hours, equivalent to 20 person/per day's

workload and on LMT bugs are 318 hours, equivalent to 39 person/per day's workload. They are such big workloads. As the common bugs exist between many projects simultaneously, after adding bug manager in SPM team, he only needs to handle one bug for many projects. As figure 1 shows, he only needs to handle 40 common bugs and spent 20 hours, saved 144 hours, decreasing workload sharply. Regarding to time on LMT bug, after improving bug and limitation system, it dropped to 1 hour on average from 1.5 hours, plus adding SPM assistant, it cost only 27 hours to handle all products' limitations and saved 291 hours.

2021 Product	SPM	All SW Bug	Common Bug	Time per Common Bug(Hr)	Time on Common Bugs(Hr)	Limitation Bug	Time per LMT Bug(Hr)	Time on LMT Bugs(Hr)	Time per LMT Bug After System Improvement(Hr)	Time on LMT Bugs After System Improvement(Hr)
A2	Emma	63	32	0.5	16	20	1.5	30	1	20
B2	Apple	71	38	0.5	19	23	1.5	34.5	1	23
C2	Tom	80	40	0.5	20	27	1.5	40.5	1	27
D2	Danny	66	32	0.5	16	22	1.5	33	1	22
E2	Grace	75	36	0.5	18	24	1.5	36	1	24
F2	Jennifer	68	32	0.5	16	20	1.5	30	1	20
G2	Sally	65	30	0.5	15	21	1.5	31.5	1	21
H2	Nick	56	26	0.5	13	18	1.5	27	1	18
I2	Swing	73	37	0.5	18.5	22	1.5	33	1	22
J2	Jerry	55	25	0.5	12.5	15	1.5	22.5	1	15
Total Time					164			318		212
All	Bug Manager		40	0.5	20					
All	SPM Assistant					27			1	27
Time Saved					144					291

Figure 2 SPM Workload on Common Bug and LMT Bug

2. Figure 3 shows experiment results which were collected via questionnaire from SPM separately in 2020 and 2021. In 2020, only 3 projects used Gantt diagram to manage projects and got RTM on time, on time percent of all products is 30%, while in 2021, after experiment, it increased to 70% with 100% Gantt method adopted. That means using Gantt diagram can improve progress management of project effectively.

2020 Product	SPM	RTM on Time(2020)	Use Gantt(2020)	2021 Follow-on Product	RTM on Time(2021)	Use Gantt(2021)
A	Emma	No	No	A2	Yes	Yes
B	Apple	No	No	B2	Yes	Yes
C	Tom	No	No	C2	No	Yes
D	Danny	No	No	D2	Yes	Yes
E	Grace	No	No	E2	Yes	Yes
F	Jennifer	Yes	Yes	F2	Yes	Yes
G	Sally	No	No	G2	No	Yes
H	Nick	Yes	Yes	H2	Yes	Yes
I	Swing	No	No	I2	No	Yes
J	Jerry	Yes	Yes	J2	Yes	Yes
Percent of all products		30%	30%		70%	100%

Figure 3 Experiment Result

3.3 Conclusion

In this paper, we use project management theory and software project schedule management theory to sort out the current project management process and make quantitative analysis, and finally develop an optimization plan. This will improve the efficiency of the company's software project operation, make the company's product launch more on-time and improve customer satisfaction. The conclusions of this paper are as follows:

1. The difficulties and problems of project management in the preload software department are analyzed, the organizational structure and workflow of project stakeholders are analyzed, and these problems are classified according to the project management content into several elements such as project human resource management, project communication management, project risk management, project time management, etc., which are solved one by one using different methods.

2. Use WBS work breakdown structure method to decompose the specific work of SPM, find the key factors affecting the project management schedule of preload software, and for these factors, use corresponding methods such as Gantt chart method to set up milestones for project completion in each phase. Adjustment of human resources and other optimization of project human resources allocation, shorten the project process and improve efficiency.

3. Optimize the Limitation process in the BUG system with more repetitive work, saving the processing time of various stakeholders of the project, focusing advantageous time for project management, which can improve the overall efficiency of the project and shorten the process.

4. Recommendation

The development of the theory of project management itself has been relatively mature, and the main directions of subsequent development are: (1) to combine the theoretical methods of project management and information technology to improve management efficiency through information technology; (2) to cooperate with organizational structure optimization to establish an efficient management organization; (3) to establish a good R&D cultural atmosphere, improve the sense of achievement of R&D personnel, and form a positive and fast upward corporate culture.

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