

USING DIGITAL TECHNOLOGIES TO FACILITATE IDENTIFICATION OF
POLITICAL RISKS IN INTERNATIONAL CONSTRUCTION PROJECTS

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ABSTRACT

USING DIGITAL TECHNOLOGIES TO FACILITATE IDENTIFICATION OF POLITICAL RISKS IN INTERNATIONAL CONSTRUCTION PROJECTS

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In the context of international construction projects, effective and timely country risk assessment, particularly assessment of political risks is crucial due to uncertainty regarding socio-political conditions that have considerable impact on construction. Traditional risk identification and assessment methods, which rely on manual efforts and subjective evaluations, often fall short in capturing the complexities of political risk assessment. This research aims to address these challenges by leveraging digital technologies, particularly machine learning and natural language processing (NLP), to facilitate, enhance and to automate the political risk identification process. Based on findings of a needs analysis of construction professionals, a comprehensive taxonomy of political risk-related factors is developed, facilitating the systematic identification and categorization of risks specific to the construction industry and construction of domain ontology. The study explores the application of web crawling and AI-driven tools, such as ChatGPT, to automate the extraction of relevant political information from the web sources. Through a workshop and practical implementations, the research evaluates the effectiveness of these technologies in improving risk identification and assessment practices for contractors operating internationally. Findings demonstrate that web crawling gathers structured data from

specific sources for targeted insights, as demonstrated by its application in extracting country-specific indicators from websites. While ChatGPT's current performance in generating visuals and region-specific examples is limited and its knowledge base may not always reflect country-specific nuances, it provides broader insights and, demonstrates a promising understanding of political risk concepts and adapts well to scenario modifications, showing potential for enhancing political risk identification and assessment in the future. This suggests that with further development, particularly through a domain-specific large language model (LLM), it could become a valuable support tool for scenario-based political risk assessments. Finally, a framework for a domain-specific LLM that represents a significant advancement in automating political risk assessments is proposed. The findings contribute to the ongoing efforts to automate and refine the political risk identification and assessment processes, offering significant potential benefits for enhancing the strategic decision-making capabilities of construction firms in global markets.

Keywords: International Construction, Political Risk Identification, Automation, Generative AI, Large Language Models

ÖZ

ULUSLARARASI İNŞAAT PROJELERİNDE SİYASİ RİSKLERİN BELİRLENMESİNİ KOLAYLAŞTIRMAK İÇİN DİJİTAL TEKNOLOJİLERİN KULLANILMASI

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Uluslararası inşaat projeleri bağlamında, özellikle projeler üzerinde önemli etkisi olan sosyo-politik koşullara ilişkin belirsizlik nedeniyle, etkili ve zamanında ülke risk değerlendirmesi, özellikle politik risklerin değerlendirilmesi hayati öneme sahiptir. Manuel çabalara ve öznel değerlendirmelere dayanan geleneksel risk tanımlama ve değerlendirme yöntemleri, genellikle politik risk değerlendirmesinin karmaşıklıklarını yakalamada yetersiz kalmaktadır. Bu araştırma, politik risk tanımlama sürecini kolaylaştırmak, geliştirmek ve otomatikleştirmek için dijital teknolojilerden, özellikle makine öğrenimi ve doğal dil işleme (DDİ), yararlanarak bu zorlukları ele almayı amaçlamaktadır. İnşaat profesyonellerinin ihtiyaç analizi bulgularına dayanarak, inşaat sektörüne ve alan ontolojisinin inşasına özgü risklerin sistematik olarak tanımlanmasını ve kategorize edilmesini kolaylaştıran kapsamlı bir siyasi riskle ilgili faktörler taksonomisi geliştirilmiştir. Çalışma, web kaynaklarından ilgili politik bilgilerin çıkarılmasını otomatikleştirmek için web tarama ve ChatGPT gibi yapay zeka destekli araçların uygulanmasını araştırmaktadır. Araştırma, bir atölye çalışması ve pratik uygulamalar yoluyla, bu teknolojilerin uluslararası faaliyet gösteren yükleniciler için risk tanımlama ve değerlendirme uygulamalarını

iyileştirmedeki etkinliğini değerlendirmektedir. Bulgular, web taramanın, web sitelerinden ülkeye özgü göstergeleri çıkarma uygulamasında gösterildiği gibi, hedeflenen içgörüler için belirli kaynaklardan yapılandırılmış veriler topladığını göstermektedir. ChatGPT'nin görseller ve bölgeye özgü örnekler üretmedeki mevcut performansı sınırlı olsa da ve bilgi tabanı her zaman ülkeye özgü nüansları yansıtmasa da, daha geniş içgörüler sağlamakta ve politik risk kavramlarına ilişkin umut verici bir anlayış göstermekte ve senaryo değişikliklerine iyi uyum sağlamakta olup, gelecekte politik risk tanımlama ve değerlendirmesini geliştirme potansiyeli göstermektedir. Bu, özellikle alan-özü büyük dil modeli (BDM) aracılığıyla daha fazla geliştirmeye senaryo tabanlı politik risk değerlendirmeleri için değerli bir destek aracı olabileceğini göstermektedir. Son olarak, politik risk değerlendirmelerini otomatikleştirmede önemli bir ilerlemeyi temsil eden alan-özü bir BDM için bir çerçeve önerilmektedir. Bulgular, politik risk tanımlama ve değerlendirme süreçlerini otomatikleştirme ve iyileştirme konusundaki devam eden çabalara katkıda bulunmakta ve küresel pazarlardaki inşaat firmalarının stratejik karar alma yeteneklerini geliştirmek için önemli potansiyel faydalar sunmaktadır.

Anahtar Kelimeler: Uluslararası İnşaat, Siyasi Risk Belirlenmesi, Otomasyon, Üretken Yapay Zeka, Büyük Dil Modelleri

To my family

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CHAPTER 1

INTRODUCTION

1.1 Problem Statement

In today's business environment, as many sectors have been, the construction industry has become increasingly global. This is largely driven by significant advancements in transportation, technology, and communication, which have been transforming the world for decades (Abbasi and Baldry, 2004). The concept of globalization has rapidly spread across the globe as a result of these changes (Darwish et al., 2012). Consequently, the process of globalization has led to a diminishing significance of political borders (Ngowi et al., 2006), making previously isolated markets more accessible to contractors. This has facilitated the rise of international contractors and accelerated the globalization of the construction industry worldwide (Ngowi et al., 2005; Abbasi and Baldry, 2004). As globalization continues to expand, it encourages participation from both developing and developed nations in the international construction market (Abbasi and Baldry, 2004). Given the current trends and developments in the construction industry, it is evident that the globalization of construction industry will continue to grow in the future.

The global construction market has experienced considerable growth, with its size valued at \$2.32 trillion in 2023 and projected to reach \$3.58 trillion by 2030, reflecting a compound annual growth rate (CAGR) of 5.9% from 2024 to 2030 (The Business Research Company, 2024). This expansion is further supported by reports forecasting a 1.2% increase in global construction volume this year, with an average annual growth rate of 3% over the remainder of the decade (ENR, 2024). Furthermore, the global construction market, which was valued at \$15.46 trillion in 2023, is anticipated to reach \$19.52 trillion by 2027, with a CAGR of 6% (AECOM, 2024). According to the Global Construction Handbook (2024), the volume of

contracting and technical consultancy within the construction sector has reached approximately \$15.5 trillion in 2024 and is projected to grow to \$24.3 trillion by 2030 (International Construction, 2024). These projections highlight the significant and ongoing expansion of the global construction industry, driven by rising infrastructure demands, urbanization and technological advancements, economic growth and development.

According to ENR (2023), the total revenue of the Top 250 International Contractors was approximately \$428.5 billion in 2022. Turkish contractors accounted for 5.5% of this total revenue, highlighting their significant presence in the global market. Additionally, Turkey was ranked as the second country with the most companies on the list, with 42 construction firms, coming right after China. This confirms Turkey's strong position in the global construction industry as reported by ENR in 2023. Furthermore, according to the Turkish Contractors Association (TCA), as of the end of 2023, Turkish contractors have undertaken 12,122 projects in 135 countries with a total business volume of \$503 billion.

The global construction industry is characterized by its scale and complexity, with projects spanning various sectors and geographical locations, and the international success of Turkish contractors in the construction industry has long been attributed to their inherent risk-taking attitude (Ozyurt, 2018; Akçamete, 2006). This entrepreneurial spirit has propelled them to undertake challenging projects across various global markets, contributing to their reputation as formidable players in international construction. However, the outcomes of these projects are significantly influenced by the selection of countries and the associated risks, which can profoundly affect the success and sustainability of their ventures.

Global construction projects are complex undertakings that are shaped by numerous factors, including the political, economic, and social conditions of the host country. These factors introduce a variety of risks that can impact project timelines, costs, quality, and overall feasibility (Bu-Qammaz, 2007; Eyboosh M., (2010). Among these, political risks stand out as particularly challenging due to their unpredictable

nature and the profound effects they can have on project outcomes. (Marchetti and Vitale, 2014). Political risks are complex to identify and assess due to their ambiguous, complex, and intertwined nature, often exacerbated by deficient definitions, varying societal and political contexts, and the absence of a universally accepted conceptual framework (Leitner, 2017). Political risks, which include government instability, regulatory changes, and civil unrest, are often difficult to foresee and manage, making them a critical consideration for contractors operating in international markets.

