

Iqra National University

Final Term Exam Paper

Subject: Risk and Disaster Management in Construction

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Q1:

Risk log/ Register:

A risk register is a document used as a **risk** management tool and to fulfill regulatory compliance acting as a repository for all **risks** identified. Risk Log is used to facilitate recording, storing and sorting of risks under various headings.

It is used to identify potential risks in a project or an organization, sometimes to fulfill regulatory compliance but mostly to stay on top of potential issues that can derail intended outcomes. The risk register includes all information about each identified risk, such as the nature of that risk, level of risk, who owns it and what are the mitigation measures in place to respond to it

Or a risk register, sometimes known as a risk log, is an important component of the overall risk management framework. Created during the early stages of a project, the risk register is a tool that helps you track issues and address them as they arise

Or risk log or register is a document to use for risk identification including additional information about each risk, nature of risk, reference and owner, mitigation measure.

If we have risk log it help us in preparing of a realistic project budget because it formed as risks and their potential impact.

Risk log should be entered in data base system and it rechargeable it means it can manipulate and facilitate to record the risk storing, sorting under various heading and this will include as below:

Project phase,

Owner of risk,

Location of risk,

Cross reference to the project budget and program

Database should ranking the risk as per its qualitative assessment like high, medium or low and quantitative assessment like its percentage of probability and cost of impact it mean risk register show us the each risk's quality and quantity.

the risk register should facilitate information for avoiding risk, mitigation the risk, transferring of risk to other party, feedback plans for secondary risk arising, risk log capable to update and will provide an audit trail, risk log should be used as management tools to prompt risk owners to take action.

The register log is very important for awareness of senior management to take action that first try to will eliminate at source, secondly reduce as low as practicable, third inform residual risks to affected parties, fourth control or monitor risk so it will all possible if we have a good managed risk register log.

I am working as bridge and road condition surveyor so my project register log is below:

Project Details:

Project: Qalamwal mena

Location: Khost Province, Afghanistan

Date of Site Visit: 21/8/2020

Originator: Eng. Mohammad Ismail

Checker: Eng. Haroon

This assessment is prepared for the site visit of Qalamwal mena of Khost Province, Afghanistan.

ID	Date raised	Risk description	Risk			Without controls			Controls	Residual risk	Action
			H	M	L	Cost impact	Time impact	Other			
01	21/8/2018	Slips, trips, fall when working on bridge or in the river bed		√		200\$	5 days of delay	Personal injury; Delay in carrying out future inspections	Avoid getting close to edges; avoid shortcuts access riverbed; team members act as flaggers to prevent cars getting close to inspector; ask locals to provide a ladder, better step watching	Fall down	Wok should postponed for ladder and safety belt
02	21/8/2018	There was Disposed needles or sharp objects so caused Bodily injury and contraction of disease due to contaminated objects puncturing skin and underlain tissues	√			70\$	1 days delay	Injury; disease	Wear safety work boots and hand gloves. Do not try to attempt to move sharp objects	Some needle and sharp objects remained	Safety shoes should be wear
03		Objects impacting inspectors' body particularly heads and/or shoulders due to fall object	√			50\$	1 day delay	Injury	Stay away from areas where objects can fall down. Wear hard hats	No residual risk	
04	25/8/2018	Damaged electric lines short circuiting			√	300\$	2 weeks delay	Burned	Use safety shoes and gloves. Consider all exposed cables as live and do not touch them	Exposed cables	Do not touch them until be cover

Q 2:

Discuss how Cost-benefit analysis is effective for a project? Support your arguments with real example:

What is Cost Benefit Analysis?

Cost benefit analysis is a process used primarily by businesses that weighs the sum of the benefits, such as financial gain, of an action against the negatives, or costs, of that action. The technique is often used when trying to decide a course of action, and often incorporates dollar amounts for intangible benefits as well as opportunity cost into its calculations.

Although CBA can be used for short-term decisions, it is most often used when a company or individual has a long-term decision.

CBA is an easy tool to determine which potential decision would make the most financial sense for the business or individual. The process also takes indirect benefits or costs into consideration, like customer satisfaction or even employee morale. And opportunity cost often plays a big role when deciding between several options. When listing potential costs and benefits, companies or analysts will often factor in things like labor costs, social benefits and other factors that may not be immediately obvious.

Understanding Cost-Benefit Analysis:

Before building a new plant or taking on a new project, prudent managers conduct a cost-benefit analysis to evaluate all the potential costs and revenues that a company might generate from the project. The outcome of the analysis will determine whether the project is financially feasible or if the company should pursue another project.

