



جامعة الجميع الذكية
EVERYONE'S SMART UNIVERSITY

Everyone's Smart University

Project (Spring 2021)

Student Name	Mohammed Hussein Al-Bandary	اسم الطالب
Students I.D	2021203114	الرقم الجامعي

Section

Master

Date

Thursday

18 / 03 / 2021.

Course Code

(PMG510)

Project Risk Management

Instructions:

- آخر موعد للتسليم هو يوم السبت 2021-05-08 في تمام الساعة ٩ مساءً.
- الإجابة متاحة باللغة الإنجليزية أو اللغة العربية مع مراعاة أن تكون المصطلحات العلمية باللغة الانجليزية.
- يتم تسليم المشروع في صيغة ملف pdf مع الالتزام نموذج الجامعة ولن تقبل أي مستندات أخرى.
- يجب مراعاة أقسام البحث الرئيسية (مقدمة Introduction، دراسات علمية سابقة Literature Review، طريقة البحث Methodology، النتائج والمناقشة Results and Discussion، وأخيراً المراجع References. وان كان هناك ملحقات Appendices يتم إضافتها)
- يجب الالتزام بـ Theme موحد كما يلي:
- حجم الخط 12.
- نوع الخط Arial.
- لون الخط أسود.
- المسافة بين الأسطر line spacing 1.5
- عدد صفحات البحث (لا يقل عن ثلاث صفحات ولا يزيد عن ست صفحات).

Instructor's Name: Eng. Mosaab M. Hamed

Project:

Risk Identification and Analysis (Based on the project you chose in APM)

The objective of this report is to identify project risks, prepare a risk probability matrix, and carry out an analysis of selected risks. Referring to the project you select in **Advanced projects management APM course**, your task is to prepare a risk management plan that identifies potential risks in **the selected stage of the project** and identify risk management strategies.

From the course content and readings, you know that the overall purpose of risk planning is to anticipate possible risk events and be ready to take appropriate action when risk events occur—to eliminate or reduce negative impacts on the project.

You may wish to begin this exercise with a brainstorming about potential risks to get candidate risks “on the table” for consideration. And then identify and refine that wording for risks that have some realistic chance of occurring in this stage. For example, potential weather problems present a real obstacle to completing field data collection by the planned completion date. It is also an issue that the project manager will ultimately have to plan for, as opposed to other issues such as a major disaster (e.g., your office burning down), is not a high-enough probability event that requires much time in planning. As described below, you will select several of the identified risks and carry out a risk analysis.

You will use the distilled list of risks to make a risk probability/impact matrix. The matrix will have at least three categories (high/medium/low) for probability and impact.

Remember that it is important to name risks effectively—use words that describe the risk event and point to the impact on the project (e.g., “injury of field technician disrupts data installation work”).

After completion of the risk matrix, document a risk analysis for the selected risks. This detailed documentation for that selected risk will include:

- a description of the risk and potential impacts (schedule, quality of work, cost, etc.) on the project.
- indicators or triggers that would be monitored to help identify the risk as early as possible.
- specific risk response strategies to take.

Using probability and impact matrix calculate the **Expected Monetary Value (EMV)** for all risks that have the impact in terms of cost \$\$.

Best of luck...

التعرف على المخاطر وتحليلها (بحث مبني على مشروعك الذي اخترته في مادة ادارة المشاريع المتقدمة)

الغرض من هذا التقرير هو التعرف على المخاطر المحيطة بالمرحلة التي تختارها المرحلة من مراحل مشروعك (نفس المرحلة التي اخترت التطرق لها في مشروعك لمادة إدارة المشاريع المتقدمة Advanced project management) حيث أن مهمتك هي تحضير خطة متكاملة لإدارة المخاطر تشمل التعريف بالمخاطر المحتملة التي تحيط بتلك المرحلة وتحضير مصفوفة احتمالية المخاطر ومن ثم القيام بالتحليل لهذه المخاطر المختارة وتحديد استراتيجيات ادارة المخاطر المناسبة لكل خطر على حدة.

