

RISK MANAGEMENT PLAN

Version 1.2

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1. INTRODUCTION

Risk is an expectation of loss, a potential problem that may or may not occur in the future. It is generally caused due to lack of information, control or time. A possibility of suffering from loss in software development process is called a software risk. Loss can be anything, increase in production cost, development of poor quality software, not being able to complete the project on time.

Software risk exists because the future is uncertain and there are many known and unknown things that cannot be incorporated in the project plan. A software risk can be of two types (a) internal risks that are within the control of the project manager and (b) external risks that are beyond the control of project manager. Risk management is carried out to:

1. Identify the risk.
2. Reduce the impact of risk.
3. Reduce the probability or likelihood of risk.
4. Risk monitoring.

The purpose of risk management is to identify potential problems before they occur so that risk-handling activities may be planned and invoked as needed across the life of the product or project to mitigate adverse impacts on achieving objectives.

Although technical issues are a primary concern both early on and throughout all project phases, risk management must consider both internal and external sources for cost, schedule, and technical risk. Early and aggressive detection of risk is important because it is typically easier, less costly, and less disruptive to make changes and correct work efforts during the earlier, rather than the later, phases of the project.

Before risk management begins, the following elements should be well defined:

1. Purpose, project sponsor, objectives, resources, scope:
 - 1.1 The purpose of the project is to develop an online- shopping website.

- 1.2 The project sponsor will be monitoring the project's progress from its start to its end and making sure it is properly accounted for to all stakeholders of the project.
- 1.3 The objectives of the project are as follows:
 - 1.3.1 Provide all deliverables identified by the project's due date.
 - 1.3.2 Fulfill all state website design and business functionality requirements.
 - 1.3.3 Complete the project within budget.
 - 1.3.4 Produce detailed user's manual on using and maintaining the website.
- 1.4 For the resources, the project will be planned with these three resources: budget, time and human resources.
- 1.5 For the scope, the project team will cover these three deliverables: business requirements, web design elements and website features.
2. Project team responsibilities.
 - 2.1 Project manager takes a proactive role in ensuring effective.
 - 2.2 Project sponsor is responsible for the funding of the project and is ultimately responsible for its success.
 - 2.3 Technical Lead/Senior Web Programmer is designated to be responsible for ensuring that all the technical aspects of the project are addressed and that the project is implemented in a technically sound manner.
 - 2.4 Customer will accept the final deliverables of this project and will be informed of the project's status including potential impacts to the schedule for the final deliverable or the project itself.
3. Meeting guidelines:
 - 3.1 Meeting agenda should identify the presenter for each topic along with a time limit for that topic.
 - 3.2 Meeting minutes includes the status of all items from the agenda including any follow-up actions.
 - 3.3 Action items includes both action item along with the owner of the action.
 - 3.4 Meeting chair person is responsible for distributing the meeting agenda, facilitating the meeting and distributing the meeting minutes.

2. TOP THREE RISKS

The top three high probability and high impact risks to this project are:

R1: Lack of stakeholder's involvement

As the website is to provide specific functionality and constructed with the latest web design trend, stakeholder's involvement is crucial to the project team's requirements analysis before the construction of the website. With the lack of stakeholder's involvement, the project will not be able to finish on time and may fall short of the required project scope.

R2: Integrating with third party system

Integrating (synchronizing, importing/exporting) the website with 3rd party systems can seem straightforward on the surface, but sometimes prove challenging. If such integration is mission-critical for the overall project success or plays an important role in the high-priority requirements fulfillment, then the requirements must be fully identified and tested/prototyped, and sooner rather than later.

R3: Huge change request late in the project

If stakeholders decide to add the original functional and design requirements to make major changes to the way parts of the site are programmed/designed to function, it will result in delaying the project's expected delivery and may even require a major overhaul of the website.

Besides the top three risks, there are also some other possible risks that may happen during the process of development:

R4: Problems caused by new technologies.

New technologies can bring bugs, which makes the system cannot work properly.

R5: Unexpected software abnormalities ("bugs")

Project team unable to discover or resolve software abnormalities in time will cause these abnormalities to escalate as the website develops further. This will pose a threat to the website's completion being delayed or even cause the website to undergo overhaul. These software

abnormalities could be caused by human errors, hardware and software incompatibility or found in the development tools used by the project team.