Despite the acknowledged importance of political risks, there has historically been a lack of specific focus on these issues within the broader context of risk management in construction projects. This gap in focus is concerning, given that political risks can be some of the most impactful and challenging to mitigate. They are often intertwined with other risks, such as economic fluctuations or social unrest, creating a complex web of potential challenges that require careful consideration and strategic management (Sottilotta, 2016).

The problem addressed in this thesis is the significant challenge contractors face in efficiently identifying and assessing political risks in international construction projects. This challenge arises from the complex and dynamic nature of these political risks. Traditional risk management methods are often inadequate, necessitating the development of more advanced, technology-driven approaches to improve the accuracy and timeliness of political risk assessments.

To effectively manage political risks, it is essential to develop automated risk identification and assessment frameworks to identify and assess them before adversely affecting project outcomes. Conventional techniques of risk management may fall short in the face of rapidly changing political environments, highlighting the need for more advanced tools and techniques. The main objective of this study is to propose methods to facilitate the identification and assessment of political risks in international construction projects, utilizing advanced digital technologies to enhance the effectiveness of risk management. A promising approach is the

integration of automation and digital technologies, such as machine learning and natural language processing, which can facilitate the identification and assessment of political risk factors.

By leveraging these technologies, construction companies can improve their ability to assess political risks in real-time, allowing for more proactive and informed decision-making. Automation can help streamline the collection and analysis of large volumes of data, reducing the reliance on subjective human judgment and minimizing the risk of errors. As a result, the management of political risks becomes more feasible, allowing contractors to better navigate the complexities of international construction projects and enhance their chances of success.

In conclusion, there is a need for a more sophisticated approach to political risk identification and assessment. By incorporating automation and digital technologies into the risk assessment process, contractors can better manage political risks, thereby ensuring the successful execution of their international projects.

1.2 Scope of the Thesis

The scope of this thesis encompasses the exploration and development of methods to enhance the identification and assessment of political risks in international construction projects. The study primarily focuses on the political risk identification stage, aiming to streamline the extraction of relevant political information, alongside the risk assessment process. Throughout the thesis, the term “risk assessment” is used with the understanding that risk identification is the crucial first step in the assessment process. Enhancing the identification process is essential to support and strengthen the overall risk assessment.

The study focuses specifically on the needs of Turkish contractors operating in global markets, examining the unique challenges they face due to political risks. This thesis investigates the limitations of existing risk assessment frameworks and proposes the integration of advanced digital technologies, such as machine learning (ML) and

artificial intelligence (AI), to facilitate a more effective and timely assessment of political risks. The research covers the development of a taxonomy of political risk-related topics, the application of web crawling and ChatGPT, a popular large language model, for automated information retrieval, and the evaluation of these technologies through practical workshop. The findings aim to provide a structured framework that construction companies can utilize to improve their risk management practices in politically volatile environments. The scope is deliberately focused on political risks within the broader context of country risk, with an emphasis on leveraging digital tools to overcome the inherent challenges in traditional risk assessment methods.

1.3 Thesis Organization

This thesis is organized into several chapters, each addressing a critical aspect of the research objectives. Chapter 1 provides an introduction to the study, outlining the importance of political risk assessment (PRA) in international construction projects and the challenges associated with it. Chapter 2 reviews the relevant literature and presents the results of the needs analysis survey on country risk assessment, and identifies gaps in current research and practice. Chapter 3 details the research design and methodology employed in this study, explaining the steps taken to achieve the research objectives and the rationale behind the chosen methods. Chapter 4 discusses the identification and representation of political risks, introducing the taxonomy of political risk-related topics developed through a comprehensive literature review. Chapter 5 explores the application of digital technologies for political risk identification and assessment, including the use of web crawling and large language models like ChatGPT to facilitate the process. Chapter 6 presents a workshop that evaluates the use of ChatGPT for political risk assessment, discussing the findings and implications for the construction industry. Chapter 7 proposes a framework for developing a domain-specific large language model (LLM) for automated political risk assessment, outlining the potential benefits and future applications. Finally,

Chapter 8 concludes the thesis by summarizing the key findings, discussing the contributions to the field, presenting the limitations, and suggesting areas for future research.

CHAPTER 2

RESEARCH BACKGROUND ON TRADITIONAL POLITICAL RISK ASSESSMENT METHODS AND NEEDS OF THE INDUSTRY

In this chapter, country risk assessment methods proposed in the literature are presented, as well as findings of needs analysis conducted to identify the expectations of industry professionals. Findings of the literature review and insights from the needs analysis are used to identify the research gap and research questions.

2.1 Country Risk Assessment: Literature Review and Needs Analysis

Executing construction projects abroad is typically considered as riskier than domestic projects due to the increased vulnerability of international endeavours (Javernick-Will and Levitt, 2010). Alongside the inherent characteristics of construction projects, contractors face numerous country-specific challenges when collaborating with multinational project teams and engaging various stakeholders in global construction (Ngowi et al., 2005).

The context of a host country plays a crucial role in the dynamics of international construction projects. The success of international endeavours is significantly shaped by various local factors, including economic, political, and legal conditions, as well as international relations and cultural differences. Recognizing and evaluating these country-specific risks is vital for contractors considering international markets (Ozorhon et al., 2007).

Country-specific and regional conditions such as cultural norms, legal frameworks, and the financial environment are pivotal in determining the success of international construction projects (Bu-Qammaz et al., 2006). These conditions directly affect project timelines, costs, quality, client satisfaction, and productivity. Understanding

and preparing for potential risks associated with entering a new country or initiating a project in a familiar yet changing environment is essential for mitigating adverse impacts and enhancing project success. Country risk identification and assessment are critical processes for organizations operating in the international construction industry (Chan and Tse, 2003). These processes involve identifying potential risks associated with a specific country and evaluating the likelihood and impact of these risks on project success (Gunhan and Arditi, 2005).

Risk identification and assessment processes are considered the most important phases of the systematic risk management process by several researchers (Al-Bahar and Crandall, 1990). Over the years, various scholars have contributed to the development of methodologies for identifying and assessing country risks, utilizing a range of tools and techniques to address the complexities involved in international markets.

2.1.1 Literature Survey on Country Risk Assessment

2.1.1.1 Country Risk Assessment Methods

Several methods are available for identifying and assessing risks in international construction projects. Researchers employ a range of techniques to examine the conditions within various countries. In the realm of international construction, risk identification and assessment have utilized multiple methodologies.

A variety of methodologies and models are used to identify and assess these risks, including qualitative approaches such as brainstorming and the Delphi method, as well as quantitative techniques like the Analytical Hierarchy Process (AHP), Monte Carlo Simulation (MCS), Fuzzy Logic, Decision-Making Trial and Evaluation Laboratory (DEMATEL), Neural Network Models, and Decision Trees (Bahamid and Doh, 2017).

Given the complex nature of country risks and the dynamic environment of country conditions, solely relying on qualitative methods is often deemed insufficient and has faced considerable criticism (Bu-Qammaz, 2007). There has been a significant emphasis on quantitative methods such as Multi-Criteria Decision Making (MCDM) techniques. These methods are designed to evaluate multiple criteria to determine the most optimal choices (Yıldız, 2018).

Several MCDM techniques are frequently discussed in the literature. Among the most prevalent are the Analytic Hierarchy Process (AHP), the Analytic Network Process (ANP), and the Simple Multi-Attribute Rating Technique (SMART) (Dikmen et al., 2007). The AHP is particularly well-recognized and widely used in construction risk assessment. It structures decision-making through a hierarchy of criteria and alternatives, facilitating systematic evaluation based on pairwise comparisons. The ANP is a more generalized form of AHP that accommodates the interdependencies and feedback among elements, providing a more holistic approach to decision-making. This feature makes ANP particularly valuable in complex scenarios where factors are interconnected. Lastly, the SMART is an effective risk rating tool, especially useful when multiple project objectives must be balanced. SMART simplifies the decision-making process by assigning weights to different attributes and rating each option accordingly, making it a practical choice for evaluating diverse project risks (Bu-Qammaz, 2007).

MCDM techniques have been extensively applied in various studies to assess country risks in international construction projects, providing a framework for decision-making. Among these applications, the AHP has been particularly influential. For example, Hastak and Shaked (2000) developed the International Construction Risk Assessment Model (ICRAM-1), which leverages AHP to evaluate risks at multiple levels systematically. The ICRAM-1 model is designed to analyze risks associated with international market expansion, focusing on the macro (country), market, and project levels. They identified 73 tangible and intangible risk indicators categorized under three levels. This model facilitates a comprehensive

assessment by categorizing risk indicators across these three tiers. By using AHP, Hastak and Shaked were able to assign importance weights to different risk factors, thereby determining the overall risk level for a project in a foreign market. This structured approach helps quantify the potential risks at each level, offering a systematic method for stakeholders to evaluate and mitigate risks in international construction projects.

Dikmen and Birgonul (2006) introduced an AHP-based model to assess risks and opportunities within international construction projects. This approach allows decision-makers to compare the attractiveness of different project options by evaluating various risk factors at both project and country levels. The goal was to provide a more comprehensive evaluation of international construction projects by considering both risks and opportunities within a structured AHP framework, aiding in better decision-making. AHP was used to structure the decision-making process and to quantify the relative importance of different risk and opportunity factors.