من محتويات المقرر والمصادر الأخرى المتاحة أصبحت تعلم الان أن الغرض العام لمرحلة التخطيط للمخاطر هي توقع أحداث المخاطر المحتملة والتجهز لاتخاذ ردة الفعل المناسبة عند وقوع الخطر – لمنع أو تقليل الاثار السلبية على المشروع.

قد تحبذ بداية هذا البحث بعصف ذهني عن ماهية المخاطر التي قد تحيط بتلك المرحلة من مراحل مشروعك، وذلك للحصول على قائمة بتلك المخاطر. ومن ثم تحديد وتصفية هذه القائمة للوصول إلى قائمة مختصرة بالمخاطر التي لها فرصة واقعية أكبر في الحدوث. على سبيل المثال: المشاكل الجوية المتوقعة والتي تمثل عقبة حقيقية أمام اكتمال جمع البيانات من المواقع في أو قبل الوقت المحدد، هذه تعتبر مشكلة على مدير المشاريع أن يضعها في الحسبان. من ناحية أخرى، فإن المخاطر غير الواقعية مثل الكوارث الطبيعية والأعاصير (تلك التي تسبب حريقاً بمكتبك وفقدان الأوراق المهمة) ليست لها احتمالية وقوع عالية وبالتالي لاتستدعي تضيق الكثير من الوقت في التخطيط لها. كما سيتبين لك، ستقوم باختيار عدة مخاطر من تلك التي قمت بالتعرف عليها لتحليلها.

ستقوم باستخدام هذه القائمة المختصرة لعمل مصفوفة المخاطر (الاحتمالية/الأثر). المصفوفة ستحتوي على الأقل على ثلاث تصنيفات (عالي/متوسط/منخفض) للإحتمالية والأثر.

لاتنس استخدام أسماء تصف طبيعة المخاطر بصورة فعالة – قم باستخدام كلمات تصف الحادثة الخطرة وتشير الى أثرها على المشروع (مثل: إصابة أحد الفنيين في الموقع مما يؤثر على أعمال التركيب).

بعد انتهاءك من مصفوفة المخاطر، قم بتوثيق تحليلك للمخاطر المختارة. هذا التسجيل المفصل للمخاطر يجب أن يتضمن:

- وصف للخطر واثاره المحتملة (الجدولة، جودة العمل، التكلفة، الخ)
- المؤشرات والمحفزات التي يجب مراقبتها للمساعدة في التعرف على هذا الخطر قبل وقوعه
- تفصيل للاستجابة المقترحة للتصدي لهذا الخطر

باستخدام مصفوفة الاحتمالات والتأثير ، احسب **القيمة النقدية المتوقعة (EMV)** لجميع المخاطر التي لها تأثير من حيث التكلفة \$\$.

مع تمنياتي بالتوفيق..

Risk Identification and Analysis for Saudi Aramco North Admin Building Voltage Conversion Project, Ras Tanura

1. Introduction

Electricity demand in Saudi Arabia has increased significantly over the past 25 years. Nowadays, Saudi Arabia and few other countries are utilizing a dual-voltage power distribution system in which 127 Volts is used for commercial and residential buildings, whereas industrial applications and large commercial buildings require 220 Volts for operation. Currently, more than 70% of world countries are using a 230/400 Volts distribution system **(Saudi Electricity Company, 2020) [1]**.

On August 31, 2010, the Kingdom of Saudi Arabia Council of Ministers approved the change of voltage to the international standard (400/230 Volts, AC, 60 Hz) as recommended by the International Electrotechnical Commission (IEC); the organization that prepares and publishes international standards for all electrical, electronic, and related technologies **(Saudi Electricity Company, 2020) [2]**.

