Assignment Brief and Front Sheet PGT

This front sheet for assignments is designed to contain the brief, the submission instructions, and the actual student submission for any WMG assignment. As a result the sheet is completed by several people over time, and is therefore split up into sections explaining who completes what information and when. Yellow highlighted text indicates examples or further explanation of what is requested, and the highlight and instructions should be removed as you populate 'your' section.

This sheet is only to be used for components of assessment worth more than 3 CATS (e.g. for a 15 credit module, weighted more than 20%; or for a 10 credit module, weighted more than 30%).

To be completed by the student(s) prior to final submission:
Your actual submission should be written at the end of this cover sheet file, or attached with the cover sheet at the front if drafted in a separate file, program or application.

Student ID or IDs for group work	**5597768**

To be completed (highlighted parts only) by the programme administration after approval and prior to issuing of the assessment; to be consulted by the student(s) so that you know how and when to submit:

Date set	11/11/2024
Submission date (excluding extensions)	9/12/2024 at 12pm UK time
Submission guidance	To be submitted electronically via Tabula
Late submission policy	If work is submitted late, penalties will be applied at the rate of **5 marks per University working day** after the due date, up to a **maximum of 10 working days** late. After this period the mark for the work will be reduced to 0 (which is the maximum penalty). "Late" means **after the submission deadline time as well as the date** – work submitted after the given time even on the same day is counted as 1 day late. For **Postgraduate** students only, who started their **current course before 1 August 2019**, the daily penalty is **3 marks** rather than 5.
Resit policy	If you fail this module and/or component, the University allows students to remedy failure (within certain limits). Decisions to authorise resits are made by Exam Boards. These will be issued at specific times of the year, depending on your programme of study. More information can be found from your programme office if you are concerned. If this is **already a resit** attempt, this means you will not be eligible for an additional attempt. The University allows as standard a maximum of two attempts on any assessment (i.e. only one resit). Students can only have a third attempt under exceptional circumstances via a Mitigating Circumstances Panel decision.

To be completed by the module leader/tutor prior to approval and issuing of the assessment; to be consulted by the student(s) so that you understand the assignment brief, its context within the module, and any specific criteria and advice from the tutor:

Module title & code	Project Financial Management WM9H9-15
Module leader	Dr Sherrihan Radi
Module tutor	Sherrihan Radi, Lee Griffin, Bushra Fatima and Kudakwashe Bondamakara
Assessment type	Written Report
Weighting of mark	70%

Assignment brief

Objective:

You are required to prepare a comprehensive **report** focusing on the sources of financing a project and risk management.

Project Selection:

For this report, select a project (either ongoing or completed) that has sufficient public information available for analysis. Please ensure that there is ample data available online in English about the project and its risk management.

Question 1

1.1 Briefly introduce the project. You are advised to include the project scope, structure, type, objectives, stakeholders, and timeline (if available).

You may use diagram(s) to support your answer.

[100 words; 10 Marks]

1.2 Critically evaluate the financial source(s) used to fund the selected project and justify their suitability. To answer this question, please follow the below steps:

a) Identify the different financing sources utilised for the project. Classify them in terms of debt, equity and/or other.
b) Explain how these financing sources impacted the project's capital structure.
c) Discuss the benefits and limitations of (up to) three main sources. Make sure you discuss their implications.
d) Justify the suitability of the sources.

[1000 words; 40 Marks]

Question 2

Critically analyse the risk management process of the selected project, focusing on its risk assessment and mitigation strategies. To answer this question, you are advised to:

a) Give a brief overview of the project's risk management process and identify the project's risks.
b) Critically analyse no more than **four** risks; at least one of these risks must be **financial** risk. Discuss their likelihood and potential impact(s) on the project.
c) Critically evaluate the effectiveness of the risk management strategies in mitigating these risks, comparing them to industry best practices.
d) Discuss the strengths and weaknesses of the project's risk assessment and mitigation strategies.

[1,100 words; 50 Marks]

Note that the above points a) to d) of both questions should serve as a guide for the key areas to be addressed in your answer, but you have flexibility in structuring your report.

