

Project Management Plan

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This documents describes key aspects of the project plan.

Project Aim and objectives

The aim of our project is to deliver a computer system for a luxury car that will include the human user interface with the riskiest strategy. The customer is located in Germany wants a very professional solution and emphasizes on the importance of quality and safety. Waterfall model is the software development methodology used to develop this project as asked by the customer.

Locations of the sites

The customer: Germany

Head office: Sweden, Karlskrona

Site 1: Bangalore, India

Site 2: Australia, Melbourne

Site 3: China, Beijing

Sub-Contractor: Poland, Gdansk

Project time frame

The project will be completed using waterfall model in the following amount of time for each phase:

Phase	Duration
1. Analysis	3 months
2 Design	3 months
3a. Development	6 months
3b. Test Planning	3 months
4. Test Execution	6 months

Global Software Engineering

Global software engineering in the present century is being adopted by most of the companies because of its benefit of cheaper, faster and better development of software systems [1]. In this distributed environment quality software is developed at a lower price. Communication between the different sites plays a major role in the project progress when distributed globally. The parameters which influence GSE mainly are:

- Language difference
- Multisourcing
- Cultural difference
- Time difference
- Political influence
- Geographical difference

The different choices available for sourcing in this particular scenario are tabulated below:

Same country	On-shore insourcing (Sweden)	Onshore outsourcing (none)
Different country	Off-shore insourcing (Australia, India, China)	Off-shore outsourcing (Poland)
	Same organization	Different organization

Assumptions made from the given scenario:

1. English is the common medium of language used for communication between the different sites.
2. Political pressure shall not have any effect on the sites at different locations
3. There is economic stability prevailing in the countries where the sites are located.
4. The head office i.e. Sweden, Karlskrona takes control over the project and the responsibility of handing over the project to the customer.
5. All the sites which are involved in the project, have the necessary resources and tools for completion of the project.
6. The persons travelling between different sites shall not have any immigration related issues.

Task Assignment Summary

The riskiest task allocation for our project is detailed in Table 1. The site(s) that have been allocated to work on a task are marked with an X.

Table 1 Task distribution

ID	Analysis		Design				Development					Test Planning		Test Execution		
	SE	AUS	SE	AUS	CN	PL	SE	IN	AUS	CN	PL	SE	AUS	SE	IN	AUS
1		X		X				X					X		X	
1.a.		X		X				X					X		X	
1.a.i.		X		X				X					X		X	
1.a.ii.		X		X				X					X		X	
1.a.iii.		X		X				X					X		X	
1.a.iv.		X		X				X					X		X	
1.b.		X		X				X					X		X	
1.b.i.		X		X				X					X		X	
1.b.ii.		X		X				X					X		X	
1.b.iii.		X		X				X					X		X	
1.b.iv.		X		X				X					X		X	
1.c.		X		X				X					X		X	
1.c.i.		X		X				X					X		X	
1.c.ii.		X		X				X					X		X	
1.c.iii.		X		X				X					X		X	
1.c.iv.		X		X				X					X		X	
1.c.v.		X		X				X					X		X	
2	X					X					X	X		X		
2.a.	X					X					X	X		X		
2.b.	X					X					X	X		X		
2.c.	X					X					X	X		X		
2.d.	X					X					X	X		X		
3	X					X					X	X		X		
3.a.	X					X					X	X		X		
3.b.	X					X					X	X		X		
3.c.	X					X					X	X		X		
4	X					X					X	X		X		
4.a.	X					X					X	X		X		
4.b.	X					X					X	X		X		
4.c.	X					X					X	X		X		

Task Distribution Strategy

This section describes the practical arrangement behind the task distribution to each site, explains how the people will be engaged in the tasks and how they will practically complete the work, as well as the motivation for why such task distribution strategy is considered as the riskiest one.