In compliance with the Saudi Government Directive, Saudi Aramco has decided to convert all its office buildings from the existing voltage of 208/120V to the new voltage standard of 400/230V. According to the dynamic environment and the unique nature of projects, risks and uncertainties are inevitable. Risks can negatively influence a project's scope, schedule, and baseline cost. Therefore, organizations should adopt risk management analysis techniques based on project characteristics to ensure sustainable firm performance **(Larson & Gray, 2013) [3]**.

This research paper aims to discuss the potential risks associated with Saudi Aramco North Admin Building Voltage Conversion project.

2. Literature Review

This section consists of two subsections. First, a review of project classification studies including typologies and considering project types. Second, a review of risk classification approaches taking into account risk categories.

2.1 Project Classification

A set of factors like organization structure, engineering, innovation, and product development have a great influence on the frameworks of project classification. **Blake (1978)** divided the projects into minor and major [4]. **Henderson and Clark (1990)** ignored the industry type while categorizing the projects. He linked the classification system to the level of innovation and creativity [5]. **Wheelwright and Clark (1992)** stated that the main criteria for developing a proper classification system is through considering the in-house company's product portfolio that focuses on a single industry and small projects [6]. **Vaidyanathan (2013)** classified the projects based on the main technological factors like uncertainty, complexity, and interdependence [7]. **Bangsgaard (2010)** mentioned that manufacturing, scientific research projects, industrial, and management are the four groups for his classification structure [8].

2.2 Risk Classification

The most common elements that hinder a project's performance or lead to failure to accomplish project goals are risks and uncertainties (**Fang et al., 2012**) [9]. Risks can influence a project positively and negatively and have a direct impact on the scope, quality, cost, and schedule. A negative risk outcome results in losses (**Webb, 1994; Chapman, 2003**) [10]. Organizational environment, team knowledge, user involvement, and software development lifecycle are the key factors used to classify the risks (**Wallace et al., 2004a; Han and Huang, 2007**) [11].

3. Methodology

This section focuses on the implemented methodology and the tools used to identify and manage the risks associated with Saudi Aramco North Admin Building Voltage Conversion Project. A risk management technique called Expected Monetary Value (EMV) was used to compare risks and provide quantitative risk analysis to the data that was collected from previous projects' risk registers.

3.1 Safety Management Guide

The Safety Management Guide is considered as one of the main references to guide everyone to prepare a proper Job Safety Analysis (JSA) before carrying out any critical jobs. The basic objective of this document is to allow job performers to identify the potential hazards and then provide control measures to eliminate or mitigate these hazards **(Saudi Aramco Safety Management Guide, 2013) [12]**.

3.2 Job Safety Analysis (JSA)

The JSA is a risk management tool required to be conducted for all the critical jobs when there are missing or inadequate control measures like current operating procedures and safe work practices. When JSA is performed correctly, this process can prevent and reduce injuries and incidents **(Saudi Aramco Safety Management Guide, 2013) [13]**.

3.3 Risk Assessment Matrix

A risk assessment matrix is used to identify the potential risks of jobs and prioritize JSAs based on hazard severity and probability of occurrence. It allows the user to determine the potential risk of a job by selecting the likelihood (frequency) and severity (consequence) that can result from the hazards associated with the job **(Saudi Aramco Safety Management Guide, 2013) [14]**.

Likelihood*		Risk Level				
5	Very High	Medium (5A)	Medium (5B)	High (5C)	High (5D)	High (5E)
4	High	Medium (4A)	Medium (4B)	Medium (4C)	High (4D)	High (4E)
3	Medium	Low (3A)	Medium (3B)	Medium (3C)	Medium (3D)	High (3E)
2	Low	Low (2A)	Low (2B)	Medium (2C)	Medium (2D)	Medium (2E)
1	Very Low	Low (1A)	Low (1B)	Low (1C)	Medium (1D)	Medium (1E)
Hazard Severity/Consequence**		Very Low A	Low B	Medium C	High D	Very High E

* Likelihood Values Based on Table 2 Criteria.