Gunhan and Arditi (2005a) investigated the factors influencing construction companies' decisions to expand internationally. They employed a novel combined approach, integrating the Delphi method with the AHP to systematically evaluate the factors influencing these decisions. This methodology began with conducting two rounds of Delphi surveys to collect and consolidate expert opinions, achieving a consensus on the critical factors. Subsequently, AHP was utilized to prioritize and quantify the importance of company strengths, threats, and opportunities in the international market. This approach provided insights into the strategic considerations of construction firms as they assess international opportunities and challenges, offering a framework to guide their expansion strategies.

While AHP and its variants are widely used for their structured decision-making frameworks, they have been critiqued for assuming the independence of risk factors, which may not reflect real-world scenarios. To address this, models such as the Analytic Network Process (ANP) have been developed to account for the dependencies among risks, offering a more realistic representation of project

uncertainties (Bu-Qammaz et al., 2006). Bu-Qammaz et al. (2006) undertook a study to identify the sources of cultural risk linked to international construction. Within the context of their study, they employed ANP to determine the relative priorities of the identified factors. The identified cultural risk factors were categorised into two criteria: host country and project (construction) environment-specific risk.

Several studies have utilized fuzzy logic and influence diagrams to assess risks in international construction projects. Dikmen et al. (2007) introduced a methodology focused on evaluating international project risks, particularly emphasizing cost overruns. Their objective was to provide a structured approach for understanding and quantifying risks in the context of international construction, considering both project-specific factors and the broader country environment. They employed two key methods: influence diagrams and a fuzzy risk rating methodology to calculate the overall risk of cost overruns. Their influence diagram approach modelled the impact of country-specific factors, such as economic, political, legal, and cultural elements, on project success, offering a framework for analyzing how these factors contribute to cost overruns.

In addition, Ashley and Bonner (1987) concentrated on political risks in international construction, using influence diagrams to examine their potential impacts on project elements like labour, material, overhead costs, and revenue. They developed a political risk analysis approach that utilized influence diagrams to explore the cause-effect relationships and time-sequences associated with political risks. Their model categorized political risks and their influence on project outcomes, including labor, material, overhead costs, and revenue generation. The authors provided a structured approach to information gathering, risk identification, impact assessment, probabilistic evaluation, action planning, updating, and monitoring.

Tah and Carr (2000) proposed a hierarchical risk breakdown structure to classify risks in construction projects. They investigated the causal relationships between risk factors, the risks arising from them, and their consequences in construction projects. This structure simplifies the risk assessment process by separating risks into different

categories, which can be evaluated individually. Their work also introduced fuzzy risk rating approaches to account for the interdependencies among various risk factors.

Other notable methodologies include the Decision-Making Trial and Evaluation Laboratory (DEMATEL). The DEMATEL method is used to assess risk interdependencies and evaluate overall risk by considering historical data. This approach may be effective in understanding the complex relationships between different risk factors and their cumulative impact on project success (Zhu et al., 2022).

Han and Diekmann (2001) developed a risk-based decision support system to aid in go/no-go decisions for overseas construction projects. Their goal was to provide companies with a structured, risk-based tool to support decision-making, particularly in the early stages of international construction projects. Their model utilized Cross-Impact Analysis (CIA) to assess uncertainties, incorporating 32 variables across five categories, including country conditions, namely, cultural, legal, political, economic, geographical, and environmental.

In a study by Matineh Eybpoosh et al. (2011), 36 interrelated risk paths were identified in 166 international construction projects undertaken by Turkish contractors. Through structural equation modelling (SEM) techniques, the study identified causal relationships among various risk factors, highlighting the interconnected nature of risks in international projects.

2.1.1.2 Discussion of the Traditional Risk Assessment Methods

While these methods offer structured frameworks for risk assessment, they have various limitations when dealing with country risk assessment in international construction, listed as follows.

- **Assumption of Independence:** A common shortcoming is the assumption of independence between risk factors, while in reality, they are

interconnected and influence each other. Many approaches consider risks as individual factors rather than complex, interactive network elements. This is especially not ideal given that international projects involve a web of external and internal risks that are difficult to model, identify, and comprehend. Traditional risk management methods struggle to model and manage the diverse and complex interactions among risks in international projects.

- **Subjectivity:** Most of the studies rely heavily on personal experience and judgment, brainstorming, and qualitative assessments, potentially introducing subjectivity and limiting the accuracy of risk quantification.
- **Limited Scope:** Some approaches may not adequately address all country risks specific to international construction, or the construction market, lacking comprehensiveness.
- **Limited Consideration of Political Risks:** There is a notable lack of comprehensive studies addressing political risks, particularly in the context of countries with rapidly changing political environments.
- **Time-Consuming Process:** These methods rely on manual procedures and human intervention, which demand significant time and effort.
- **Lack of Practical Applicability:** Some techniques lack sufficient applicability in real construction projects due to limitations in addressing the aforementioned issues.

These limitations highlight the need for further research and development of more robust and comprehensive country risk identification and assessment methods tailored explicitly to the complexities of international construction projects.

2.1.2 Needs Analysis Survey

In addition to the literature review, a “Needs Analysis” study was conducted to understand the industry requirements within companies. This study involved interviews with two civil engineers who are experts in risk management, aiming to analyse the current state of country risk identification and assessment processes in

companies and determine their specific needs. During the interviews, experts were asked about the sources of country information, the processes involved in identifying and assessing country risk within construction companies, and how these processes are managed internally in their company.

The interview form was designed based on the literature to understand company needs through open-ended questions. In this interview, experts were asked questions to evaluate their organization's current practices regarding country risk assessment and management. The details of this needs analysis study are explained below, with the complete list of questions available in Appendix A. Ethical approval for this needs analysis study was obtained from the University's Institute before conducting the interviews, with a protocol number of 057-ODTU-2021.

2.1.2.1 Respondent Profiles

In designing the interview form, the primary section focused on gathering company professional information, categorized under "Personal Information" and "Company Information." Following this, the first phase of the needs analysis study, titled "Open-Ended Questions," was conducted. The profiles of the respondents, who are experts in their respective fields, are summarized in Table 2.1 below. These two interviews were conducted separately online via the Zoom platform, each lasting approximately one hour.

The expert profiles under consideration in this study are drawn from two distinguished companies with a rich history and extensive experience in international construction. Both companies, operational for over 40 years, are well-established within Turkey's construction sector and recognized by the Turkish Contractors Association (TMB) as prominent, large-scale entities.

Table 2.1. Expert Profiles

	Expert 1	Expert 2
Major	Civil Engineering	Civil Engineering
Academic Background	M.Sc.	Ph.D. Candidate
Title	Deputy Tender Manager	Risk Manager
Type of Company	Consultant/Engineering	Contractor
Professional Experience in Construction Management	6-15 years	6-15 years
Knowledge in Construction Management	High	High
Knowledge in Country Risk Management	High	High
Knowledge in IT, Automation and Machine Learning	Medium	Medium

Expert 1 is associated with a company that functions as a design/project and consultancy firm. This company's fields of activity encompass a wide range of projects, including housing, commercial buildings such as hotels and shopping centers, state buildings like schools and dormitories, as well as specialized structures in transportation, energy (including Hydroelectric Power Plants and energy transmission lines), water infrastructure (such as dams and irrigation systems), and industrial plants.

Expert 2 is from a company that operates both as a design/project company and a contractor firm, engaging in similar sectors: housing, commercial, and state constructions, alongside transportation, energy, water, and industrial projects.

Both expert companies have been active internationally for over three decades, gaining valuable experience in numerous countries. This extensive international exposure makes them ideal candidates for this study, offering insights grounded in a broad spectrum of global construction environments.

2.1.2.2 The Survey

The main objective of this needs analysis was to understand the country risk identification processes within companies during the initial stages of their projects. Additionally, it was essential to gain a holistic view of their current practices regarding country risk management in general. Therefore, in the “Open-Ended Questions,” experts were also asked to evaluate their organization’s current practices in general by responding to open-ended questions. Initially, experts were asked questions such as, “How do you define country risk assessment and management? Why and when is it conducted?” to understand their general practices. This was followed by a more detailed inquiry: “How do you conduct country risk assessment?” Questions were also asked regarding the major steps involved in country risk management, whether formal processes or standards exist within the company, and who is responsible for these processes.

After gaining an overview of their country risk assessment processes, experts were asked, “What kind of country risk data (political, economic ratings, etc.) are collected and stored? What type of data (e.g., quantitative, qualitative, numeric, textual, audio, records, etc.) are collected/stored?” This was followed by asking, “What information sources do you utilize?” to elaborate on and clarify the sources of country-related information.

Subsequently, the experts were asked, “How do you select the specific/useful country risk data among all data in these sources?” They were also questioned on which types of country risks they prioritize and which risk factors they focus on during the initial stages. Specifically, they were asked, “How do the types of country risk factors (e.g., political, financial, environmental, social, and cultural risks) affect the selection of information sources?” Additionally, it was inquired whether these information sources remain consistent or vary from country to country. Following this, questions were posed regarding how the data obtained from these information sources is utilized within the company, including who uses it and how it is applied.

To further understand industry needs, experts were asked to indicate the positive aspects and benefits, as well as the negative aspects and weaknesses, of their current country risk identification and assessment practices. They were also asked whether they saw a need for any improvements in their current practices and, if so, what could be done to make these practices more effective and how such improvements might impact their company's performance.