[Total assignment: 100 Marks]

Indicative word count allocation:

Introduction	150 words
Question 1	1,100 words
Question 2	1,100 words
Conclusion	150 words
TOTAL	**2,500 words**

Format:

The work should be prepared in a **report** format with appropriate cover page, table of contents, introduction, and conclusion. Make sure you insert different **sections and subsections** to make your work easier to read.

Word count	2500 words excluding table of contents, tables, figures, references and appendices.
Module learning outcomes (numbered)	1. Work within a team to critically analyse the financial performance of a project. 2. Collaborate in a team to examine project cost and appraise project investment decision(s). 3. Critically evaluate the financial source(s) used to fund a project and justify their suitability. 4. Critically analyse the risk assessment of a project including the risk mitigation strategies.
Learning outcomes assessed in this assessment (numbered)	Learning outcomes 3 and 4.
Marking guidelines	Please refer to the assessment guidelines here: MSc Module Assessment Guidelines (warwick.ac.uk)

Academic guidance resources	**1. Format** Please use a 12-point readable font (e.g. Arial) at 1.5 or 2 line spacing. Justify the paragraph margins and include sections and sub-section titles. It is advisable that you include a cover page, table of contents and page numbering. **2. Referencing** Please use the Harvard referencing system. For guidance check: - Leeds Harvard referencing examples | Study and research support | Library | University of Leeds - Referencing styles - University of Warwick Library - You are advised to use a referencing tool e.g. EndNote EndNote - University of Warwick Library All of your work must be referenced to a valid academic source (**NOT Investopedia, Wikipedia or similar pages or blogs**). **3. Use of AI** - Where you have used an AI **in any form** - even if just for structure, translation or other help you MUST disclose it somewhere setting out WHY you decided to use an AI, WHAT the input was (for translation attach the other language text as an appendix) and exactly WHERE in the document the output appears (for a structure please attach the AI suggested structure as an appendix). - Keep good records of these interactions, as you may be asked to produce them at some point. - Failure to disclose such use could form an Academic Integrity offence under Regulation 11. - Reference the AI you have used. - You cannot use any of the generated text without **paraphrasing** it in your own understanding and referencing the AI. - All references generated by the AI must be verified. **4. Resources** - Lectures, syndicate activities, assignment briefing session and video. - Module reading list (see Moodle page) - Other textbooks and journal articles. You can use the library search for this: https://warwick.ac.uk/services/library/ or search for articles using Science Direct, Scopus or Business Source Complete (you can find these in the databases link below). - Databases: https://pugwash.lib.warwick.ac.uk/search~S1/v - Other resources: https://warwick.ac.uk/services/library/find-resources

Where to get help:

1. Talk to your module tutor if you don't understand the question or are unsure as to exactly what is required.

2. Study, Professional and Analytical Skills (SPA) Moodle site – we have a lot of resources on this website with workbooks, links and other helpful tools. https://moodle.warwick.ac.uk/
3. There are also numerous online courses provided by the University library to help in academic referencing, writing, avoiding plagiarism and a number of other useful resources. https://warwick.ac.uk/services/library/students/your-library-online/
4. If you have a problem with your wellbeing, it is important that you contact your personal tutor or wellbeing support services https://warwick.ac.uk/services/wss

PROJECT FINANCIAL MANAGEMENT:

GOTTHARD BASE TUNNEL

REPORT

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GBT – Gotthard Base Tunnel

NRLA – New Rail Link through the Alps

PPP – Public Private Partnership

CHF – Swiss Franc

FinöV - Finanzierung von Infrastrukturvorhaben des öffentlichen Verkehrs

1. INTRODUCTION

The Gotthard base tunnel is a majestic modern infrastructure, which was built beneath the Swiss Alps to improve European rail connectivity by reducing travel time for passengers as well as freights (Fabbri, 2019). The project took 17 years to complete the 57 km long tunnel construction and spent about 12.2 billion CHF to complete the project (Los Angeles Times, 2016). The tunnel located between Erstfeld and Bodio, it was officially opened in June 2016 and put to commercial use in December 2016.

Such a massive project must have relied on multiple sources of financing to meet the project demands and could have encountered varied amounts of threats and opportunities throughout the project. This report provides an in-depth analysis on the financial aspects, risks faced during the construction, and also the mitigation strategies used during the project lifecycle. By analysing these, the report aims to discuss the lessons learned and how this can be applied in future infrastructure projects.