** Hazard Severity/Consequence Values Based on Table 3 Criteria.

Table 1: A Risk Assessment Matrix.

Table 2 guides estimating the frequency for each identified hazard that will be based on historical data as well as engineering judgment.

Level	Frequency	Description
1	Very Low	Never heard of in the industry
2	Low	Some incidents have occurred in the industry
3	Medium	Incident has occurred in Saudi Aramco
4	High	Has occurred several times in Saudi Aramco
5	Very High	Has occurred several times in facility, proponent organization or project

Table 2: Likelihood Categories.

Table 3 guides estimating the hazard severity/consequence of each identified hazard in terms of impact on people, environment, economic, and company reputation.

Level	Severity	Description	
1	Very Low	People	No injury or damage to health
		Environment	No or slight effect/damage within a system
		Economic	Slight damage and/or operational impact < \$10K
		Reputation	No impact and no public concern
2	Low	People	Minor employee injury or damage to health not affecting work performance nor requiring treatment beyond first aid
		Environment	Minor contamination within fence; no permanent effect
		Economic	Equipment damage and/or operational impact < \$100K
		Reputation	Slight impact and no public concern. Public or media awareness may exist
3	Medium	People	Serious employee injury or health effect that can result in lost time injury, restricted work or irreversible health effects
		Environment	Localized effect within the plant fence with limited damage and spontaneous recovery
		Economic	Equipment damage and/or operational impact < \$1 MM
		Reputation	Regional public/media attention, causing considerable reputation impact
4	High	People	Single employee fatality or permanent disability, or some impact on third party
		Environment	Severe damage to be extensively restored with no significant lasting consequences
		Economic	Damage and/or operational impact < \$10 MM
		Reputation	National public or media attention
5	Very High	People	Multiple employee or third party fatalities
		Environment	Damage extending over a large public area or environmentally sensitive area(s) w/ significant consequence and loss
		Economic	Equipment damage and/or operational impact > \$10 MM
		Reputation	International public/media attention, with severe impact

Table 3: Hazard Severity/Consequence Categories.

Once the potential frequency and hazard severity are determined, a risk level can be obtained for each job by plotting the frequency and consequence in the risk assessment matrix as illustrated in Table 1.

4. Discussion and Results

This section aims to identify a set of potential risks, provide a risk probability matrix, and carry out quantitative risk analysis using the Expected Monetary Value (EMV) risk management technique for the selected risks which are associated with Saudi Aramco North Admin Building Voltage Conversion Project.

4.1 Hazards Identification Plan (HIP)

The HIP was formulated for implementation in compliance with Saudi Aramco General Instructions, safety policies, and standards. This is a confirmation of the commitment of the contractor "Alascon" to safeguard, protect the lives, and property of Saudi Aramco and any other third party in connection with the work to be performed. To achieve this objective, Alascon's construction management, in coordination with the concerned Saudi Aramco Project Engineer and proponent as required, had to make a joint site visit to identify the potential hazards of the work to be undertaken and to initiate control measures to maintain adequate safety for the duration of the work **(Saudi Aramco Safety Management Guide, 2013) [15]**.

4.2 Expected Monetary Value (EMV)

An Expected Monetary Value (EMV) is an effective tool that uses the quantitative approach to compare and analyze a variety of risks for a particular project. It uses both the probability and impact of a risk to perform the required calculations. The multiplication of the impact and the probability of a certain risk can give us the contingency budget which is used as a precautionary action to cover the impact of the risks in case they happen. After conducting the risk management analysis and acquiring the contingency budget, the project manager can ask the top management to add this budget to the initial fund specified for the project **(Saudi Aramco Safety Management Guide, 2013) [16]**.

