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| |  |  | | --- | --- | | ENGR 650 – Project Management | 12/02/2020 | | Fall 2020  Dr. Farnaz Ganjeizadeh | |   **Remote learning Software**  A Project By:  Chandnee Das  Dante Romero Cruz  Suchita Ranawade  Farzad Amintavakoly |
|  |

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# 1. Introduction

## 1-1 Abstract

A remote learning initiative is where the student and educator are not physically present in a traditional classroom setting, but instruction is delivered through technological tools such as discussion boards, video conferences, and virtual assessments. It is an attempt to recreate the classroom and face-to-face through the Internet.

For our project, we will analyze our business using Priority Matrix, Work Breakdown Structure, MS Project Summary/Gantt Chart, Decision Tree, Pyramid Forecast, Costs and Resources, and Project Communication Plan. We also analyze the risk that can potentially affect or benefit our business, and as part of our Risk Management Plan, we analyze the Breakdown Structure, Risk Assessment, Risk Response and Control, and the PERT analysis.

## 1-2 Roles and Responsibilities

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## 1-3Vision and Mission

In partnership with our diverse community, we will educate students in a safe and supportive environment and equip them with the knowledge, values, and skills to become responsible citizens in a dynamic global society.

In today's circumstances, meeting in person is no longer possible, thus creating a dilemma of how to continue educating our future generations, as teachers cannot teach in schools as before. Rather, instruction is delivered through technological tools such as discussion forums, video conferences, and/or virtual assessments. It is an attempt to recreate the classroom through the Internet. Faced with this situation, day by day the demand for remote learning is increasing, due to the flexibility it offers to meet at any time and in any place, in addition, to survive the current competition, the student must continue their studies on a regular basis. During this pandemic situation, remote learning software is the best method to continue their education. The result of this project has an economic impact through the effective use of remote learning software for schoolchildren so that the student can learn in a way. remote using this software.

## 1-4 Scope, Milestones and Deliverables

1-4-1 Objectives of the projects: Remote learning application for efficient distance online learning within 8 months at the cost of $1.8 million (including overhead cost and profits)

### 1-4-2Deliverables:

* Video & Audio conference
* File sharing and screen sharing
* White board and writing tools
* Informational encyclopedia
* Examination browsers
* Attendance list and grade files

### 1-4-3Milestones:

* Identifying stakeholders by 9 November
* Architectural design, by 3 December
* Developing a design by 21 December
* Testing a prototype by 12 February
* Final production and verification by 8 march

*Technical Requirement:*

* Software’s and licenses
* Computers Engineers

*Customer Review:*

* K-12 students, college students, teachers/professors, school administrators, and/or independent educators.

*Projected Staff and Salaries:*

* (1) Project Manager: $1,00,000/annual
* (2) Entry-Level Software Engineers: $90,000/annual
* (1) DEVOPS Engineers: $100,000
* (1) Quality Engineer: $90,000/annual
* (1) Testing Engineer: $100,000

## 1-5 Organization chart



## 

## 1-6 Project Communication Plan

The purpose of a project communication plan is to express what, who, how, and when information will be transmitted to project stakeholders so schedules, issues, and action items can be tracked. A perfect communication plan controls the flow of information and improves managers autonomy because of reducing interference by establishing and defining responsibilities and assignments of team members.

Project communication plans address the questions like; What information needs to be collected and when, who will receive the information, what methods will be used to gather and store information, what are the limits, if any, on who has access to certain kinds of information, when will the information be communicated, and how will it be communicated.