In many models, a cost-benefit analysis will also factor the opportunity cost into the decision-making process. Opportunity costs are alternative benefits that could have been realized when choosing one alternative over another. In other words, the opportunity cost is the forgone or missed opportunity as a result of a choice or decision. Factoring in opportunity costs allows project managers to weigh the benefits from alternative courses of action and not merely the current path or choice being considered in the cost-benefit analysis.

By considering all options and the potential missed opportunities, the cost-benefit analysis is more thorough and allows for better decision-making.

Key Take away:

- A cost-benefit analysis (CBA) is the process used to measure the benefits of a decision or taking action minus the costs associated with taking that action.
- A CBA involves measurable financial metrics such as revenue earned or costs saved as a result of the decision to pursue a project.
- A CBA can also include intangible benefits and costs or effects from a decision such as employee morale and customer satisfaction.

When should you conduct a cost-benefit analysis?

A cost-benefit analysis should be conducted before allocating funds to a project. A thorough analysis of a project should identify all potential benefits and the probability of achieving goals, compared with the all-in associated costs. The outcome of the analysis will help decision makers determine if the project is feasible and if it should proceed, or if the funds are better spent elsewhere. If a project is to go ahead, the benefits should outweigh the costs and meet the intended goals.

The Cost-Benefit Analysis Process:

A cost-benefit analysis (CBA) should begin with compiling a comprehensive list of all the costs and benefits associated with the project or decision.

The costs involved in a CBA might include the following:

- Direct costs would be direct labor involved in manufacturing, inventory, raw materials, manufacturing expenses.
- Indirect costs might include electricity, overhead costs from management, rent, and utilities.
- Intangible costs such as customer impact of pursuing a new business strategy, project, or construction of a manufacturing plant, delivery delays of product, employee impact.
- Opportunity costs such as alternative investments, or buying a plant versus building one.
- Cost of potential risks such as regulatory risks, competition, and environmental impacts.

Benefits might include the following:

- Revenue and sales increases from increased production or new product.
- Intangible benefits, such as improved employee safety and morale, as well as customer satisfaction due to enhanced product offerings or faster delivery.
- Competitive advantage or market share gained as a result of the decision.

An analyst or project manager should apply a monetary measurement to all of the items on the cost-benefit list, taking special care not to underestimate costs or overestimate benefits. A conservative approach with a conscious effort to avoid any subjective tendencies when

calculating estimates is best suited when assigning a value to both costs and benefits for a cost-benefit analysis.

Finally, the results of the aggregate costs and benefits should be compared quantitatively to determine if the benefits outweigh the costs. If so, then the rational decision is to go forward with the project. If not, the business should review the project to see if it can make adjustments to either increase benefits or decrease costs to make the project viable. Otherwise, the company should likely avoid the project.

Important:

With cost-benefit analysis, there are a number of forecasts built into the process, and if any of the forecasts are inaccurate, the results may be called into question.

Advantages and Disadvantages of Cost Benefit Analysis:

Cost benefit analysis can be a helpful tool for businesses or individuals to undertake when considering a new course of action.

Running a CBA for a potential decision can help visualize the implications and impact of that course of action, and is often very helpful for smaller or medium-sized decisions that are more immediate in scope of time.

However, there are some disadvantages to practicing a CBA in certain circumstances. For bigger decisions with a longer time horizon, CBAs can sometimes fail to take into account other factors that might not be significant in the short term but would impact the long term, like inflation, interest rates and other larger, more long-term factors. For these calculations, net present value or internal rate of return are often better methods to use.

Additionally, performing a CBA can often put projects or decisions in a purely numerical point of view, which may fail to take into account unforeseen events or circumstances that might affect the action.

How to Calculate Cost Benefit Analysis:

For standard CBA, the formula, the benefit/cost ratio, is fairly simple:

Benefit/cost, simplified as b/c.

While there are slightly more complex formulas, the benefit-cost ratio is essentially just taking into account all of the direct or indirect costs and benefits and seeing if one outweighs the other. Additionally, running a CBA often takes into account opportunity cost and is frequently used to compare different options by calculating their benefit-cost ratios.

The formula reflects the sum of all the benefits divided by the sum of all the costs, with consideration for the duration of the decision or action (or, analysis horizon).

Cost Benefit Analysis Steps:

Cost benefit analysis is fairly simple to execute, and can be helpful when considering a new course of action or strategy.

Step 1: Compile lists

The first thing to do when running a cost benefit analysis is to compile a comprehensive list of all the costs and benefits associated with the potential action or decision.