R6: Key project team member sick/urgent leave/quits

If unpredictable things happens to the key project team members, leaving or quits is inevitable. Without key plays, the project will suffer huge delays.

R7: Over-emphasis on low priority details.

Requirements for the website should be identified as being Low Priority and High Priority. Low Priority requirements are website details that can easily be changed, or “would be nice to have”, if time and budget allows. High priority requirements are time consuming, difficult to change, and is a “must have”. A delay will happen if project team fixates on low priority requirements, for example spending too much time on the color of a certain web page.

3. RISK MANAGEMENT APPROACH

The approach the project team has taken to manage risks for this project includes a systematic process by which the project team identified, scored and ranked the various identified project risks.

The most probable and highest impact risks were added to the project schedule to ensure that the risk managers (Project Manager and Tech Leader) takes the necessary actions to mitigate these risks at the appropriate times as the project progresses.

Part of the project schedules is a regular time meeting for the Project Manager and his team to provide status updates on their assigned risk to the project sponsor, and if necessary provide an executive summary to keep the project’s stakeholder informed.

Upon the completion of the project, the project team will analyze each identified risk and the adopted risk management process. Based on this analysis, the team will identify any improvements that can ameliorate the risk management process for future projects.

4. RISK IDENTIFICATION

For this project, as CSI has been in existence for ten years, we got plenty of similar projects and experienced engineers, risk identification was conducted in the Historical Review of Similar Projects and in the initial project risk assessment meeting. The method used by the project team to identify risks was the Crawford Slip method. The project manager chaired the risk assessment meeting and distributed notepads to each member of the team and allowed 10 minutes for all team members to record as many risks as possible.

Risk assessment meeting

A risk assessment meeting should be held with the project sponsor, all project team members, and all the stakeholders. During the meeting chaired by the project manager, the project team was distributed to record as many risks as possible. Later, the risks were presented to all the paper to everyone in the meeting room for discussion. The risks identified during the meeting were added to the project plan and risk register.

Expert Interview

Two Expert Interviews were held for this project. The interviews revealed several risks which were then mitigated by making changes to the project plan. The remaining risks are included in the Risk Register.

Historical Review of Similar Projects

The project team reviewed the history of similar projects in order to determine the most common risks and the strategies used to mitigate those risks.

Risk Recording Format

Risk event analysis form	
Risk item title	
Description	IF:
	THEN:
	Comments:
Risk evaluation	3a. Money at stake Optimistic: Likely: Pessimistic:
	3b. Time at stake Optimistic: Likely: Pessimistic:
	3c. Probability of event Low, Moderate, Significant, High
Risk Category	
Root cause	
Countermeasures	Plan 1 Summary: E.g. If we add a 4 days buffer to the project, delay risk will be reduce to 10%.
	Plan 2 Summary:
	Plan N Summary:
Plan chosen	Trigger:
	Trigger owner:
	Trigger date:

5. RISK QUALIFICATION AND PRIORITIZATION

In order to determine the severity of the risks identified by the team, Delphi method was used to estimate impact factor to each risk, together with risk probability, the most concerned risk will be identified. This process allowed the project manager to prioritize risks based upon the effect they may have on the project. The project manager utilized a probability-impact matrix to facilitate the team in moving each risk to the appropriate place on the chart. Through Risk profile chart, impact (Low, Moderate, Significant, and High) of each risk was estimated.

Detailed information is shown in the picture and table below:

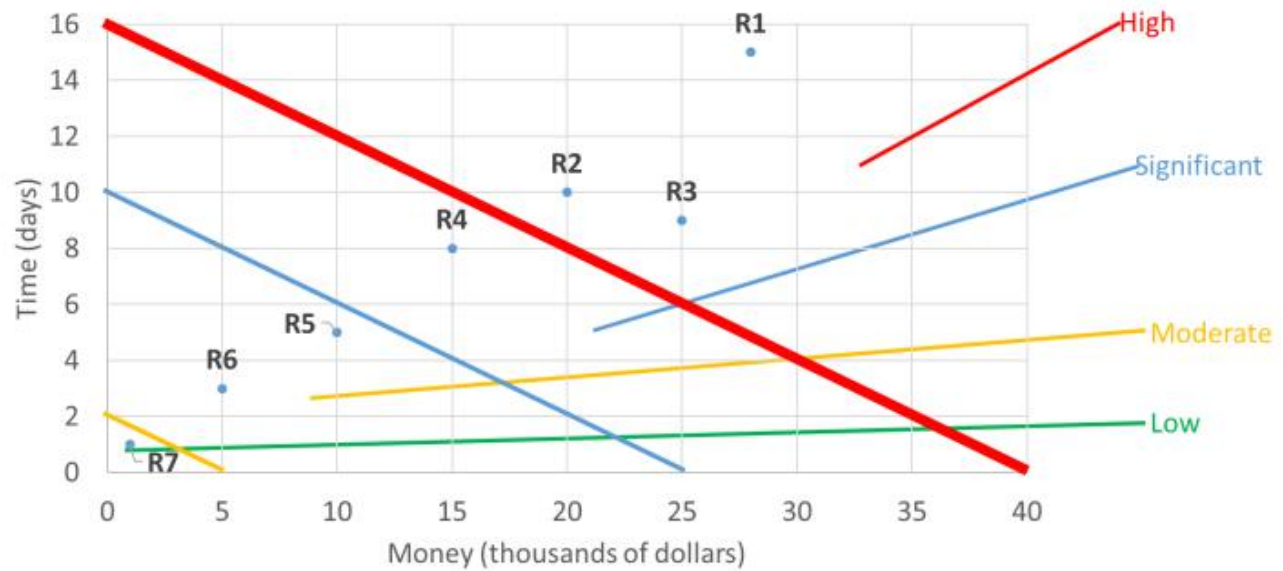


Figure: Risk Profile Chart

Risk	Time (days)	Money (thousands of dollars)
R1	15	28
R2	10	20
R3	9	25
R4	8	15
R5	5	10
R6	3	5
R7	1	1

Table: Risk profile chart data (from team brain storm and Delphi method)

Together with probability of each risk, the probability-impact matrix was built and the most concerned risk was identified.

Detailed information is shown in the picture and table below:

Risk	Impact (Low, Moderate, Significant, High)	Probability (Low, Moderate, Significant, High)
R1	High	High

R2	High	High
R3	High	Significant
R4	Significant	Significant
R5	Moderate	Significant
R6	Moderate	Moderate
R7	Low	Low

Table: Probability-impact matrix

Impact	High			R ₃	R _{1,2}
	Significant			R ₄	
	Moderate		R ₆	R ₅	
	Low	R ₇			
		Low	Moderate	Significant	High
Likelihood of occurrence					

6. RISK MONITORING

The most likely and greatest impact risks have been added to the project plan to ensure that they are monitored during the time the project is exposed to each risk. At the appropriate time in the project schedule a Risk Manager is assigned to each risk. During the bi-weekly project team meeting the Risk Manager for each risk will discuss the status of that risk; however, only risks which fall in the current time period will be discussed. Risk monitoring will be a continuous process throughout the life of this project. As risks approach on the project schedule the project manager will ensure that the appropriate risk manager provides the necessary status updates which include the risk status, identification of trigger conditions, and the documentation of the results of the risk response.

1. Track high concerned risks in the current iteration
2. Decide the countermeasure plan when the risk is triggered

3. Close the outdated risks
4. Identify the new risks and update

7. RISK MITIGATION AND AVOIDANCE

Risk mitigation is defined as taking steps to reduce adverse effects. There are four types of risk mitigation strategies that hold unique project continuity and disaster recovery. It's important to develop a strategy that closely relates to and matches our project. The following are the 4 types of risk mitigation:

1. **Risk Acceptance:** Risk acceptance does not reduce any effects however it is still considered a strategy. This strategy is a common option when the cost of other risk management options such as avoidance or mitigation may outweigh the cost of the risk itself. A company that doesn't want to spend a lot of money on avoiding risks that do not have a high possibility of occurring will use the risk acceptance strategy.
2. **Risk Avoidance:** Risk avoidance is the opposite of risk acceptance. It is the action that avoids any exposure to the risk whatsoever. Risk avoidance is usually the most expensive of all risk mitigation options.
3. **Risk Mitigation:** Risk mitigation is the most common risk management strategy used by business. This strategy limits a company's exposure by taking some action. It is a strategy employing a bit of risk acceptance along with a bit of risk avoidance or an average of both.
4. **Risk Transference:** Risk transference is the involvement of handing risk off to a willing third party. For example, numerous companies outsource certain operation such as customer serve, payroll serve, etc. This can be beneficial for a company if a transferred risk is not a core competency of that company. It can also be used so a company can focus more their core competencies.