Finally, the experts were asked, "Do you think automated systems, such as an automated document review for knowledge acquisition, can be used for country risk assessment? What would be the potential benefits/bottlenecks of such a system?" These questions aimed to explore their views and needs regarding automation.

Although the questions were listed sequentially during open-ended questions, as shown in Appendix A, the interviews were not conducted in a strict question-answer format. Instead, the experts were guided through all the questions, allowing for a more conversational dialogue where they discussed and shared their processes and needs from an industry perspective. Due to the interrelated nature of the questions, responses were often intertwined. As a result, after their responses were collected, the information gathered from both interviews was compiled into a cohesive summary. Consequently, the results of the needs analysis are presented below as a synthesized overview with highlighted findings, combining the insights and integrating the perspectives and needs of both experts.

2.1.2.3 Results of the Needs Analysis Survey

In both firms, it was reported that a country assessment is conducted when entering a new market, emphasizing that this process is information-driven and crucial to risk management. It involves the "country information data collection process," and this process primarily occurs during the decision-making phase of whether to enter the country entry, utilizing external information sources. Once the decision to enter a market is made and entry is established, updates can be typically obtained through

internal sources, such as information gathered from established country offices within that region.

It was noted that the main purpose of this country-related data collection is to support the decision to enter a new market or country. This can occur in various scenarios, including business development prior to bidding on a construction project, during the bidding phase itself, or in situations involving mergers, acquisitions, large joint ventures, or collaborations with suppliers.

According to the experts, the initial phase of exploring new markets involves researching “general information” about “potential countries” (e.g., five countries are selected). This evaluation primarily relies on data obtained from web sources, including the review of web documents. Additionally, depending on the country, published country reports may also be examined, they stated. During the interviews, the preference for web-based information sources was highlighted, as these sources are considered the most accessible means for gathering general country information, similar to their use in everyday search activities.

Following this, it was explained that the list of potential target countries is narrowed down (e.g., to three countries), after which more detailed research is conducted, sometimes involving site visits to these countries. Furthermore, Expert 1 noted that if their firm lacks employees with prior experience in a particular country or they cannot conduct on-site visits, they sometimes obtain information from individuals well-versed in the country, often referred to as “local intermediaries” or “bagmen.”

In summary, the initial findings of this needs analysis study indicate that when companies seek to enter new markets, they commonly conduct a review of web documents as part of their country research process. Web sources are favored for their up-to-date and accessible nature. However, the experts also indicated that due to the wide range of variables and concepts associated with country risk, reviewing web documents can be challenging and time-consuming.

Concerning the flow of information within the company, Expert 2 reported that various websites are monitored simultaneously, and data is compiled into an Excel or Word document, typically by the tendering department. Initially, internet data is manually reviewed, and the document is filled by accessing each site separately. The importance of efficiently identifying relevant sources and completing the review process was emphasized, especially given the time-sensitive nature of the tendering process. The prepared Excel or Word document is then forwarded to the relevant and appropriate department within the company, discussed in tender committees, and necessary actions are finally taken, often by incorporating contingencies into bids. It was also noted that there is no consistent information flow, and the use of country information varies depending on the recipient and their intended purpose (e.g., administrative staff may decide on market entry, the tender unit may use it for pricing, and the technical team may use it to assess country risks for design purposes).

Regarding the initial country risk assessment, experts highlighted that this topic is multidisciplinary and sometimes assessed using only SWOT or related analysis. Additionally, experts from both firms indicated they lack a formal process for country risk identification and assessment, often relying on Excel sheets or market research reports in Word documents to make decisions. When asked about the information sources, they mentioned that different websites are employed for various country factors, typically from well-known and internationally recognized sites. However, they sometimes supplement this with data from local sources or through discussions and conversations with knowledgeable individuals. In such cases, the information is typically verified through double-checking.

In relation to the formal process and standardization availability, experts emphasized the need for a formal process for preparing these documents, as well as a standardization of terminology, given that different sources may use varying wording to describe the same concept. They also noted the issue of inconsistency in terminology among different team members within the company, which can lead to

discrepancies in the information about the same country. Additionally, it was noted that there is a risk of information loss when an employee leaves the company or project. This issue arises because some employees rely heavily on their personal expertise and may not fully document or transfer every step of their country research to others. As a result, valuable data and insights can be lost.

Regarding prioritization, experts from both firms acknowledged that countries have an obviously significant impact on projects, and while they recognize the need to consider a broader range of factors, they stated that initial assessments are often not very detailed. They stated that narrowing down more efficiently and effectively may be a good strategy. Throughout the interviews, both experts repeatedly emphasized that the most critical factors for them are economic and political factors for the initial step. They noted that economic and political stability directly influence the construction industry, so these aspects are prioritized first. Although political environment-related risks are sometimes overlooked, experts stressed their importance by citing examples where better country risk management could have mitigated the adverse effects experienced in various projects due to political risks. Experts pointed out that the negative impacts of political risks on international projects could be reduced through better political risk management.

In summary, the economic and political characteristics of the country are initially assessed. In addition, other factors such as tax conditions, working conditions (e.g., partnerships with local firms, local labor or subcontractor productivity, labor laws, working hours), infrastructure (e.g., electricity, internet), transportation, and customs, as well as logistics conditions, are also evaluated in the subsequent steps. Although social, environmental, and cultural risks are recognized as important, financial and political factors are the primary concerns for these Turkish construction firms. Some risks, such as environmental risks, might be overlooked in the initial assessment for certain countries. Similarly, more technical aspects, such as price fluctuations in material costs, might not be fully considered in the initial stages of country assessment and may be addressed later in the financial proposal process.

When considering the impact of a country's conditions and level of development on the process, they stated that the country level directly affects their processes. There may be differences in their criteria and the information sources between the processes regarding developing and developed countries. Additionally, the importance of maintaining continuous funding was emphasized, particularly the significance of payment terms. The financial status of the administration in national or government-funded projects was highlighted as crucial. It was noted that projects funded by foreign loans might require a different evaluation. The necessity of checking whether a country is on international sanction lists was also mentioned. Expert 2 indicated that there is a designated person responsible for this sanction assessment. Factors such as inflation, exchange rates, and countries' economic growth rates may be examined, along with research on potential major projects and existing projects over the next 5-10 years. Information sources like the Asian and African Development Banks may be reviewed, focusing on forward-looking development plans and related reports.

In connection with the information sources, they emphasized that their primary focus is on web-based documents, as previously mentioned, rather than on internal and local contacts, consultants and intermediaries, on-site visits, and personal experiences. They were asked to provide more detailed information on the specific web sources they utilized. They highlighted the potential benefits of facilitating the use of web resources for companies and provided detailed information on key web sources they rely on. These sources include various international databases and reports from institutions such as the World Bank, OECD, IMF, and others, as well as government-affiliated sites. Below is a list of some of the key information sources and websites mentioned by the experts.

- 1. World Bank and Doing Business**

- data.worldbank.org/country
- doingbusiness.org/en/data

- 2. CIA The World Factbook**

- cia.gov/the-world-factbook
- 3. **European Commission**
 - ec.europa.eu/trade/policy/countries-and-regions
 - ec.europa.eu/trade/policy/accessing-markets
 - ec.europa.eu/growth/sectors/construction/observatory_en
- 4. **OECD – Organisation for Economic Co-operation and Development**
 - data.oecd.org
- 5. **UN Data – United Nations Statistics Division**
 - data.un.org
- 6. **Country Commercial Guides (CCGs) for U.S. Government**
 - trade.gov/ccg-landing-page
- 7. **Columbia International Affairs Online (CIAO)**
 - ciaonet.org
- 8. **World Economic Forum**
 - weforum.org/reports
 - weforum.org/publications
- 9. **International Monetary Fund (IMF)**
 - imf.org/en/Data#data
- 10. **Investing.com**
 - investing.com
- 11. **Trading Economics**
 - tradingeconomics.com
- 12. **Bloomberg**
 - bloomberg.com
- 13. **Oxford Economics**
 - oxfordeconomics.com/global-industry-services/global-construction-service

These sources are commonly used by experts to gather relevant data and insights needed for country risk assessment and management. In addition to the websites mentioned above, data from International Financial Institutions (IFIs) and country

notes published by the Turkish Contractors Association (TCA) are also reviewed online. Furthermore, government-affiliated websites of the respective countries are monitored, although it is advised to consider the level of press freedom in those countries. Overall, priority is generally given to data sourced from international, independent organizations. For sanction lists, sources from the United Nations and the United States are consulted.

To summarize the information sources used, data collection can be categorized into four main approaches:

1. **Web-based Data:** As previously mentioned, these companies extract data from a variety of websites.
2. **Internal and Local Contacts:** Information is also gathered through discussions with employees who have prior experience in the country or with external contacts. In cases where local sources are used instead of web sources, potential inconsistencies may arise, and efforts are made to verify the data through reliable sources.
3. **Consultants and Intermediaries:** Sometimes, information is acquired through intermediaries or consultancy firms that specialize in providing insights about the target country, particularly for foreign entrants. Although these services are often costly, they are utilized when needed.
4. **On-Site Visits and Personal Experience:** If necessary and budget allows, on-site visits are conducted to validate the information obtained from web documents. The importance of such visits depends on the specific conditions of the target country, the relevant projects, company strategies, and the country's significance to the company.