Consider not only the obvious costs (like the cost of installation for new software, or for the software itself) but also possible intangible costs like the opportunity cost of picking one software over another, or over another option like hiring a new employee.

Additionally, consider all the possible benefits of the course of action or decision - how much might it add to your revenue? What other benefits may be inherent in the action that would make it outweigh the costs? For example, would a new software improve efficiency or capabilities that could promote new business or make current operations run smoother? Be sure to also consider intangible benefits as well as obvious, fiscal ones.

Step 2: Give the costs and benefits a monetary value

Once you have two comprehensive lists of costs and benefits for the action, assign monetary values to each individual cost or benefit.

For some, the values will be obvious - like the cost of installing the software might be \$500. However, it is also important to try to assign monetary values to direct or indirect and tangible and intangible costs or benefits if possible. For example, installing a new software may render an employee's computer inaccessible for a couple hours, costing that employee working time or productivity and therefore money generated for the company.

Once you assign monetary values for each cost and benefit, add all the costs and benefits respectively and set up the equation.

Step 3: Set up the equation and compare

Take the sum of the benefits (the sum of all the monetary values assigned to the benefits of the action) and the sum of the costs (all the monetary values of the costs of the action) and plug them into the b/c equation.

The equation should be a numerical equation, and if the numerical benefits (the sum of the fiscal values for the benefits of the action) outweigh the costs, it is advisable to proceed with

the decision. If not, the company or individual should re-examine the potential action and make adjustments accordingly.

This equation can also be set up for multiple different options or projects and can help companies compare options side by side.

Actual examples of CBA:

A real estate developer considering several different investment options.

The assumptions for the investments are that option 1 would build 300 houses, renting 50 of them for 10 years at \$3,000 per year. The 50 rented units would be sold after 10 years for \$60,000.

Construction costs for option 1 would be \$80,000 per house, which would sell for \$100,000 each. The cost of a sales office would be \$1,000,000 and the salaries of sales staff would be \$200,000 each year. The project would last 2 years, with a financing cost of \$2,000,000 per year.

For option 2, the construction company could build 200 houses, renting 25 of them for 5 years at \$3,500 per year. The 25 units could be sold after 5 years for \$70,000.

Construction costs for option 2 would be \$70,000 per house, and the rest of the homes would sell for \$110,000 each. The cost of a sales office would be \$2,000,000 and sales staff salaries would be \$150,000 each year. The project would last 1 year, with a financing cost of \$1,500,000 per year.

For option 1, costs would include:

Construction cost = \$24,000,000

Sales office cost = \$1,000,000

Cost of sales staff = \$400,000

Financing cost = \$4,000,000

Total costs would therefore be \$29,400,000.

For option 1, benefits would include:

Income from rentals = \$1,500,000

Income from sales = \$25,000,000

Income from sales after rental = \$3,000,000

Total benefits would therefore be \$29,500,000. Using the cost benefit analysis formula b/c, the ratio would be $29,500,000/29,400,000$, or 1.0. Since the equation is possible, the benefits for option 1 outweigh the costs. However, since the developer is trying to decide between two projects, the same analysis needs to be performed for option 2.

For option 2, costs would include:

Construction cost = \$14,000,000

Sales office cost = \$2,000,000

Cost of sales staff = \$150,000

Financing cost = \$1,500,000

Total costs would therefore be \$17,650,000.

For option 2, benefits would include:

Income from rentals = \$437,500

Income from sales = \$19,250,000

Income from sales after rental = \$1,750,000

So, the total benefits for option 2 would be \$21,437,500. The b/c ratio for option 2 would therefore be $21,437,500/17,650,000$, or 1.2.

Comparing both options together, it is clear that option 2 has a higher benefit-to-cost ratio (and costs less to execute) and would therefore be the most fiscally resourceful option for the developer to pick.

Q 3:

(A): Normal Distribution:

The normal distribution is the most important probability distribution in statistics because it fits many natural phenomena.

For example, heights, blood pressure, measurement error, and IQ scores follow the normal distribution. It is also known as the Gaussian distribution and the bell curve. The normal distribution is a probability function that describes how the values of a variable are distributed. It is a symmetric distribution where most of the observations cluster around the central peak and the probabilities for values further away from the mean taper off equally in both directions. Extreme values in both tails of the distribution are similarly unlikely.

A random variable X whose distribution has the shape of a normal curve is called a normal random variable.

(b): Given data:

$$\mu=60000, \sigma = 15000, x<45000$$

$$z = \frac{x-\mu}{\sigma} = \frac{45000-60000}{15000} = -1 \text{ From table it will be } = 0.15866$$

$$= 16\%$$