The table below shows the risk strategy that will be carried on every risk and considerations which must be made and the options available to the project manager in managing these risks.

Risk	Risk strategy	Considerations
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R1: Lack of stakeholder's involvement	Risk Mitigation	<p>Cause: Stakeholders too busy or failed to see the need for the project.</p> <p>Consequences: The project will not be able to finish on time and may fall short of the required project scope</p> <p>Solution:</p> <ol style="list-style-type: none"> 1. Set up a communication plan to enable project team to contact with stakeholders. 2. Hold weekly meetings with stakeholders to get their feedbacks.
R2: Integrating with third party system	Risk Mitigation	<p>Cause: Unexperienced staff from the third party system was sent to help integrate with the system.</p> <p>Consequences: The systems will not use the functions provided by the third party system. This results in the system will not meet the requirements.</p> <p>Solution: An experienced staff who has more than 5 years' work experience come to assist the integration, which can lower down the probability of the risk.</p>
R3: Huge change request late in the project	Risk Mitigation	<p>Cause: Poor communication of business functionalities and poor analysis of design requirements.</p> <p>Consequences: It may cause delaying the project's expected delivery and over budget.</p> <p>Solution:</p> <ol style="list-style-type: none"> 1. Proper requirements analysis is to be done beforehand and scope statements must be signed and accepted by stakeholders and project sponsor.

		<ol style="list-style-type: none"> 2. Hold weekly meetings with stakeholders to show the progress of project and get their feedbacks. 3. If huge changes are bound to happen, then set up prior mutual agreement with stakeholders.
R4: Problems caused by new technologies.	Risk Avoidance	<p>Cause: Apply new technologies to the development without being familiar with its drawbacks.</p> <p>Consequences: The system may have bugs and cannot work properly.</p> <p>Solution: Use sophisticated technologies to avoid the problems caused by new technologies.</p>
R5: Unexpected software abnormalities (“bugs”)	Risk Mitigation	<p>Cause: Human errors. Development tool used.</p> <p>Consequences: The system cannot work properly.</p> <p>Solution: The project team should have at least two experienced programmers so that the project team has senior consultants to assist team when there is a problem.</p>
R6: Key project team member sick/urgent leave/quits	Risk Mitigation	<p>Cause: Overworking times.</p> <p>Consequences: The project may not be able to finish on time.</p> <p>Solution:</p> <ol style="list-style-type: none"> 1. Add programmers to assist the team member to finish the tasks. 2. Hire external programmers if the budget is enough.
R7: Over-emphasis on low priority details.	Risk Mitigation	<p>Cause: Inexperience project team.</p> <p>Consequences: The project may not be able to finish on time.</p>

		Solution: <ol style="list-style-type: none"> 1. Hold weekly meeting with stakeholders. Developer report the progress to the team leader 2. The project team should adopts a feature-driven approach in developing the website and the project requirements and analysis were discussed, signed by stakeholder early in the project phase.
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For R3, project required the integration with the third party system to meet the requirements. As the staff from the third party system is new and unexperienced, which may cause 60% probability that the integration will fail. The failure of integration can cause a loss of money, as much as 12000 dollars. After negotiation with the third party system providers, they decided to send an experienced staff who has more than 5 years working experience if we offer 5000 dollars to pay for him. This solution can reduce the probability to 10%.

We calculate the risk reduction leverage as the ratio of reduction in risk exposure over the cost of the reduction:

$$\begin{aligned}
 \text{Risk reduction leverage (RRL)} &= \text{RE}_{\text{before}} - \text{RE}_{\text{after}} / \text{Cost of risk reduction} \\
 &= (0.6 * 12000 - 0.1 * 12000) / 5000 > 1
 \end{aligned}$$

The result shows that this solution is a cost effective risk measure.