Regarding the effects of country factors, they noted that the information sources they consult vary depending on the specific factor being examined. For political risk-related data, they emphasized that it tends to be more sensitive and subject to frequent changes compared to other types of data. The structure and update

frequency of the data also differ; for instance, political data may need to be updated regularly, while information related to climate or regulations might not require as frequent updates.

Among these methods, web-based data is considered the timeliest, relevant and readily available source for acquiring related information, which is crucial for the decision-making in country risk identification and assessment. Experts also expressed an interest in automation-based methods, believing that a facilitative approach in this area would significantly support and enhance their work as construction companies. They also noted that the collected data from these sources is typically numeric or text-based rather than audio or record type of data, suggesting that potential facilitative methods could initially focus on these data types for greater ease of implementation.

2.1.2.4 Discussion of the Findings

The findings from the Needs Analysis Survey provide valuable insights into the current practices and challenges faced by companies in the construction industry regarding country risk assessment and management. Through the interviews with two civil engineering experts specializing in risk management, several critical issues were identified. Those issues are grouped and tabulated in Table 2.2.

Table 2.2. Experts’ Approach with Highlighted Key Points

Key Points	Expert 1	Expert 2
Uses web-based sources for data collection	X	X
Has challenges with reviewing web documents manually	X	X
Interests in automation for country risk assessment	X	X
Highlights lack of formal process, often relies on Excel/Word documents	X	X

Table 2.2. Experts' Approach with Highlighted Key Points (cont)

Emphasizes risk of information loss due to reliance on personal expertise	X	X
Highlights the political risk that directly influences the construction industry	X	X
Collects data typically numeric and text-based	X	X
Emphasizes the need for standardization of terminology	X	X
Uses local intermediaries when lacking internal expertise or on-site visits	X	
Emphasizes inconsistent information flow and varying use depending on the recipient, lack of standardized information flow		X

These findings highlight the complexities and gaps in existing approaches to country risk assessment, particularly in the context of political risks, which are recognized as a significant but often underexplored factor in practical applications. There is a need for standardized methodologies, improved data collection, and the potential role of automation in enhancing the effectiveness of country risk assessments, particularly in terms of political risks.

2.2 Research Gap

The field of country risk assessment encompasses a broad and multifaceted array of factors, making it challenging to address all potential risks effectively. As a result, focusing specifically on political risks presents a more targeted and beneficial approach. While political risks are acknowledged as a critical component of country conditions, they remain intangible and less explored area, particularly in practical applications. There is a significant gap in research dedicated to the practical processes of political risk identification and assessment. This gap underscores the

necessity of developing methodologies that not only enhance the understanding of political risks but also facilitate the risk assessment process. A well-designed research approach is needed that can bridge the gaps given below:

- **Inconsistent Use of Terminology:** The inconsistent use of terminology regarding country risk across different sources poses a significant challenge. Existing research often fails to cover all relevant political risk topics pertinent to the construction sector. Establishing a standardized vocabulary for country risk assessment, particularly for political risks, would improve clarity and reduce discrepancies in understanding.
- **Absence of Formalized Processes:** Findings highlight the lack of standardized methodologies and frameworks for country risk assessment, particularly for political risks, within construction companies. This gap indicates a need for research on developing standardized methodologies and frameworks that companies can adopt to ensure consistency and accuracy in country risk assessments.
- **Need for Automation:** Manually reviewing web documents for political risk assessment is time-consuming and potentially inaccurate, and it struggles to keep up with rapidly changing political situations. There are challenges in the data collection and review process. This gap indicates the need for more efficient data collection, analysis, and aggregation methods, potentially leveraging automation and AI.
- **Risk of Information Loss and Knowledge Transfer:** The potential for information loss when employees leave the company or project was highlighted as a concern. Research could investigate ways to improve knowledge management and transfer within organizations, ensuring that valuable insights and data are preserved and accessible.
- **Limited Practical Applicability of Existing Methods:** Existing risk assessment methods often lack practical applicability in real-world construction projects. This gap highlights the need for research focused on developing more facilitative and time-saving methods specifically tailored to

the complexities of international construction, considering the dynamic nature of political environments.

The research gap identified from the literature review and needs analysis constitutes the basis of the research scope and directions that will be discussed in the next chapter.

CHAPTER 3

RESEARCH DESIGN AND METHODOLOGY

This chapter presents the main objectives, research design, and methodology employed for these purposes.

3.1 Research Objectives

Building on the findings from the previous chapter, it is clear that the identification, organization, and collection of information regarding political risk in the construction industry need significant enhancement to address the identified gaps. Given the knowledge-intensive nature of political risk identification and assessment, where information plays a critical role, it is essential to streamline these processes (Martinez-Rojas et al., 2016). Although gathering information from web documents may be a valuable source, manually and continuously reviewing extensive web data could be inefficient for construction contractors. Issues in the manual review process include difficulties in obtaining timely and updated data in dynamic political environments, which can be tedious, time-consuming, and prone to human error. The conducted literature survey and needs analysis revealed a lack of studies in construction management literature focused on facilitating political risk identification and assessment in international construction projects. Despite its significant impacts on project outcomes, the current literature does not provide a systematic method or formal process for political risk identification and assessment in the construction industry. A mechanism that could timely and accurately obtain information on political risk-related countries specific to the construction industry would be beneficial for contractors and assist in informed decision-making during the political risk assessment process. Therefore, contractors require a method that enables them to make risk-informed decisions easily.

In response to this need, this thesis aims to propose methods to facilitate political risk assessments for contractors and evaluate advanced digital technologies for this purpose. The objectives of this thesis are:

- Developing a taxonomy through a literature review to organize political risk-related topics.
- Reviewing and evaluating current digital technologies and available tools for possible use in political risk identification and assessment processes.
- Exploring the use of web crawling to systematically and automatically retrieve political information.
- Exploring the use of ChatGPT in political risk assessment for construction project management.
- Proposing a framework for domain-specific ChatGPT for political risk identification and assessment.

It has to be noted that this study focuses on Turkish contractors operating in international markets, and the scope and data used in this thesis center on the Turkish contractors' needs, current practices and perspectives.

3.2 Research Methodology

This section introduces the research methodology used in this thesis to facilitate political risk identification and assessment, as shown in Figure 3.1. The Figure provides a visual representation of the steps and logical sequence of the research process and outlines the research design and methodology. In this Figure, rectangles represent the research steps, while ellipses indicate the research and data collection methods corresponding to each step.

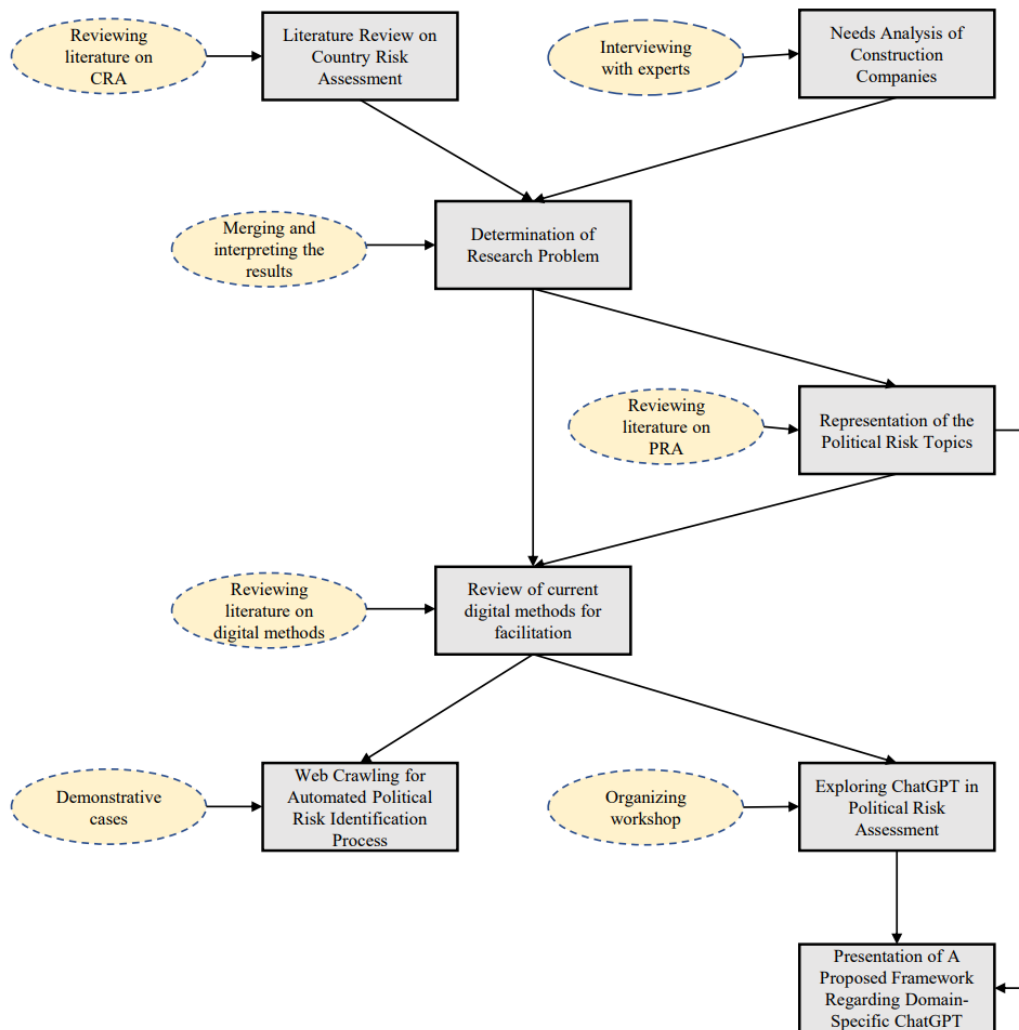


Figure 3.1. Research Steps

The first step involves conducting comprehensive preliminary research, which includes a literature review and a needs analysis. This step aims to gather foundational information, investigate the specific needs of the construction sector, and understand industry-specific requirements. A literature review on country risk assessment is performed alongside a needs analysis of construction companies through expert interviews. This combined approach ensures a thorough understanding of both academic perspectives and practical industry requirements.