This section describes why tasks were allocated to each site. In this distribution modularisation technique is used to allocate the tasks to different sites. Modularisation is a strategy defined by D.L Parnas where work is segregated into modules [2]. In this context, the tasks are divided into two modules rather than a sub-program. If modularisation is performed successfully then all the internal parts of the project can be performed at a single site [3]. By using modularisation method dependencies between the sites can also be reduced. In this scenario, Module 1 is assigned with the tasks 1a, 1b and 1c. Module 2 is assigned with the tasks 2, 3 and 4.

Modules	Tasks		
Module 1	1.a. Transmission control unit (TCU)	1.b. Steering and breaking control	1.c. Engine control unit(ECU)
Module 2	2. Safety systems	3. Human-machine interface	4. Comfort systems

Table: Assignment of tasks to modules

Analysis Phase

The requirements analysis phase is one of the crucial phase in the waterfall cycle. In this phase, the analysts identify the functional and non-functional requirements for the project. For the analysis phase, we have 6 analysts from Sweden and 12 analysts from Australia. The tasks in the module 1 are assigned to Australia where 8 analysts will work on this module for three months. The module 1 is assigned to Australia because the site has long reputation for developing computer systems for cars around the world and the number of analysts are also more when compared to Sweden which seems practical. Communication with head-office can be done every month through face-to-face meetings and regularly through asynchronous communication tools such as E-mails, voicemails, electronic bulletin boards etc.

The tasks in module 2 are assigned to Sweden site where 6 analysts will work on the tasks of module 2 for three months. The practical reason behind assigning this task to Sweden is that they are in the same time zone as the customer and have knowledge about their culture. They will have previous experience about developing the safety systems, Human-machine interface and comfort systems of a European model cars. They can communicate easily through face-to-face meetings or video calls.

The main risk involved in this arrangement of the task is that the customer site (Germany) and Head site (Sweden) share same time zones but both sites with Australia have different time zones and hence will face difficulty in communication. There may also be cultural issues. The risks are identified and discussed in the sections below.

Design Phase

The design phase is the next succeeding phase to the analysis phase in the waterfall model. The requirements identified during the analysis phase are converted into a system design and documented which acts as an input for the development phase. The design for the

module 1 is assigned to Australia site where there 10 designers will be working on this task from the 20 designers available for three months. The reason for assigning this task to Australia is that it has sufficient human resources who are experienced with this job which seems practical. Communication with the head-office can be done through face-to-face meetings every month and regularly through Emails, voice mails etc.

The tasks in the module 2 are offshore-outsourced to sub-contractor (Poland) site. 8 designers from the Poland site will be working on this task for three months as it has sufficient number of designers. The Poland site is also a reputed organization for developing computer system for cars and is also a certified development organization. The Poland site also shares same time zone with the head-office (Sweden) and customer (Germany). Communication can be done through face-to-face meetings if compulsory or else video calls, phone calls, emails etc. regularly.

The reason behind not allocating the tasks to China site is that it does not have any project management resources. With language as a barrier and without any project management resources, assigning such a huge task is not practical.

The main risk involved in this task distribution is that assigning tasks to the sub-contractor. Offshore-outsourcing to Poland site may lead to trust issues, budget overrun and even termination of the project [4]. Involving three different sites may also result in communication problem.

Development Phase

The development phase is the most important phase of the waterfall cycle. The input from the design phase is taken and actual coding is done in this phase to produce a working code as an output. The development for module 1 is assigned to Indian site where 12 developers will work for six months for completing the task. The developers also can gain some experience training under the expertise of Sweden developers. The number of developers are also sufficient in India. The communication with the head-site (Sweden) can be done every month through face-to-face meetings between project managers and Australian site through pre-planned video calls, phone calls, e-mails etc. as the time difference is also manageable.

The development of module 2 is assigned to Poland site where 10 developers will be working for six months to complete the task. Poland site has sufficient number of developers and also shares the same time zone with the head-site (Sweden) and customer site (Germany). Communication can be done through face-face meetings when necessary or video calls, phone calls etc regularly. Since design phase for module 2 is also allocated to Poland, it will be easy to communicate.