In this project various methods of communication have been developed to meet the needs of the project performance for the betterment of managing current workflow and helps keep important stakeholders informed and avoid some potential problems. In the following table the type of documents regarding the project is determined. The stakeholders and related recipients are defined and prioritized. Also, based on the amount of job and frequency of occurring the possible tasks and risks the timing of communication is assigned. As it is shown in the table, stakeholders need to be informed about progress and performance of the project every month, and team members meet up occurring every week to discuss any possible technical or financial problems. Some few methods of communication developed based on the importance of communication and value of the documents for the project and stakeholders in which some important information and documents needs to be archived to use in further applications. A meeting for technical team members is necessary whereas they might exchange their perspective and solutions with respect to a problem or risk while statues reports can be distributed to inform assigned recipients. The provider of information is assigning tasks of collecting and analyzing the information and delivering them to target audiences which helps to organize and establish responsibilities in this regard.

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**Figure 22: Communication Plan**

# 2. Project Analysis

## 2-1 Priority Matrix

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Description automatically generatedThe Ultimate success of the project depends on whether we are satisfying customers’ requirements, exceeding the performance, and reducing the cost of the project. During balancing between cost performance and time we must find the tradeoff which will help us to complete the project in time and with minimum cost. If the project duration increases, the cost will increase in our case. As we have seen that senior managers are always ready to crash the activities by adding extra labor and increasing the cost or sometimes, they prefer to outsource the cheap labor though time of the project increases. When to preference time, scope and cost is decided by project managers. Here we have used the priority matrix which helps to decide the priority among different attributes. With the help of this management will establish the relative importance of them. Constraints are fixed, enhancing means adding value to the project. Accept means tolerable It may be allowed time to slip or scope to reduce or project to go over budget. In our project the priority matrix is as shown in Figure 1,

**Figure 1. Priority Matrix**

Time is the constraint in our project as we wanted to launch the product as soon as we can. Today we see that online learning technology is taking a new term in the market and we do not want to miss this opportunity. Secondly w, we are paying software engineers which are our main resource on a time basis so we should reduce time as possible to save the cost. The second attribute is to enhance. Here, the scope will add value to our project. Hence, scope is kept for enhancement. As all we know, software projects are continuous improvement. We do not know when a bug will appear, when the process will go down and when we need software assistance. It is not a physical production; hence, you may add multiple features services versions to it without any waste creation. The last one is Accept, the software projects are reusable the raw material we will be using here is time for development utilities and we can reuse the parts of codes. The software will not become absolute soon. We can add features and launch it hence the budget is accepted in this case.

## 2-2 Work Breakdown Structure (WBS/PBS)

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Description automatically generated**PBS: For software development projects we found process breakdown structure (PBS) is the good match. Here we have organized projects according to their phases. Each of the 5 major phases has broken down into specific activities until the sufficient level of details are achieved to communicate what needs to be done to complete that phase. Here deliverables are defined as the outputs required to move on to the new phase. At the end of each phase there will be a checkpoint to decide whether all the deliverables of that phase have completed with quality or not.

**Figure 2. Work breakdown structure**

**Phase 1**

* The contacts of the stakeholders
* Requirements to design a software
* Documentation of the requirement

**Phase 2**

* Application architecture
* Application flow
* Database design
* End user interface design
* Workflow diagram
* The ways in which software could develop
* Documentation of different designs and modules.
* The starting code
* Documentation of process to follows

**Phase 3**

* Developed module A
* Developed Module B
* Developed module C
* Tested Module A
* Tested Module B
* Tested module C
* Documentation of code
* Information of techniques and technology.
* Deployment of parts
* Documentation of errors
* Solutions of solved error and history documents.

**Phase 4**

* The beta version of application
* User guidelines
* Different packages of software’s
* The change requirements information from customers
* Errors if occurred.