This is followed by identifying the research problem, deficiencies, and unexplored areas in existing literature and practices. This step includes integrating the results of the literature review with the needs analysis to identify key gaps and requirements within the industry.

In the next step, namely the representation of political risk topics, a taxonomy for political risk-related topics is developed to categorize and organize political risk topics systematically. Additionally, a concept map is drawn to illustrate the interrelations among these topics.

Following this, available digital tools and methods are reviewed and evaluated, and current digital technologies for automated political risk assessment are investigated in detail. The subsequent step involves automating data collection through web crawling to efficiently and accurately gather relevant political risk information from online sources. It provides a demonstrative example of web crawling for political risk identification in international construction. The study then explores the application of AI, specifically ChatGPT, one of the most popular large language models (LLM), in political risk assessment for construction project management. A workshop is conducted with political risk experts to discuss ChatGPT's performance, potential applications, benefits, and drawbacks. Finally, the findings and insights are synthesized into a proposed framework for a domain-specific LLM, aiming to enhance the political risk assessment processes in the construction industry. This proposed framework includes stages such as developing a knowledge base terminology, i.e., taxonomy. The taxonomy generated in this thesis can be used within the proposed framework for domain-specific LLM development, providing a structured knowledge base for identifying and assessing political risks.

The next chapter addresses the identification and representation of political risk-related topics which will inform the following steps.

CHAPTER 4

IDENTIFICATION AND REPRESENTATION OF POLITICAL RISKS

4.1 Introduction

The initial step in effective risk management is the identification of risks, a critical and essential phase that sets the stage for further processes (Zou et al. 2007; Akinci and Fischer, 1998). Comprehensive identification of all potential risks is imperative (Tadayon et al., 2012; Chapman, 2001). The purpose of this step is to recognize all potential high-impact risks and list them systematically. This recognition provides valuable foresight into the risks that may arise in the future, enabling adequate preparation before these risks are encountered. Given that risks and uncertainties continuously evolve, the risk identification process must be iterative, with new risks emerging throughout the project's lifecycle (KarimiAzari et al., 2011). Most effective risk management models recommend identifying risks as early as possible due to their significant impact on the success of a project. Recognizing these risk factors provides the foundation for developing subsequent management strategies and policies.

Identifying country risk variables that affect construction project objectives is a well-researched and widely published area. However, there is a notable gap in studies that specifically focus on political-related topics and their associated risk factors within the construction industry. Although political risks are generally studied in the literature by diverse disciplines, their ambiguous, complex, and intertwined nature often prevents a comprehensive coverage of all relevant topics. Additional contributing factors include deficient definitions, varying notions influenced by societal and political contexts, and the absence of a universally accepted conceptual framework for political risk research, which is frequently criticized in the literature (Kobrin, 1979; Fitzpatrick, 1983; Sottilotta, 2013; Leitner, 2017). Similarly, while

many researchers have identified general country risk factors, including political risks, within construction engineering and management, these studies often struggle to comprehensively cover all relevant political risk topics pertinent to the construction industry. Therefore, it is essential to systematically compile and list all relevant political risk topics specific to the construction sector. The first step is to determine the relevant topics, compile a comprehensive list, and organize them systematically in order to facilitate the identification and assessment of political risks. For this purpose, this research focuses on developing a method for the representation of political risk-related topics, where the political concepts are listed and grouped accordingly.

The following sections first present a definition of political risks based on the current literature. Then, methods for identifying political risks are examined. Various ways of representing political risks, including taxonomy, concept maps, and causal maps, are introduced. Finally, the limitations of traditional political risk identification and assessment processes, along with potential solutions, are discussed.

4.2 Political Risk Definition

Political risk fundamentally represents a type of risk encountered by investors, companies, and governments. It is linked to political decisions, events, conditions, and actions by state or non-state actors that impact business performance (Leitner, 2017; Sottilotta, 2016). There are many definitions of political risk in the literature proposed by researchers from various disciplines. Leitner (2017) defines political risks as events in the international business context where public actions, whether by governments or non-governmental actors in the host country, interfere with international business operations, thereby affecting their outcomes. On the other hand, Sottilotta (2013) states that political risk may be viewed as the probability that the profitability of an international investment is adversely affected by unforeseen changes in the local or international political climate. It can also be influenced by

country conditions shaped by governmental policies that affect the rights of investors.

As global dynamics have evolved and the world has significantly changed, the concepts, definitions, and methodologies associated with political risk research have also been adapted to focus on specific research interests since the early days of political risk research (Leitner, 2017). Historically, various researchers have proposed diverse definitions of political risk to capture its multifaceted impacts on international business and encapsulate the complex effects of political risk on international business. Simply, political risk was characterized as “non-economic risk” by Ciarrapico (1992) and Mayer (1985). On the other hand, Eiteman and Stonehill (1973), Aliber (1975), and Hennisz and Zelner (2010) described it as “unwanted government interference with business operations.” Additionally, Root (1972), Brewers (1981), Jodice (1984), and MIGA (2010) defined it as “the probability of disruption of the operations of Multinational Enterprises (MNEs) by political forces or events.” Moreover, Robock (1971), Thunell (1977), and Micallef (1982) viewed political risk as discontinuities in the business environment stemming from political changes, which could significantly impact a firm’s profits or strategic objectives. Furthermore, Green (1974) and Thunell (1977) linked political risk with political instability and radical changes within the host country.

Historically, events such as the 1956 Suez Crisis and the 1960 Congo uprising profoundly and abruptly altered both the political and business landscapes. During this era, the Cold War and the onset of decolonization shaped the global political climate. Throughout this period, political risk began to be recognized as a component distinct from economic factors in international business (Leitner, 2017; Sottiolotta, 2016). Significant events in the 1970s, such as the 1973 oil shock and the 1979 Iranian revolution, had a profound impact on the business world’s perception of political risk and deeply influenced corporate strategies. These large-scale events underscored the importance of political risk assessment and management, leading to the rapid expansion of the political risk industry, including consulting firms and coverage provided by both public and private insurers (Simon, 1984). In the 1980s,

the focus on political risk shifted to include issues related to debt management by host countries, resulting in a closer examination of host country debt management and government policies (Leitner, 2017).

From the 1990s, especially following the World Trade Center events in 2001, there was a notable rise in geopolitical factors such as terrorism, which emerged as a significant form of political risk (Berry, 2010). In the 2000s and beyond, influenced by globalization, the scope of political risk broadened, and its definition and assessment saw significant developments (Sottilotta, 2016). The scope of political risk analysis evolved to become truly global activities, not just conducted by Western firms but also by companies in emerging and developing markets. It had previously been predominantly viewed as a characteristic of “less developed” countries (Zink, 1973; Green, 1974; Green and Korth, 1974).

In addition to being influenced by historical events, the definition and understanding of political risk may also differ in terms of the actors involved, the sources of risk, and the level of analysis (Leitner, 2017). Political risk actors can include formal governments as well as non-governmental entities like militias, mafia-like organizations, and social movements. The sources of risk are diverse, ranging from economic factors such as exchange rates and GDP growth, to political and regulatory environments and the interplay of formal and informal institutions. The level of analysis is divided into macro and micro political risks, as introduced by Robock (1971). Macro political risks affect all businesses within a country, encompassing broad geopolitical issues such as wars and terrorism, whereas micro political risks are specific to industries, firms, or projects, focusing on only the factors directly impacting these particular firms or sectors. This distinction is crucial for conducting detailed risk assessments and adapting strategies to manage the identified risks effectively.

The definition of political risk has grown more complex over time, leading to ongoing confusion about what political risk exactly entails and how it should be best assessed in international business and political science (Sottilotta, 2016). Despite

decades of research, no consensus exists on a common definition due to the term's multidimensional, complex, intertwined, and interdisciplinary nature (Leitner, 2017; Sottilotta, 2016). As Sottilotta (2016) notes, defining political risk is an "elusive task" due to its multifaceted nature. This ambiguity complicates the task of defining political risk, as it spans multiple disciplines and involves various actors, including governments and social movements (Jarvis, 2008).

Today, political risk assessments should account for global and regional fluctuations, economic and social factors, and the actions of diverse actors (Sottilotta, 2016; Kansal, 2015). This complexity necessitates continuous re-evaluation and adaptation of definitions and methodologies. While challenging, this evolution also offers opportunities for international businesses to better manage risks in a dynamic global environment.