As more project risks are identified throughout the project, they will be accessed by the project manager and technical leader, and together with the project team will develop avoidance and mitigation strategies. These risks will also be used to update the Risk Register and the risk management plan to ensure these risk are being monitored in timely fashion and are responded to accordingly.

Both identified and future occurring project risks will be managed and controlled within the constraints of time, scope and cost. The project manager, with assistance of the technical leader will determine the best way to respond to each risk to ensure compliance with these constraints. In worst case scenarios it may be necessary to allow flexibility to one of the project's constraints.

If necessary, funding may be added to the project to allow for more resources in order to meet the project schedule and scope requirements. Time and scope are rigid project constraints and no flexibility. However, cost constraint will only be allowed to be flexible in extreme cases where no other risk avoidance or mitigation will work.

8. EFFORT, BUDGET ESTIMATION

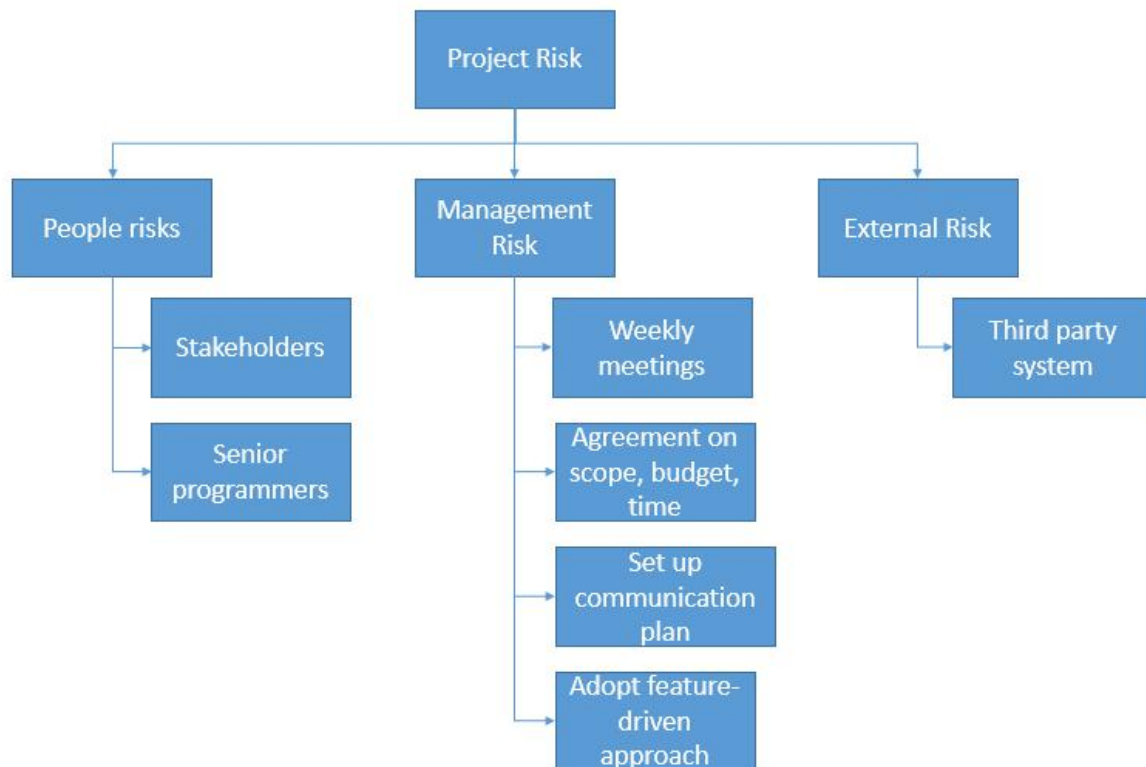


Figure: Risk Work breakdown Structure

The table below shows the detail information about budget, effort and duration. **DELPHI** method and **FP-Based** Cost estimation method are deployed in this part. It is supposed that the salary of one developer is \$8,000 per month.

Task Items	Budget (thousands of dollars)	Effort (pm)	Duration (days)	Start Date	End Date
Hold weekly meetings with stakeholders.	28	3.5	Once per week	09/24/16	03/12/17
Hold weekly meetings with third party system providers.	20	2.5	Once per week	09/24/16	10/10/17
Design interface used to communicate with third party system.	25	3.125	6	09/24/16	09/30/16

9. APPENDIX

RISK REGISTER

The Risk Register for this project is a log of all identified risks, their probability and impact to the project, the category they belong to, mitigation strategy, and when the risk will occur. The Risk Register also contains the mitigation strategy for each risk as well as when the risk is likely to occur.