**Phase 5**

* Final Application
* Completely developed software
* Documentation about software
* Final packages

## 2-3 MS Project Overview and Gantt Chart

**Graphical user interface, application, table, Excel

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Graphical user interface, application, table

Description automatically generated**Figure 3. MS project with Gantt chart and critical path**

**Figure 4. MS project with Gantt chart and critical path**

## 2-4 Decision Tree

We have two options when it comes to the development of the project. The decision should make whether we should expand the software by adding extra services to it and spending extra money and time. or we should keep the software as it is with no extra cost and no more time to market. Expansion of software means keeping it open for everyone. Everyone should use it (example: Businesses) and not limited for educational purposes. The project expansion is adding extra services, upgradation to versions which would be required for businesses and not limited for educational purposes

Example - For Educational purposes, the number of people who can join the meeting at the same time is limited to 60. But for business purposes it should be more than that. For extra changes we would need extra engineers, license, data analysts, marketing team, servers, could storages, which will cost extra $995000 (Salaries +utilities + licenses)

Diagram

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**Figure 5. Decision Tree**

Note the users, considered are minimum possible subscribers that we have to get to cover the prices we invested. Here we have tried to cover the minimum threshold greater is always better. We calculate probabilities from the percentage of people who may use this software and calculate the profit we can make from each source if minimum possible subscribers use this service. We multiply the probabilities with the profits and then we added all the money to make one figure. We compare this figure with the money we invested, and we found that the amount we are receiving is greater than the invested. Hence, we choose to expand this software.

### 2-4-1 Calculations:

***Expand for extra $995K***

*From extracurricular classes:*

5000 users \* $199.90 =$999500

The probability that we could get $999500 is 0.35 as there are not so many extracurricular classes as compared to private business and seminars.

$999500\*0.35 = 349,825

*From Private businesses:*

20,000 users \*$199.90=$3998000

The probability that we could get $3998000 is 0.45

0.45 \* $3998000 = 1,799,100

*From people who wanted to conduct seminars:*

For 3000 users \* $199.90=$599700

The probability that we could get $599700 is 0.20

0.20 \* $599700 = 119,940

*Total from Expansion:*

$ 349,825+$1,799,100+$119,940= ***$2,268,865***

***DO not expand for zero cost:***

*From Private Schools:*

8000 users \* $169.90/yr. =$1359200

The probability that we could get $1359200 is 0.20

$1359200\*0.20 = $271840

*From coaching classes:*

5000 users \*$169.90/yr.=$84950

The probability that we could get $84950 is 0.10

0.10 \* $84950 = $8495

*From public schools:*

For 10,000 users \* $169.90/yr.=$1699000

The probability that we could get $1699000 is 0.70

0.70 \* $1699000 = $1189300

*Total from Educational and no change option:*

$271840+ $8495+ $1189300 = ***$1,469,635***

As we see then the final decision is wise if we choose to expand as the amount, we spend to expand is $995K and we will get $2,268,865.

## 2-5 Pyramid Forecasting

Pyramid Forecasting provides a means of organizing, integrating, and securing forecasts and identifying business constraints. As part of product demand management, pyramid forecasting helps to recognize all demands for goods and services to support the market. This implies prioritizing the demand for products and services when it is greater than expectations. Proper demand management makes it easy to plan and use resources for profitable business results. The Pyramid Forecasting consist of multiple levels for forecasting, and in general 3 levels: Total business volume, Product family volume, and Product/item volume.

For our software forecasting we prepared 4 packages base on different needs of educators. As seen in ***Figure 6***, in the Product/item volume level, we indicate our Free Package, Pro-Package, the Educational Institution Package, and the Busines Package. In each package, we have anticipated the number of users that will be using our software and the monetary values of each package. Once the anticipated value of users and set the value of each package, we roll-up forecasting the anticipated users and the total value of our busines, as we can see in the excel calculation (see ***Figure 7***). This process will be required back-and forth negotiation at each level until a proper forecast is reach.

Diagram

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**Figure 6: Pyramid Forecast**

**Figure 7: Pyramid Forecast Calculation**

## 2-6 Cost and Resource

### 2-6-1Resource -Constrained scheduling

MS project is capable of assessing and resolving complicated resource-constrained schedules. We use our project to demonstrate how this is done using MS projects. This software helps the project manager to view the project from different perspectives and conditions. Our project begins November 9 ,2020 and ends on March 9 ,2021 with a duration of 87 days.