In summary, political risk is an evolving concept that demands new analytical tools and interdisciplinary approaches to better understand the risks in today's environment. Given the broad and complex definitions of political risk, examining the traditional identification methods to understand current practices is required.

4.3 Political Risk Identification

This section outlines the widely used methodologies to identify political risks and secure project outcomes. The methods used in risk determination include brainstorming, the Delphi technique, interviews and expert opinions, questionnaires, and checklists.

Sharma (2020) explains that brainstorming serves to generate ideas on specific topics, bringing together individuals from various departments related to a project. A facilitator helps guide the conversation, and participants discuss problems they have encountered in the past or may face in the future. This method involves noting all identified factors and reviewing them to finalize the risk factors. According to Kiral et al. (2014), this technique allows a group of experts to freely express their

thoughts and develop ideas. The British Standards (31010) describe brainstorming as a conversation among knowledgeable individuals to identify potential failure modes and associated hazards, risks, decision criteria, and/or treatment options in a free-flowing discussion.

On the other hand, the Delphi method, established by Olaf Helmer and Norman Dalkey in the 1950s for military use, can be described as a structured communication tool involving a panel of experts (Linstone and Turoff, 2002). This method is recognized as a systematic and comprehensive risk identification technique. According to Chapman (1998), its key features include the anonymity of, the statistical response of the group, and controlled and iterative feedback. Chapman (1998) highlights that this method utilizes statistical analyses like mean, standard deviation, and quartile calculations based on participant responses to foster consensus over several rounds. In subsequent rounds, statistical data are shared with participants, and the process is iteratively continued until a statistically supported consensus is reached. Ultimately, a comprehensive list of risk factors is compiled (Kıral et al. (2014).

In the interview and expert opinion method, individuals with experience in construction projects are consulted to gather expert insights on risks, which are then used to compile a list of relevant risks impacting project objectives. Similarly, the questionnaire method collects information through a series of questions. Both approaches can be potentially enriched by reviewing documents, past project experiences, and case studies of previously conducted projects. Finally, the checklist method employs a predefined list of potential risks and failures identified from previous related projects.

Using the appropriate techniques for risk identification is crucial for developing a robust risk management framework. These aforementioned methods are commonly utilized in risk management in construction literature, and each has its own set of advantages and disadvantages. All these identification methods are grounded in decision-making processes, and information is key, as with any decision. Each

method ultimately generates a list of risks, which includes terms and topics related to the specific type of risk. Regarding political risk identification, regardless of which methods are chosen, providing domain-based knowledge in the application of these techniques is essential. This is also valid for these traditional methods as well as digitally enhanced methods that are recently becoming more popular with the advancements in technology developments, which are discussed later in the next chapters.

When identifying any type of information-intensive risks, it is important to carefully select the terminology used. The choice of words, phrases, concepts, and terms is critical in defining and expressing risks throughout iterative risk identification processes. Standardization ensures consistency in terminology in subsequent iterations.

To identify risks specifically related to political environment, it is crucial to establish a structured list as a glossary of terms used. As previously mentioned, defining political risks is often challenging and lacks consensus. In this interdisciplinary field, the ambiguities in political risk definitions when creating a glossary can pose challenges. To facilitate this challenge, a glossary of political risk was developed to list related topics to clarify what is encompassed by the term, what it implies, and what it includes. As a structured representation of political risk-related topics, a taxonomy, concept, and causal maps were generated, detailed in the following section.

4.4 Political Risk Representation

In this section, the definition of taxonomy, which elucidates the meaning and significance of the term for the context of this study, is provided first, followed by the presentation of the developed taxonomy based on political risk-related topics. Subsequently, a concept map, which is a diagram illustrating proposed interconnections among various concepts, is created to depict the identified political

risk topics. This map demonstrates the relationships, interdependencies, and complexities of political risk terms different from the developed taxonomy.

4.4.1 What is Taxonomy?

Taxonomy, fundamentally rooted in biology, is the scientific discipline concerned with naming, describing, and classifying entities based on their characteristics. Derived from the Greek words “taxis” (arrangement) and “nomos” (law), taxonomy historically focused on the systematic biological classification of living and extinct organisms and involved the principles and methodologies of systematic botany and zoology, organizing various species, such as plants and animals, into hierarchical structures of superior and subordinate categories (Britannica, 2024).

Initially, the scope of taxonomy was limited to the classification of organisms based on shared traits. However, its scope has broadened significantly over time. Today, taxonomy has evolved to encompass the classification of a wide range of entities/items beyond biological organisms, including documents, videos, and concepts, by applying a structured framework. This expanded definition retains its core purpose and involves two primary components: creating an organized scheme of classes (taxonomy) and assigning entities to these classes (classification). Today, taxonomy is utilized in various disciplines such as natural sciences, business and economics, computing (including software engineering), education, and academia.

Taxonomies frequently establish hierarchies, organizing taxonomic units known as “taxa” (singular “taxon”) to help users more easily locate what they are searching for. These hierarchies facilitate the retrieval and understanding of information, underscoring the utility of taxonomy in various fields by aiding in the systematic organization of diverse elements. Taxonomy’s foundational role in the systematic organization and classification of diverse entities provides a structured approach that facilitates better understanding and accessibility (Ereshefsky, 2007; Ereshefsky 2000).

In a broader context, taxonomy extends beyond simple parent-child hierarchies to include network structures, encompassing various relationship schemes. In these frameworks, a single item may have multiple parent categories; for instance, a “Car” could be classified under both “Vehicle” and “Steel Mechanisms,” indicating that “car” fits into multiple taxonomies. Moreover, taxonomy can also refer to the grouping of similar items or the creation of alphabetical lists (Jackson, 2004; Lukas, 2009).

4.4.2 Taxonomy of Political Risk-related Topics

Taxonomies have also been frequently applied within construction engineering and management, including country risk management (Howell and Chaddick, 1994). However, no specific taxonomy development has been conducted for political risks in this field. In this thesis, the taxonomy of political risk-related topics is developed, and its potential applications in political risk studies are discussed.

The taxonomy of political risk-related topics is a systematic hierarchical classification of different political-related topics that organizes and categorizes the various concepts of political risks associated with a country. It provides a comprehensive and structured framework for identifying and assessing these political risks, facilitating a better understanding and management of the potential challenges posed by political factors in different national contexts.

In this study, a literature review, a common approach for identifying relevant topics, was employed as the underlying methodology to explore and identify topics related to political risks. This review served as the foundation for generating the taxonomy. The methodology involved a comprehensive examination of existing literature to systematically develop and refine the taxonomy by identifying related terms and concepts.

This literature survey was conducted using publications from the Web of Science (WoS) database and Google Scholar to ensure comprehensive coverage. In addition

to academic publications, such as journal articles and conference papers, books, and official websites of both public and private agencies (e.g., the Country Risk Model defined by the Economist Intelligence Unit (EIU), OECD, and the PRS Group, which publishes the International Country Risk Guide (ICRG), were reviewed. In addition to the literature survey, expert opinions from the needs analysis were also incorporated, and the political risk-related topics identified by the experts were added to the relevant categories during the creation of the taxonomy. This approach aimed to include all possible political risk-related terms and topics pertinent to the foreign construction market during international construction projects.

Following the conducted detailed literature survey, the list of political risk-related topics is organized into three main categories:

- 1) Political Spheres/Politics
- 2) Economic Conditions/Economy
- 3) Social Conditions/Society

Rather than only considering political spheres, a literature survey on economic and social conditions was also conducted because all these categories collectively provide a structured approach to identifying and assessing the diverse political risks associated with a country. The main headings of the taxonomy can be seen in Figure 4.1.