2. SELECTED PROJECT

2.1 PROJECT OVERVIEW

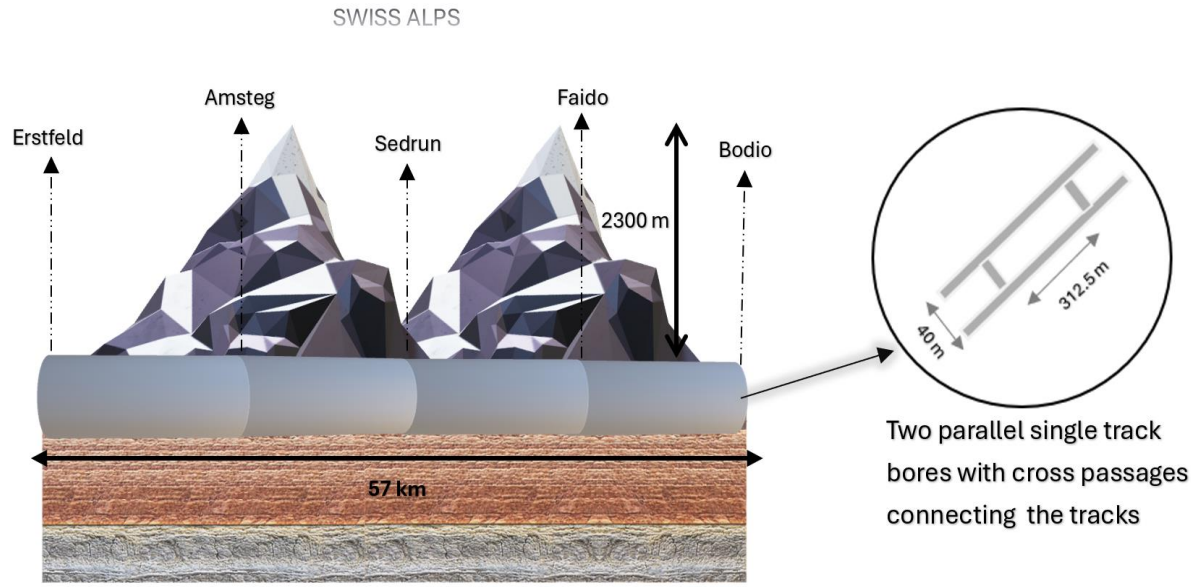

Figure 1: Structure of Gotthard base tunnel (created by author)

The Gotthard Base Tunnel is the longest and deepest traffic tunnel in the world, extending from Erstfeld to Bodio (Simoni, 2015; BBC News, 2016). The first flat low-level rail route is laid 2.3 km deep inside the majestic Swiss Alps (Vogelhuber et al., 2023). The tunnel was built to ease the freight traffic congestion through roads and maximize the connectivity between southern and northern Europe (Simoni, 2015). When compared with the historic railway tunnel that passes through the higher elevation of the Swiss Alps, the Gotthard Base Tunnel is a high-speed rail tunnel that runs straight through the base of the mountain, enabling a faster transport route for both passengers and freight (Simoni, 2015; BBC News, 2016). The transition of transporting freight from road to railway enabled environmentally sustainable transportation (Simoni, 2015; BBC News, 2016).