After that we assign our resource names on the resource usage sheet with their salary and maximize using their capability. We assign one project manager, two entry level software engineers, 1 DevOps engineer, 1 testing engineer and 1 quality engineer. Project manager salary is $1,00,000/annual which means he/she gets $48.08 per hour. Entry level software engineer salary is $90,000/annual which means he/she gets $43.27 per hour. DevOps Engineer, testing engineer salary is $1,00,000/annual. They also paid like a project manager per hour $48.08. Quality engineer salary is $90,000/annual which means he/she also get like an Entry level software engineer per hour.

After assigning resources based on their tasks, we see that two of the tasks are overallocated like Meeting stakeholders and documentation of requirements of stakeholders.

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**Figure 8: Before leveling with resource constraints**

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**Figure 9: Overallocated resource**

Table

Description automatically generatedOverallocated resource graph showing that project manager tasks are overly allocated. After leveling resources with resource constraints, we see that over allocated tasks are not showing, but the project duration is increasing like 91 days from 87 days. We also leveled with time constrained but there is no change with the critical path and network.

**Figure 10: After leveling with resource constraints**

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**Figure 11: Resource sheet before leveling**

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**Figure 12: Resource sheet after leveling**

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**Figure 13: Overallocated resource with resource usage**

From this figure we can see that 4 days project manager should work overtime 16 hr. instead of 8 hours. After leveling Resource Usage Sheet with Cost:

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**Figure 14: Resource usage sheet**

From this figure we can identify how much cost will be needed individually for workers /engineers to complete our project.

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**Figure 15: Resource remaining report**

From this resource remaining work report, we can see Some percentage of work are remaining for testing and quality engineer.

Graphical user interface, application

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**Figure 16: Work overview**

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**Figure 17: Resource cost overview**

## 2-6-2 Earned value Management

Earned value management allows the project manager to have a positive influence on cost and schedule in a timely manner. It also provides the project manager and other stakeholders with a snapshot of the current status and future status of the project by updating project status. It also helps to alert all workers to early identification or delay activities and allow for quick, proactive corrective action. After setting the status date, we can see the status of cost and schedule status. From this graph we can see CV and SV is 0, that means the project is on budget and on schedule.Table

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**Figure 18: Earned value analysis**

Graphical user interface, table

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**Figure 19: Cost indicator table**

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**Figure 20: Schedule indicator table**

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**Figure 21: Summary of MS project**

# 3. Risk Management

## 3-1 Risk Breakdown Structure

Risk is an uncertain event or condition that, if it occurs, has a positive or negative effect on project objectives. A risk has a cause and, if it occurs, a consequence. The steps of the risk management process are identification, assessment, response development and control response. In order to investigate the unlimited sources of possible risks, they need to be categorized which risk breakdown structure helps management identify and consequently manage risk.

Diagram

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**Figure 3-1 Risk Breakdown Structure**

As it is shown in the figure 3-1, the risks are categorized in product risks, financial risks, external risks, and risks associated with managerial tasks. The assessed risks of Remote Learning software in this study are Cyber Security Risk, Digital Right Risk, Software malfunction, and Users` facilities or compatibility of infrastructures. These risks are more plausible risks that the distance learning software may face.

## 3-2 Risk Assessment

Risk assessment is determined based on estimation of impact and probability of the identified risk. “An impact assessment estimates the degree of overall harm or loss that could occur as a result of the exploitation of a security vulnerability” (Performing a Security Risk Assessment,2010). A likelihood assessment estimates the probability of a threat occurring. In this type of assessment, it is necessary to determine the circumstances that will affect the likelihood of the risk occurring. Table 2-2 shows the risk severity matrix and risk assessment form for the determined risks. The detection scale would range from 5 = no warning to 1 = lots of time to react according to scenario analysis. Scenario analysis is the most commonly used technique for analyzing risks. Team members assess the significance of each risk event in terms of Probability and Impact of the event. Notice that in addition to evaluating the severity and probability of risk events the team also assesses when the event might occur and its detection difficulty. In further investigation the detection difficulty takes into account to develop Failure Mode and Effects Analyses (FMEA).