The reason behind not allocating the tasks to China site is that it does not have any project management resources. With language as a barrier and without any project management resources, assigning such a huge task seems not practical.

The main risks involved in this task distribution is that the developers in India are freshers without any experience. Assigning such a huge task may put the project to risk. Involving four different sites may lead to communication and coordination problems. There may also be cultural differences, language barriers and temporal differences.

Test Planning Phase

This phase is the test planning phase in the waterfall model where the testers in coordination with the developers validate that the requirements specified by the customer is satisfied. The test cases are developed by the testers to find the errors or bugs in the project [5]. This is done simultaneously with the development phase. The test planning for

module 1 is assigned to Australia site. 8 testers from the available 12 testers will work for three months to complete the task. Since the development of this module is assigned to Indian site communication between the developers in India and Testers in Australia can be done through face-to-face meetings initially and whenever compulsory or else through pre-planned video calls, phone calls etc. regularly. Status updates can be provided to the head-site (Sweden) through face-to-face meeting every month and regularly through asynchronous communication tools such as voice mails, Snail mails, emails etc.

The tasks in the module 2 are assigned to Sweden site where 7 testers from the available 8 testers will work on the task for three months in coordination with the developers in Poland. The Poland site is very near to the Sweden site and also shares the same time zone. So, communication overload is not very high. Communication can be done through face-to-face meetings every month or video calls, phone calls etc. regularly.

The main risk in this task distribution is that development and test planning phases should be done parallelly. Since they are assigned to four different sites with geographical and temporal distance, communication overload is very high between sites such as Australia and Sweden and high between sites Australia and India. Moreover, offshore-outsourcing tasks to a sub-contractor may lead to trust issues, budget overrun, and even project termination [4].

Test Execution Phase

The test execution phase is the last phase in the waterfall model. The test cases developed in the previous phase are executed through various testing techniques to find the bugs and errors. There are 12 testers available in Sweden site, sufficient testers available in Indian site and 16 testers available in the Australian site. The tasks related to module 1 are assigned to Indian site and where 10 testers will be working for six months to complete the task. However, the bosses are also keen to expand the working capabilities of the testers in this site by training them and making them effective. Communication with the Australian site where test planning is performed can be done through pre-planned video conferences, phone calls, emails etc. Status update to the head site (Sweden) can also be done through face-to-face meetings every month.

The tasks in the module 2 are assigned to the Sweden site. 9 testers out of available 12 testers will work on the tasks of this module for six months. Test planning of the same module is also done in Sweden. So, collocation of the test execution tasks decreases the communication load which seems practical.

The risks behind allocation of the tasks is that in module 1 the phases are not collocated which means the previous phase is done in Australia and test execution phase is done in India. This increase the communication overload which is discussed in detail in the communication plan. Also, Co-ordination between four different sites with geographical and temporal distance is also a risk.

Risks

The major risks faced by this project are listed in Table 2.

Table 2 Major Project Risks

No.	Risks	Likelihood	Impact	Mitigation/Reduction Strategy
1.	No overlap of working hours between Australian and Sweden site.	High	Medium	<ul style="list-style-type: none"> • Face-to-face meetings with the practitioners to get clarity about the project every month. • Using of asynchronous communication tools such as emails, voice mails, snail mails etc. regularly helps mitigating the risk.
2.	Cultural differences between the sites.	Medium	Medium	<ul style="list-style-type: none"> • Providing Cultural training with professionals from Sweden for newly established sites such as India helps them to learn foreign culture. • Keeping English as a common language for all the sites. • Sending project managers to the sites before the start of the phase and communicating with the practitioners helps reducing the risk.
3.	Lack of trust	Medium	High	<ul style="list-style-type: none"> • Regular communication between the staff of the sites with neatly designed communication plan may help reducing the risk. • Regular face-to-face meetings between project managers with good understanding helps building trust.
4.	Interdependencies and co-ordination of four different sites with temporal and geographical distance	High	High	<ul style="list-style-type: none"> • Face-to-face meetings between the practitioners of the sites during crucial situations in the project. • Using synchronous communication tools such as video calls, phone calls etc. regularly when overlap of hours is manageable. • Using of asynchronous communication tools such as voice mails, emails etc. regularly when overlap of hours is not possible.