Job Activity	Potential Risk	Risk Probability (P)	Cost Impact (I)	Expected Monetary Value (EMV) (P*I)	Risk Level	Mitigating Actions and Control Measures
Scope of Work Development	Project purpose and need are not well-defined	0.6	\$15,000	\$9,000	High	Define the purpose accurately in the project charter
Scope of Work Development	Project design and deliverable definition is incomplete	0.5	\$20,000	\$10,000	High	Define the scope via design workshops with input from Subject Matter Experts (SMEs)
Scope of Work Development	Project schedule is not clearly defined or understood	0.6	\$25,000	\$15,000	Medium	Conduct regular scheduling workshops to clarify the plan and individual tasks
Mobilization	Vehicle collision into equipment	0.8	\$35,000	\$28,000	Low	Driver must be certified - Safety signs and barricades must be installed
Mobilization	Back injuries while lifting heavy items	0.6	\$50,000	\$30,000	Low	Utilize proper lifting techniques
Welding and Grinding	Fire	0.4	\$75,000	\$30,000	Medium	Isolate welding area with fire blanket
Welding and Grinding	Hand Burns - Contact with hot surface	0.4	\$70,000	\$28,000	Medium	Leather gloves and leather body protection shall be worn for protection
Excavation	Damage underground utilities	0.3	\$80,000	\$24,000	High	A site inspection must be conducted prior to issuing the appropriate work permit
Excavation	Dust Inhalation, Noise and Eye Irritation	0.5	\$60,000	\$30,000	Low	Spray water to control dust - Wear the appropriate PPEs like safety goggles and hearing protection items
Shutdown and Unit Isolation	Unit activation during repair	0.2	\$90,000	\$18,000	High	Use Lockout/Tagout
Disconnection of Electrical Supply	Electric Shock	0.1	\$100,000	\$10,000	High	Ensure double insulation and proper grounding for portable electrical power tools
Installation of Lighting Fixtures	Fall from height	0.5	\$65,000	\$32,500	Low	Use ladder and temporary elevated platform
			\$685,000	\$264,500		

Table 4: Potential Hazards with Saudi Aramco North Admin Voltage Conversion Project.

5. Conclusion

According to the analysis of the risks conducted in the above table, It can be observed that the cost of rectifying the risks occurring in the initial stages is much lower than those arising in later stages. The potential impact on the project is **\$685,000**. However, the project manager can only ask for the contingency budget which is **\$264,500**.

6. References

- [1, 2] Saudi Electricity Company. (2020). Information and Instructions, Retrieved May 10, 2021, from <https://www.se.com.sa/en-us/Pages/ChangeofElectricVoltage.aspx>
- [3] Larson, E. and Gray, C. (2013), "Project management: the managerial process", McGraw-Hill Professional.
- [4] Blake, S.B. (1978), Managing for Responsive Research and Development, Freeman and Co., San Francisco, CA.
- [5] Henderson, R.M. and Clark, K. (1990), "Architectural innovation: the reconfiguration of existing product technologies and the failure of established firms", Administrative Science Quarterly, Vol. 35, pp. 9-30.
- [6] Wheelwright, S.C. and Clark, K.B. (1992), Revolutionizing Product Development, Free Press, New York, NY.
- [7] Vaidyanathan, G. (2013), Project Management: Process, Technology, and Practice, Pearson, Upper Saddle River, NJ.
- [8] Bangsgaard, A.M. (2010), "Method for risk analysis in regard of different types of projects (master's thesis)", Aarhus School of Business, University of Aarhus.
- [9] Fang, C., Marle, F. and Zio, E. (2012), "Network theory-based analysis of risk interactions in large engineering projects", Reliability Engineering & System Safety, Vol. 106, pp. 1-10.
- [10] Webb, A. (1994), Managing Innovative Projects, Chapman & Hall, London.
- [11] Wallace, L. and Keil, M. (2004), "Software project risks and their effect on outcomes", Communications of the ACM, Vol. 47 No. 4, pp. 68-73.
- [12,13, 14, 15, 16] Saudi Aramco Safety Management Guide, GN # 06-003-2013