### 3-2-1Cyber security risk

End users` concerns about security of their devices along with security of servers make cyber security risk one of the top risks in a remote learning software. The cyber security risk has too many technical aspects although in brief risks are consisting of “1. Environment variables: Variables that encapsulate information that does not change across executions of a program, 2. Network Exposures: Assuming that clients will check messages sent to a server adequately. 3. Information Exposure: Exposing sensitive information to unauthorized users that can be used to compromise data or systems. 4. Operational Misuse: Operating a system in a non-secure mode. 5. Default Settings: Default software settings may present a risk if they require user intervention to secure them” (Gilliam et al., 2003). More details are provided in Table 1 in the attachments. For information security risk assessments, the following standard can be used ISO/IEC 27005:2018, Information technology -Security techniques -Information security risk management.

### 3-2-2 Digital Right Risk

The purpose of Management is to encourage and support producers and scholars to create and develop original contents and services. The learning software inherently is at the risk of copy and distribute out of the assigned order by the producers. Reduction of subscriptions rings the bell that it may be that the product is copied and used in the market, so updating the software periodically reduces risk. Due to such peculiarities digital right risk has high probability, while upgrading the software and offering free version reduces the impact of the risk.

There are some ways to reduce the risk like assigning expiration date, disable printing, encryption and auto deletion, but licensing the product should be the prior to all even with accepting the costs since it gives all rights of the contents legally to the producers.

Chart, treemap chart

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**Table 3-1: Risk Assessment Form & Matrix**

### 3-2-3 Software Malfunction

Customers expect to use a product which properly works and the experience of failure while using the software has a great impact as it shown in Table 3-1, although the probability of happening failure has been limited through several quality control inspection steps upon distribution the software. When a system faces too many errors it is time to back up the system and get ready for start over. Test engineers evaluate the software in many ways, yet there is a chance for software malfunction. In the long term this risk reduces the users drastically and reputation and financial losses will remain for the product and managers.

### 3-2-4 Users` Facilities (Infrastructures)

Another studied risk factor comes from a variety of systems whether it comes from users` devices or the local capacities which its impact on the remote learning software is inevitable. Designers and technical expertise design the product at highest capability to work with any devices at any conditions congruent with needs of target users, still there are some assumptions which consider infrastructures potentials and end users facilities as major risks for the project. “Some concern about cost of bandwidth, and whether this might prove an obstacle to scaling up the project” (OECD,2005), along with a variety of regulations across the world makes this risk important to the project. Regarding Table 3-1, despite the low probability the impact of this risk is high also, due to diversity of technical infrastructures some risk at this area remains unknown unless using expertise which increases the cost of the project.

## 3-3 Risk Response and Control

Table

Description automatically generatedAnother step in managing the process of risk is response development and control response. The strategies that should be applied based on the risk assessment to reduce the impact of the risk on the project and the action to be taken when risk occurs. Also, predicting a contingency plan which is an alternative plan that will be used if a possible foreseen risk event becomes a reality. A contingency plan increases the chance that the project can be completed on time and within budget. (see Table 3-2)

**Table3-2: Risk Respond Plan**

Among the options like accepting the risk, avoiding the risk, Transferring the risk, and mitigating the risk, the most response actions in this project is to mitigate the identified risks. The response plan to cyber security risk is to test prototypes to examine all possible security threats. The contingency plan which is a reaction plan when a risk occurs is providing back up to save data for the future use when the problem is solved. For managing copyrights, the mitigating action is registering product, and contingency plan is updating the software periodically to prevent further loss. For users` facilities or infrastructure risk the response plan is testing a prototype to make sure of compatibility of the product with the various systems and enhancement of software to work with ubiquitous technical devices and the least requirements.