No.	Risks	Likelihood	Impact	Mitigation/Reduction Strategy
5.	Lack of technical knowledge of newly recruited developers and testers in India.	Medium	Medium	<ul style="list-style-type: none"> Providing training to the newly recruited staff in India with professionals from Australian site before starting the phases helps them to learn the about various tools and techniques so that there will be continuous flow during the actual development and testing.
6.	Change in requirements from the customer	Low	Medium	<ul style="list-style-type: none"> Regular face-to-face communication between project managers of Sweden and Germany helps them to get updates about requirements. Regular face-to-face meetings between project managers of different sites with Sweden site helps easy communication of requirements between the sites.
7.	Budget overrun	Medium	Medium	<ul style="list-style-type: none"> Proper understanding between the sites with Germany regarding budget estimation using appropriate estimation techniques during the initial kick-off meeting before the commencement of the project. Keeping some additional budget for unpredictable risks may help reducing the risk.
8.	Stress overload in the employees	Low	Medium	<ul style="list-style-type: none"> The project manager must motivate the employees working in the sites by providing them with extra perks for the employees working efficiently. Maintaining good relations with the practitioners by providing them reliefs such as work from home and leaves can reduce the stress of employees.

Communication Plan

This section describes events, meetings and training sessions proposed to be held within the project to lower the risks imposed by the task distribution strategy.

Initial project kick-off meeting:

- Purpose: To gather the details about the project, budget and targets. This also helps to know about each other for effective communication.
- When: Before starting the project.
- Occurrence: One-time meeting
- Event held: Face-to-face meeting.
- Persons involved: Project managers from Australia, Sweden, India and Poland. Analysts, Designers, Testers from Australia. Analysts and testers from Sweden. Designers and Developers from Poland. Developers and testers from India.
- Location of event: Germany (customer)
- Risks mitigated: Risks related to communication, co-ordination, cultural differences and trust.

Weekly status meetings:

- Purpose: To know the status of day-to-day tasks.
- When: During every Friday.
- Occurrence: Every week.
- Event held: Face-to-face meeting.
- Persons involved: Between the project managers and practitioners working on the respective phase (Developers or designers or analysts or testers).
- Location of event: At the respective sites (India, Australia, Poland, Sweden).
- Risks mitigated: Risks related to communication, delay of the project.

Status meetings with the head-office:

- Purpose: To know the status of tasks assigned by the head-office.
- When: During the end of the month.
- Occurrence: Every month.
- Event held: Face-to-face meeting.
- Persons involved: The project managers from the sites working in the current phase travel to the head site.
- Location of event: Head-office (Sweden).
- Risks mitigated: Risks related to communication, budget, delay of the project.

Status meetings between customer and head office:

- Purpose: To know the status of phases assigned to the respective sites.

- When: During the end of each phase.
- Occurrence: Every three or six months.
- Event held: Face-to-face meeting.
- Persons involved: The project managers from Sweden travel to the Germany after the end of each phase.
- Location of event: Customer (Germany).
- Risks mitigated: Risks related to communication, trust, budget and delay of the project.

Meetings before starting of each phase:

- Purpose: To gain trust and reduce the cultural differences between sites.
- When: During the start of each phase.
- Occurrence: Every three or six months.
- Event held: Face-to-face meeting.
- Persons involved: The project managers from Sweden travel to the sites involved in the phase and meet the practitioners working in the company.
- Location of event: At the respective sites (India, Australia and Poland).
- Risks mitigated: Risks related to cultural differences, trust.