2.2 PROJECT TIMELINE AND THE STAKEHOLDERS

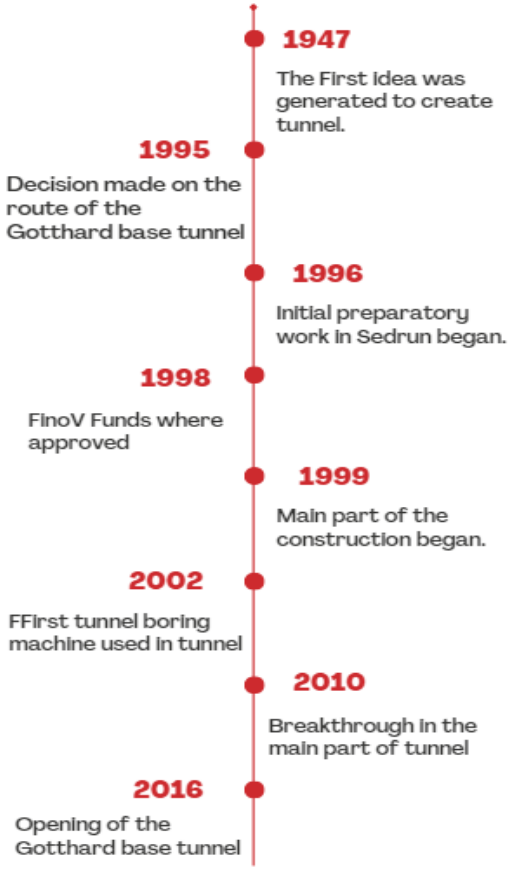

Figure 2: Timeline of Gotthard base tunnel (created by author, content from Swiss Confederation, (2016)).

Though the stakeholders were not mentioned directly, by assuming their roles played in the project, the key stakeholders of the Gotthard base tunnel project are the Swiss federal government as the financer, private capital market investors as a debt provider, Swiss citizens as taxpayers, and Swiss federal railways as future operator (Ehrbar, 2016). Other stakeholders would have been suppliers, manufacturers, engineers, local and regional authorities, etc.,

3. FINANCIAL SOURCES AND SUITABILITY

3.1 IDENTIFICATION AND CLASSIFICATION OF FINANCING SOURCES

The GBT gathered funds from various sources to smoothly run the project. At the initial stages of the construction (1998), the Swiss federal government funded the project using loans and repayable credits (Fabbri, 2019; Kumar, 2022), to bridge the gap between tax revenue collection and immediately start the construction. Kumar states that only 25% of the amount from the credit was to be repaid by the future operator “Swiss Federal Railways (SBB CFF FFS)”.

However, in the year 2005, the government waived the 25 % repayment from the future operator and transferred the burden to the taxpayers. In the same year, the credit was extended, to meet the extending costs (Ehrbar, 2016; Ehrbar, 2012). About 25 % percentage of the funds were from private capital markets. These funds were either in the form of loans or bonds, which were to be repaid by the Swiss federal railways (Kumar, 2022; Ehrbar, 2016; Fabbri, 2019).

The other source of funding came from “FinöV” funds. FinöV fund was created to fund the NRLA (New Rail Link through the Alps) projects and approximately 12.3 billion GBP was allocated to especially fund the Gotthard base tunnel project (Ehrbar, 2016; Fabbri, 2019). Kumar (2022) also states that the revenue sources for the FinöV funds are from taxpayers, contributing to 75% of the project cost. While not mentioned directly, the Swiss federal railways could have collected the operations costs and redirected the funds to repay the debts. The funds could have been accumulated from other countries that would have profited during the operation of the GBT.

Source	Classification	Details
Swiss Federal Government	Debt	Loans and credits borrowed from the government for the initial period.
Private Capital Market	Debt, Equity	It may be in the form loan, credit, or a share.
FinöV fund	Equity	The funds that are gathered from the taxpayers, are non-repayable – hence considered as equity.
Taxes	Other	Heavy road vehicle tax (65%), mineral oil tax (25%), and value added tax (10%).
The future operator	Other	Responsible for repaying the debts borrowed for the project.
International funding	Other	Funds from the international countries, who could have benefitted during the tunnel operation
Swiss Federal Railways	Other	Repay the debts, while operating the railways.

Figure 3: Sources of Financing (by author)

3.2 IMPACT OF FINANCING SOURCES ON CAPITAL STRUCTURE

According to Kumar (2022), 25% of the overall project funds are from the private capital markets, which are to be repaid by the Swiss federal railway. The loans and credits given by the state government at the initial stage of the project were waived in 2005, making it a non-refundable source of funding, and reducing the burden of repayment. Though the credits were increased in the future, 75% of the overall credit was agreed to be non-refundable (Ehrbar, 2016). This can mean that waived loans from the government are considered part of the equity portion, along with the contributions from the FinöV fund.