The contingency plan would be developing software based on reports and feedback. Finally, software malfunction risk can be reduced by transferring it through offering a warranty to the customers to assure them about the quality of the product and the contingency plan is ordering replacement while any failure takes place. Table 3-2 illustrates responses to the identified risks, offers contingency plans with the person who is in charge and when to react to the problem. Risk control involves executing the risk response strategy, monitoring triggering events, initiating contingency plans, and watching for new risks. Establishing a change management system to deal with events that require formal changes in the scope, budget, and/or schedule of the project is an essential element of risk control.

## 3-4 PERT Analysis

Table

Description automatically generatedProgram Evaluation and Review Technique (PERT) is a bottom-up range estimation technique. when work packages have significant uncertainty associated with the time or cost to complete, it is a prudent policy to require three-time estimates (low, average, and high). The low to high give a range within which the average estimate will fall. Determining the low and high estimates for the activity is influenced by factors such as complexity, technology, familiarity.

**Table 3-4: Project Critical Path and Durations**

“PERT assumes that the schedule logic represents how the project is going to be accomplished. Also, similar to schedule risk analysis, PERT focuses on the uncertainty of the activity durations” (Hullet et al, 2000). Table 3-4 provides the critical path in its durations to apply PERT analysis through following steps.

1. Use a three-point estimate to represent the uncertainty in durations. The three points are the durations under optimistic, most likely, and pessimistic scenarios.
2. Calculate the average duration and its standard deviation for each activity. The equation for the average depends on the distribution shape assumed. “The average for the triangular distribution is exactly (low + most likely + high) / 3. For the beta distribution, the average is typically approximated as (low + 4 \* most likely + high) / 6” (Hullet et al, 2000).
3. Compute the completion date for the total project by adding the average duration of the activities along the PERT critical path, which is the longest path through the network using those averages. The “PERT critical path” may be different from the traditional critical path.
4. Compute the standard deviation of the schedule path.

Calendar

Description automatically generatedThe math expression is shown in the following where “b” is pessimistic, “a” is optimistic duration, TE is expected time and te is weighted average activity time:

Table

Description automatically generated**Table 3-5: PERT Analysis for the Project**

Based on the results shown in Table 3-5, the expected duration of the project is around 94 days. In order to find the probability of finishing the project the following formula will be used. Table 3-6 shows the probability of the project duration in different time periods.

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**Figure 28: Probability of the Project**

When such probabilities are available to management, trade-off decisions can be made to accept or reduce the risk associated with a particular project duration. To complete the project in 87 days management can spend money up front to change conditions that will reduce the duration of one or more activities on the critical path like recruiting more work forces or allocate money to a contingency fund and wait to see how the project is progressing as it is implemented.

# 4. Conclusion

To sum up, regarding analysis made on the remote learning software and based on the scenario analysis, the project should complete within the time with minimum cost. Priority matrix helps us to find the relative importance of time, cost, and performance in our project. If the time is constrained, we must add more resources to get the project finish in time. If the cost is constrained, we can reduce the resources and we can avoid over allocation of resources to save money. The process breakdown structure is much like work breakdown structure, here we broke down our project in multiple phases and keep the track of multiple activities and deliverables using PBS. We can find out if all the activities under certain phase is covered or not. If all the deliverables of that phase have completed with the quality or not. From decision tree, we can make the choice from different alternatives. In this decision making most of the time we check, from which choice we will get more profit. Our project is not fully finished yet. In MS project result, 99 % completion, we get the result of cost $94,696 and work hours 1,040 hours . Cyber security and software malfunction are two most important risks to deal with due to their high impacts on the project therefore, the management team should be ready to show quick reaction if any of these risks take place. The contingency response plans are considered to reduce the impact of such risks. PERT analysis shows that customers and stakeholders can expect the releasing product during the 94 days of after starting the project, which is more than scheduled duration time, but definitely the project will be finished in a period of 98 to 103 days.

# 

# 5-Attachement

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# 6-Workcited

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