Based on the identified risks and timeframes in the risk register, each risk has to be added to the project plan. At the appropriate time in the plan—prior to when the risk is most likely to occur—the project manager will assign a risk manager to ensure adherence to the agreed upon mitigation strategy.

Risk event analysis form	
Risk item title	Lack of stakeholder's involvement
Description	IF: stakeholders too busy or fail to see the need for the project and the involvement of stakeholders is far more insufficient
	THEN: the project will not be able to finish on time and may fall short of the required project scope.
Risk category	People risk
Root cause	Stakeholders too busy or failed to see the need for the project.
Risk evaluation	3a. Money at stake (thousands of dollars) Optimistic: 20 Likely: 27 Pessimistic: 40
	3b. Time at stake (days) Optimistic: 9 Likely: 16 Pessimistic: 19
	3c. Probability of event High
Countermeasures	Plan 1 Summary: Get project sponsor to speak with the stakeholders.
	Plan 2 Summary: Clear communications plan.
	Plan 3 Summary: Weekly team meeting to surface any major hindrance in the project.
Plan chosen	Trigger: Unable to reach stakeholders or postpone meetings.
	Trigger owner: Project manager
	Trigger date:

Risk event analysis form	
Risk item title	Integrating with third party system
Description	IF: the main program cannot integrate with the third party system successfully and correctly
	THEN: some of the main functional requirements cannot be implemented.
Risk evaluation	3a. Money at stake (thousands of dollars) Optimistic: 15 Likely: 19 Pessimistic: 30
	3b. Time at stake (days) Optimistic: 6 Likely: 10 Pessimistic: 13
	3c. Probability of event High
Risk category	Operational risk
Root Cause	Invisibility to third party compliance.
Countermeasures	Plan 1 Summary: Conduct on-going monitoring of the third party relationships focusing more attention on those parties who may pose the higher risk.
	Plan 2 Summary: Assign clear roles and responsibilities for overseeing and managing third party relationships.
	Plan 3 Summary: Perform proper due diligence to identify potential risks before signing the contract.
Plan chosen	Trigger: Lack of central contract repository. Lack the proper visibility on the full complement of third party services
	Trigger owner: Technical leader
	Trigger date:

Risk event analysis form	
Risk item title	Problems caused by new technologies.
Description	IF: new technologies caused any unexpected issues
	THEN: It could infect the progress of the project.
Risk evaluation	3a. Money at stake (thousands of dollars) Optimistic: 9 Likely: 16 Pessimistic: 19
	3b. Time at stake (days) Optimistic: 4 Likely: 8 Pessimistic: 10
	3c. Probability of event Significant
Risk category	Tool risk
Root Cause	Apply new technologies to the development without being familiar with its drawbacks.
Countermeasures	Plan 1 Summary: Use sophisticated technologies to avoid the problems caused by new technologies.
Plan chosen	Trigger: The using of not compatible new technologies.
	Trigger owner: Risk manager
	Trigger date:

Risk event analysis form	
Risk item title	Huge change request late in the project
Description	IF: the stakeholder decide to add to the original functional and design requirements or make major changes to the way parts of the site designed to function
	THEN: it will result in delaying the project's expected delivery and may even require a major overhaul of the website
Risk evaluation	3a. Money at stake (thousands of dollars) Optimistic: 15 Likely: 19 Pessimistic: 30
	3b. Time at stake (days) Optimistic: 6 Likely: 10 Pessimistic: 13
	3c. Probability of event High
Risk category	Scope risk
Root cause	Poor communication of business functionalities and poor analysis of design requirements.
Countermeasures	Plan 1 Summary: Poor communication of business functionalities and poor analysis of design requirements. So proper requirements analysis is to be done beforehand.
	Plan 2 Summary: Scope statements must be signed and accepted by stake holders and project sponsor.
	Plan 3 Summary: Negotiate mutual agreement with stakeholders on scope, budget and time flexibilities.
Plan chosen	Trigger: Requirements and scope statements no accepted and signed by stake holders and project sponsors.
	Trigger owner: Project manager
	Trigger date:

Risk event analysis form	
Risk item title	Huge change request late in the project
Description	IF: the stakeholder decide to add to the original functional and design requirements or make major changes to the way parts of the site designed to function
	THEN: it will result in delaying the project's expected delivery and may even require a major overhaul of the website
Risk evaluation	3a. Money at stake (thousands of dollars) Optimistic: 15 Likely: 19 Pessimistic: 30
	3b. Time at stake (days) Optimistic: 6 Likely: 10 Pessimistic: 13
	3c. Probability of event High
Risk category	Scope risk
Root cause	Poor communication of business functionalities and poor analysis of design requirements.
Countermeasures	Plan 1 Summary: Poor communication of business functionalities and poor analysis of design requirements. So proper requirements analysis is to be done beforehand.
	Plan 2 Summary: Scope statements must be signed and accepted by stake holders and project sponsor.
	Plan 3 Summary: Negotiate mutual agreement with stakeholders on scope, budget and time flexibilities.
Plan chosen	Trigger: Requirements and scope statements no accepted and signed by stake holders and project sponsors.
	Trigger owner: Project manager
	Trigger date:

Risk event analysis form	
Risk item title	Unexpected software abnormalities (“bugs”)
Description	IF: Project team unable to discover or resolve software abnormalities in time
	THEN: these abnormalities to escalate as the website develops future
Risk evaluation	3a. Money at stake (thousands of dollars) Optimistic: 5 Likely: 10 Pessimistic: 15
	3b. Time at stake (days) Optimistic: 3 Likely: 5 Pessimistic: 8
	3c. Probability of event Significant
Risk category	Operational risk
Root cause	Hardware and software incompatibilities. Human errors. Development tool used.
Countermeasures	Plan 1 Summary: Seek other project’s senior programmers.
	Plan 2 Summary: Hire external experts.
	Plan 3 Summary: Hire more experienced programmers.
Plan chosen	Trigger: Hardware and software incompatibilities. Human errors. Development tools used. Brought up during weekly meeting. Discovered during testing phases. Informed by developers community.
	Trigger owner: Technical Leader
	Trigger date:

Risk event analysis form	
Risk item title	Key project team member sick/urgent leave/quits
Description	IF: the key members (senior programmers or technical leader) leave work
	THEN: the project will suffer huge delay
Risk evaluation	3a. Money at stake (thousands of dollars) Optimistic: 2 Likely: 4 Pessimistic: 10
	3b. Time at stake (days) Optimistic: 1 Likely: 3 Pessimistic: 5
	3c. Probability of event Moderate
Risk Category	People risk
Root cause	Overworking times.
Countermeasures	Plan 1 Summary: Adequate buffer time in schedule.
	Plan 2 Summary: Seek other project's technical leads to help.
	Plan 3 Summary: Hire more experience programmers.
Plan chosen	Trigger: Overworking the team. Setting unrealistic deadlines. Members late for work. Undesirable facial expressions and behaviors. Failure to meet small mile stones. Negative change in team dynamics.
	Trigger owner: Project manager
	Trigger date:

Risk event analysis form	
Risk item title	Over-emphasis on low priority details.
Description	IF: project team fixates on low priority requirements, for example spending too much time on the color of a certain web page.
	THEN: a delay will happen.
Risk evaluation	3a. Money at stake (thousands of dollars) Optimistic: 1 Likely: 1 Pessimistic: 2
	3b. Time at stake (days) Optimistic: 1 Likely: 1 Pessimistic: 2
	3c. Probability of event Low
Risk Category	Operational Risk
Root cause	Inexperience project team. Demanding or stubborn graphic designers.
Countermeasures	Plan 1 Summary: Set small milestones.
	Plan 2 Summary: Team building activities.
	Plan 3 Summary: Reinstate stakeholders' and business requirements
Plan chosen	Trigger: Inexperienced project team. Demanding or stubborn graphic designers. Exceed weekly meeting time. Attitude of team members. Negative change in team dynamics.
	Trigger owner: Project manager
	Trigger date:

SPONSOR ACCEPTANCE

Approved by the Project Sponsor:

<Project Sponsor>

<Project Sponsor Title>

Date: _____