The FinöV funds contributed the most to funding the project (Ehrbar, 2016; Kumar, 2022; Fabbri, 2019). These could be considered as nonrepayable equity funds, that reduce the reliance on debt. Overall, the percentage of debt financing was comparatively lesser than other sources of financing, reducing the reliance on debt, and ensuring financial stability. When comparing these findings in terms of gearing ratio, there was a high reliance on equity rather than debt, resulting in a low gearing ratio.

3.3 BENEFITS AND LIMITATIONS OF KEY FINANCING SOURCES

The three main sources that played a significant role in financing the project are FinöV funds, private capital market loans, and Swiss government loans and credits. From the three sources, FinöV funds benefited the project the most. Covering approximately 75% of the project's total financing, it was a nonrepayable fund that reduced the reliance on the debt, ensuring the smooth progress of the project (Ehrbar, 2016; Kumar, 2022).

Also, the funds sourced for the FinöV, that is the taxes collected from the taxpayers would have been highly reliable and stable, ensuring a consistent flow of the money. These FinöV funds reduced the financial burdens of repayments from future operators and the project itself (Fabbri, 2019). However, the public might have been burdened with paying taxes to source the FinöV funds, which could have impacted their livelihood budgets.

FinöV funds were not only introduced for the GBT project but all the NRLA projects, with mutual support and approval from the public and the government (Ehrbar, 2016). A small rupture in this mutual trust would have disoriented the project's progress, ultimately delaying the project's completion. This implied the need to maintain the mutual trust between the government and the public until the very end of the project.

According to Kumar (2022), private capital loans covered 25 % of the project's funding, giving immediate access to the capital, and ensuring critical support of liquid funding during the construction phase of the project. The debt repayment agreement might have been made between the debtors and the future operators, ensuring the capital was repaid with interest. This repayment strategy facilitates the necessity for efficient operation of the tunnel.

Although the repayments were planned to be repaid by the future operator, the repayment plan heavily depended on the success of the tunnel and its future operations (Fabbri, 2019). This facilitates the necessity of proper execution and operational management of the project. The accumulation of interest on these loans throughout the project duration could have posed a significant limitation.

At the start of the project, the FinöV funds did not have enough capital to support the project. This is where the federal government played a crucial role in the project, by providing temporary loans and credits, ensuring uninterrupted project progress (Ehrbar, 2016). Additionally, the flexibility of the government in extending credit limits, and waiver of repayment (Fabbri, 2019), benefited in facing the financial challenges and reduced the financial burdens. Although the repayment of the debt was waived, in the early phases it would have generated pressure on repayment.

3.4 JUSTIFICATION FOR THE SUITABILITY OF FINANCING SOURCES

The Gotthard base tunnel project heavily relied on equity funding rather than debt financing. This choice would have reduced the financial burdens like repayment, interests, etc., This reliance also enhanced the project's sustainability and avoided unnecessary financial risks (Ehrbar, 2012; Kumar, 2022).

Risks are meant to occur in every project. Proactively thinking about the risks, can sometimes help in elimination and most of the time help in facing them. The funds from the Swiss federal government in the form of loans and credits, additionally contributed to the contingency budget (Fraunhofer et al., 2014), to face geological risks, delays, and other risks. This source of funding actively contributed in risk mitigation, flexibility of the costs (increased credits), and most importantly helped in the initial phases of the project.

The FinöV fund was a primary source, that was collected from the public by the government, to benefit the public in the future through the operations of the tunnel, by reducing the travel time and freight traffic congestions. This public and government coordination ensured stable cash flow through the tax revenues (Fabbri, 2019).

4. RISK MANAGEMENT ANALYSIS

4.1 RISK MANAGEMENT PROCESS AND RISK IDENTIFICATION

The Gotthard base tunnel is a long-term massive project, which had strategic and operative levels to address the risks throughout its project life cycle. According to the AlpTransit Gotthard Ltd (2011), factors that could hinder or prevent the goal's accomplishment, and those that could further or assist it, were the two questions that helped in formulating the risk management process for the Gotthard base tunnel project.

These questions could have helped in identifying and categorizing the strategic and operational risks (Heinz, 2003), analyzing and evaluating risks based on the assessment matrix (AlpTransit Gotthard Ltd, 2011), treating and mitigating risks, and finally monitoring for unforeseen challenges.