Meetings between practitioners of Australia and Sweden:

- Purpose: To update the status and gather new inputs from the head site for effective communication as delay in status feedback may lead to ineffective development.
- When: When starting of a phase and every month during analysis, design and test planning phase.
- Occurrence: Recurring.
- Event held: Face-to face meetings due to large temporal distance and no overlapping working hours.
- Persons involved: The practitioners of Australia travel to Sweden to meet the project managers and practitioners working in the site.
- Location of event: At Sweden site.
- Risks mitigated: Risks related to communication, coordination and trust.

Meetings between practitioners of Poland and Sweden (Design phase):

- Purpose: To gather the inputs and updates regarding analysis in Sweden site and clarify the doubts.
- When: Starting of design phase and whenever necessary during the phase.

- Occurrence: Recurring.
- Event held: Face-to face meetings during starting of the phase and video conference meeting regularly.
- Persons involved: The Designers of Poland and analysts of Sweden.
- Location of event: At Sweden site if face-to face meeting or at their respective sites.
- Risks mitigated: Risks related to communication, coordination and quality of project.

Meetings between practitioners of Australia and India (Development phase):

- Purpose: To gather the inputs and updates regarding design in Australian site and clarify the doubts.
- When: Starting of development phase and whenever necessary during the development phase.
- Occurrence: Recurring.
- Event held: Face-to face meetings during starting of the phase or pre-planned video conference meeting regularly as the time gap is manageable.
- Persons involved: The developers of India and designers of Australia.
- Location of event: At Australian site when face-to-face or at respective Indian and Australian sites.
- Risks mitigated: Risks related to communication, coordination and delay in project.

Meetings between practitioners of India and Australia (Test planning phase):

- Purpose: To gather the inputs and updates regarding development in Indian site and clarify the doubts.
- When: Starting of test planning phase and whenever necessary during the phase.
- Occurrence: Recurring.
- Event held: Face-to face meetings during starting of the phase or pre-planned video conference meeting regularly as the time gap is manageable.
- Persons involved: The developers of India and testers of Australia.
- Location of event: At Indian site if face-to-face meetings or at respective Indian and Australian sites.
- Risks mitigated: Risks related to communication, coordination and delay in project.

Meetings between practitioners of Poland and Sweden (Test planning phase):

- Purpose: To gather the inputs and updates regarding development in Poland site and clarify the doubts.
- When: Starting of test planning phase and whenever necessary during the phase.

- Occurrence: Recurring.
- Event held: Face-to face meetings during starting of the phase or pre-planned video conference meeting as the time gap is manageable.
- Persons involved: The developers of Poland and testers of Sweden.
- Location of event: At Poland site if face-to-face meeting or at respective Poland and Sweden sites.
- Risks mitigated: Risks related to communication, coordination and delay in project.

Meetings between practitioners of Australia and India (Test execution phase):

- Purpose: To gather the inputs and updates regarding test planning in Australian site and clarify the doubts.
- When: Starting of test execution phase and whenever necessary during the test execution phase.
- Occurrence: Recurring.
- Event held: Face-to face meetings during starting of the phase or pre-planned video conference meeting regularly as the time gap is manageable.
- Persons involved: The testers of Australia and India.
- Location of event: At Australian site if face-to face meeting or at respective Indian and Australian sites.
- Risks mitigated: Risks related to communication, coordination and delay in project.

Additional Human Effort

1) Training for junior developers in India:

Training is given to the developers in India at Indian site. To give the training the 3 developers from Australia travel to India. The training is done before the start of the development phase for 45 days. The estimation of human resources is 4.5 person months

2) Training for junior testers in India:

Training is given to the testers in India at India in the test execution phase. To give the training 3 testers from the Australian site travel to India. The training is done before the test execution phase for 45 days. The estimation of human resources is 4.5 person months.

3) Cultural training for practitioners in India:

Cultural training is given to the members of Indian site as it is a new site and does not have foreign exposure. This is done before the start of the project. 2 Practitioners in from Sweden and Australian sites each travel for 15 days to train the members of the sites. The estimation of human resources is 1 person months.

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