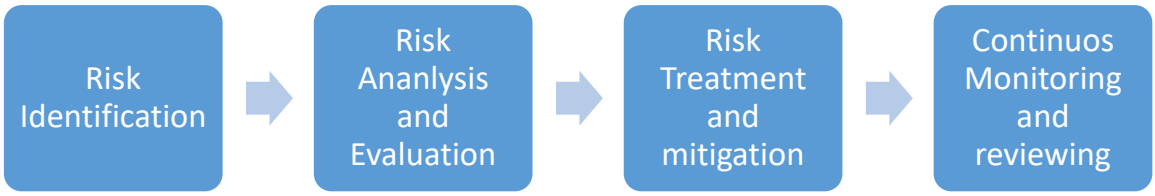

Figure 4: Process of Risk Management (Created by author)

Large projects significantly contain enormous amounts of risks, as was the case of the Gotthard base tunnel. Lieb and Ehrbar, (2011) state that Piora syncline was one of the most critical risks faced during the construction phase, which had the significant potential to halt the tunnel construction. The hydrogeological risk i.e., the water seepage during the construction disrupted the work (Loew et al., 2015; Lieb and Ehrbar, 2011), which could have caused work delays, extra costs, and a dangerous working environment.

These geological challenges in turn contributed to scheduling risks and financial risks. Risk mitigations for these risks would have potentially delayed the construction, altered the timelines, and could have encountered unforeseen costs. The capital used while dealing with these challenges has led to reserve depletion and eventually funding shortage (Ehrbar and Kellenberger, 2003). Apart from the above, other potential risks included safety during the whole project, tackling security issues, and preventing the public from entering the construction site (Loew et al., 2015).

4.2 RISK IMPACT

Piora syncline was one of the uncertain geological risks faced during the construction. The layers of rock with variable stability made the construction risky and even had the potential to halt the project. According to Lieb and Ehrbar (2011), it was identified early and categorized as a high-probability risk, because the rock formations and its properties were not fully understood even after surveys and studies.

Its impact on the project was categorized as catastrophic because of its potential to delay the project timeline, collapse of the tunnel if left unmitigated, and also cost overruns (Lieb and Ehrbar, 2011; Ehrbar and Kellenberger, 2003). Since the risk was identified early, it may have allowed the project team to develop a detailed plan for handling and mitigating the risk. This proactive measure omitted the potential failure, ensuring project continuity. But may still pose a risk if not maintained well in the future.

Moving on to the next risk is the hydrogeological risk that occurs due to unexpected water inflows. The management of water inflow was a technical, safety, as well as a financial risk. The chances of occurrence were high, again due to the varied rock types and aquifers. The water flow was not understood until the tunneling work began (Loew et al., 2015). Hence, the potential impacts were accidents, tunnel collapse, interruptions in the work, additional costs, and ecological changes in the surface (Loew et al., 2015). Pre-identification reduced the risk levels, by actively working on strategies to mitigate. However, the fact that the water inflows cannot be examined thoroughly states that the process is time-consuming and will pose a threat, if not act cautiously.

The central challenge of the project was considered to be the financial risks caused due to the complexities, long duration, and most importantly unforeseen challenges. However, the one financial risk that became a huge threat to the project was the depletion of financial reserves, leading to funding gaps (Ehrbar and Kellenberger, 2003). The reserve funds were used to tackle unforeseen challenges that occurred in the project. The likelihood of the risk was high, as uncertainties were high in the project.

The misuse of the funds could have caused delays in NRLA projects which were also getting funds from the FinoV funds, and at the worst case could have caused disputes between the government and the public, as the revenue for FInoV funds are collected from the taxpayers. Safety is crucial in every projects, especially the complex and long term projects like GBT. The challenging working conditions like working in the extreme depths (2300 meters inside) pose significant safety risks. The occurrence of safety related risks are very high and leads to fatality if left unnoticed.

4.3 RISK MITIGATION STRATEGIES

Extensive studies and surveys conducted in piora syncline to understand and predict its behavior were used in making contingency plans (Lieb and Ehrbar, 2011). This proactive investigation strategy could have minimized the uncertainties and the likelihood of failure. Ehrbar and Kellenberger (2003), state that grouting was used proactively for sealing the cracks and ruptures. However, if the grouting technique had been used as a reactive measure, it would have caused work delays, extra costs, and most importantly imply safety risks. Instead of techniques like grouting, the usage of advanced real-time monitoring systems and 3D imaging could have been the best solution for the uncertainties in Piora syncline (ITA-AITES, 2015).

Hydrogeological risk’s mitigation strategies were the permeation grouting and efficient drainage systems to redirect the water away from the construction site (Loew et al., 2015; Ehrbar and Kellenberger, 2003). The grouting technique would have filled the gaps to stop the water dripping or flow and the drainage system could have maintained the stability and also the safety of the workers, preventing accidents and fatality. The stated hydrological strategies aligned well with the ITA guidelines.

According to Ehrbar and Kellenberger (2003), regular audits and a transparent reporting system were used as a mitigating strategy for financing risks. Other than this, the contingency budgets and also the additional funds provided by the Swiss government could have been used to cover the shortfalls when the reserves were drained out. These would have ensured the project's smooth progress. However, ITA guidelines suggested adapting public-private partnerships to extend the funding sources and reduce the reliance on the government.

When it comes to risk mitigation strategies for safety, strict protocols were introduced in the working environment, which included training programs for the workers (Ehrbar and Kellenberger, 2003). The training program could have had regular safety checks for equipment and machinery, and daily hazard assessments. Lieb and Ehrbar (2011), mention in their article that multi-functional stations (MFS) were used as emergency escape routes in case of calamities.

These strategies when put together would have presented good strategic plans for mitigating the safety-related risks. However, risks are inevitable, especially in terms of safety. So, other than these strategies, worker's self-awareness for their own safety, would have also been a good strategy for avoidance of the risk.

4.4 STRENGTHS AND WEAKNESSES OF RISK ASSESSMENT STRATEGIES

The studies, and surveys done at the Piora syncline (Lieb and Ehrbar, 2011), highlight the proactive investigations done by the project team members to take precautious steps in both identifying risks and planning for mitigating strategies. Considering Piora syncline and hydrogeological condition as high probability risk, the strategies used for mitigating these risks, signify the project’s flexibility to adapt to unforeseen challenges. The project's flexibility is also demonstrated in the financing section.

The contingency funds along with the government's extended credits and loans (Ehrbar, 2016; Fabbri, 2019), is clearly showing the financial flexibility in facing the risks. Additionally, the safety measures taken to keep the working environment safe (Ehrbar and Kellenberger, 2003; Lieb and Ehrbar, 2011), implied the project's strength

for maintaining safety in underground construction and the overall well-being of the workers.

Despite the above strengths in risk mitigation strategies, there could have been uncertainties in the strategies themselves. Every technology has its own limitations, so would have been in the technologies used in the GBT project. These limitations could have caused unexpected delays and cost increases. When it comes to the financial aspects, the risk mitigation strategy used Finov and government funds to cover the extra and unexpected costs (Ehrbar, 2016).

This could be considered as an over-reliance on those funding sources. Instead, effective planning at the initial stage of the project to anticipate additional or extra costs could have been a good solution too. Finally, unexpected events like rockfalls and hydrogeological conditions could have put safety at stake, even with the most advanced risk mitigation strategies that were not mentioned in this report.

5. CONCLUSION

The massive historic Gotthard base tunnel project which took 17 long years for successfully complete, could have not been possible without careful planning, robust financing structures, responsive risk management plans, and mitigation strategies. Despite the challenges faced throughout the project life cycle, either financial or other risks, the strategies that aligned with the industry best practices, signify the project's strengths.

However, the usage of advanced technologies could have minimized the risks and broad financing sources like public-private partnerships would have ensured more financial stability. In short, though the Gotthard base tunnel could be used as a role model for other infrastructure projects, adopting advanced technologies, diverse financing models, and safety automation techniques can lead to a bright path to success.

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  (I acknowledge the use of ChatGPT, an AI-based language model by OpenAI, to assist in formatting and creating references in Harvard style. The tool was used solely to ensure accuracy and consistency in citation formatting, while the responsibility for verifying the correctness of the references lies with me)