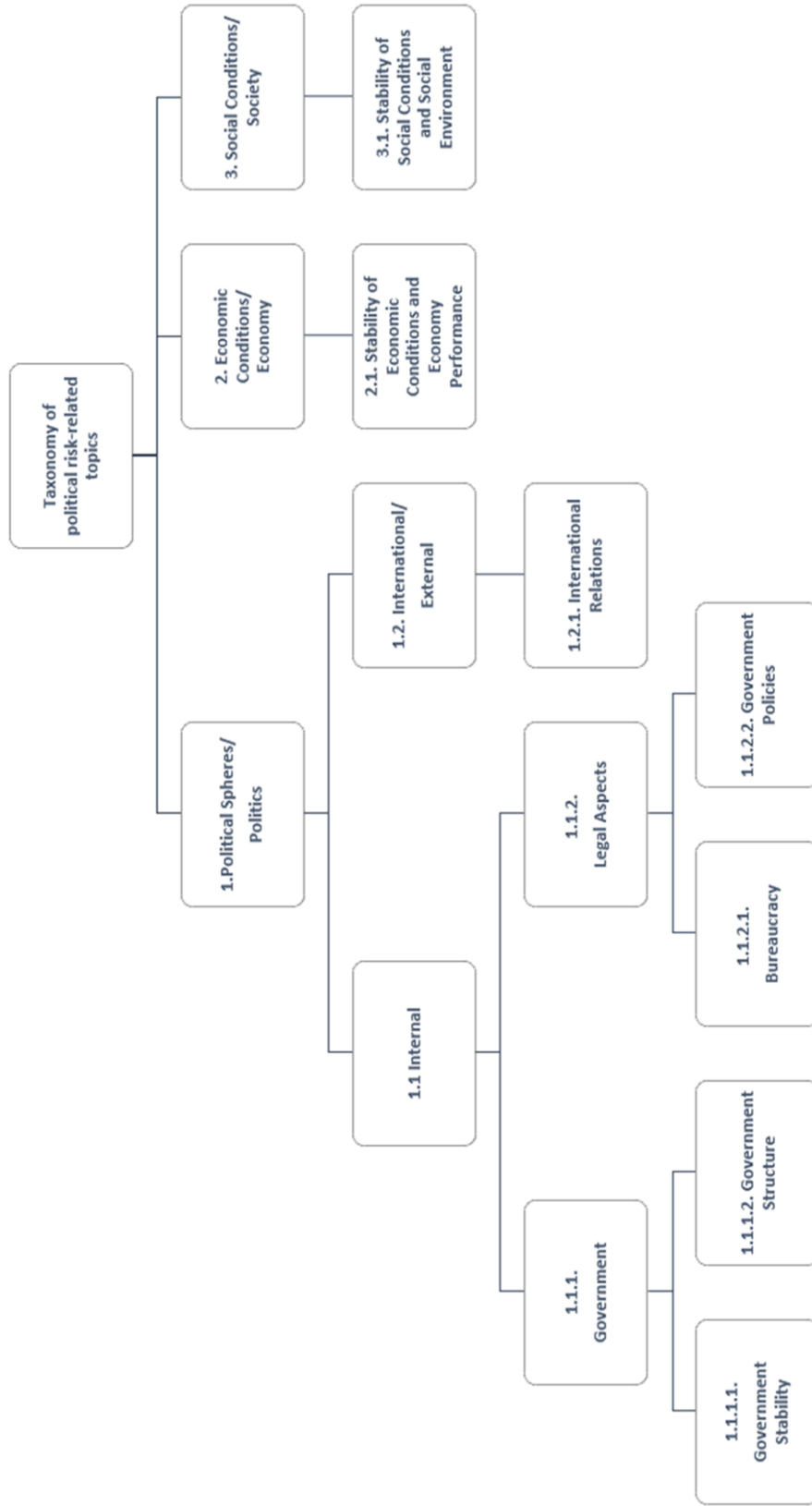


Figure 4.1. Taxonomy Structure of Political Risk-related Topics

According to Figure 4.1, the political spheres/politics category is further divided into internal and international/external. The internal subcategory includes government and legal aspects. Within the government, there are government stability and government structure. Legal aspects encompass bureaucracy and government policies. The international/external subcategory consists of international relations. The economic conditions/economy category focuses on the stability of economic conditions and economic performance. The social conditions/society category addresses the stability of social conditions and the social environment. This hierarchical structure shows that each main category is detailed with subcategories and their own subbranches. The structure and the categories of the taxonomy in table format are given in Appendix B. Each topic listed in the taxonomy, along with its reference sources and assigned categories within the taxonomy, is presented in this Appendix.

By establishing a comprehensive taxonomy, political risks associated with conducting business in different countries can be systematically identified and assessed. As frequently emphasized in the literature, the identification and assessment of risks are crucial for international construction. This is essential for understanding political risks, making well-informed decisions, and effectively managing risk exposure in international construction projects.

During the development of this taxonomy, challenges in defining political topics, as frequently mentioned in the literature, were encountered. As shown in the taxonomy, political risk topics are highly complex and intertwined. Moreover, while attempting to list them hierarchically, it became evident that relationships extend beyond simple parent-child structures, involving numerous cross-connections and interrelations. Although this taxonomy is not claimed to be the definitive or sole valid classification, meticulous effort has been made to develop the most suitable taxonomy from a construction sector perspective. This taxonomy is open to further development.

Additionally, observing and illustrating the relationships among the risk topics used in this taxonomy may aid in understanding political risks. Therefore, following the

development of the taxonomy, a sample concept map is used to show the interrelations between these political risk concepts to enhance understanding. The following section presents the concept map and the network of relationships among the risk topics.

4.4.3 Concept Map

A concept map is a visual tool used to structure and organize knowledge. Using a concept map, which is a two-dimensional diagram that contains concepts and directional links and represents relationships between concepts and ideas, is a visual way to structure and organize knowledge (Novak, 2008). Concept maps, also referred to as conceptual diagrams, aim to fundamental knowledge on a specific subject and are used to facilitate any procedure, research, evaluation, and data analysis through concepts, linking words/phrases, and propositional structure (Islam et al., 2020; Wallace and Mintzes, 1990; Markham, et al., 1994).

In concept mapping, concepts are symbolized as nodes (typically depicted as boxes or circles), while directional lines or arrows illustrate the connections between these nodes. These connections can often be annotated with propositions (statements about relationships between concepts) using descriptive linking words or phrases to detail/clarify the relationships between concepts (Novak and Gowin, 1984).

A fundamental understanding of “concepts” and “propositions” is essential for effectively constructing or comprehending a concept map. Here, “concept” refers to a recognizable pattern in events or objects, while ‘proposition’ describes a statement regarding the relationships between these events or objects as depicted in the map.

The concept map for political risk-related topics was created using a sample set of concepts to demonstrate their interrelations, as shown in Figure 4.2.

Even within this example set from the developed taxonomy, the relationships are numerous and complex. For instance, political risks are related to the political sphere, which is intertwined with legal aspects. These legal aspects include bureaucracy, which affects international relations that may cause an embargo. This relationship is demonstrated in a closer look at Figure 4.3.

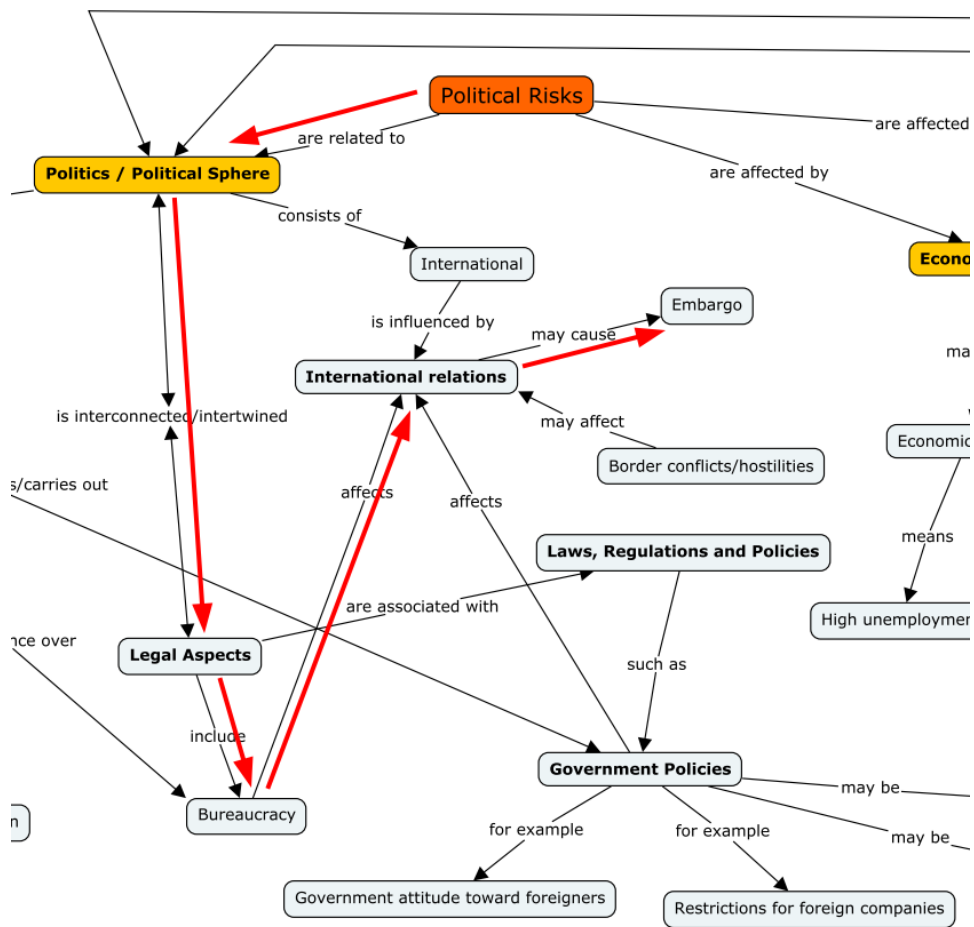


Figure 4.3. Closer Look at the Concept Map

To further explore the relationships in detail, causal maps of political risk-related topics have also been developed. Causal maps are specialized concept maps that visually depict cause-and-effect relationships, providing additional understanding of how different factors influence each other.

Causal maps are graphical representations showing networks of conceptions for a certain issue. Essentially, they are directed graphs where concepts represented as nodes are connected through arrows denoting causal links (Eden, 1992). These links can illustrate how one concept influences another; a positive influence may be marked with a (+) sign at the arrow's head, suggesting enhancement, while a negative influence may be denoted by a (-) sign, indicating a detrimental effect. These maps are important for visually representing and understanding the dynamics between different factors (Tanriverdi, 2019).

An example of a causal map is generated and demonstrated in Figure 4.4. The causal map represents concepts and sub-concepts of political risks. Therefore, it can provide a picture of the interrelationship of political risk factors emphasizing the cause-and-effect relations.

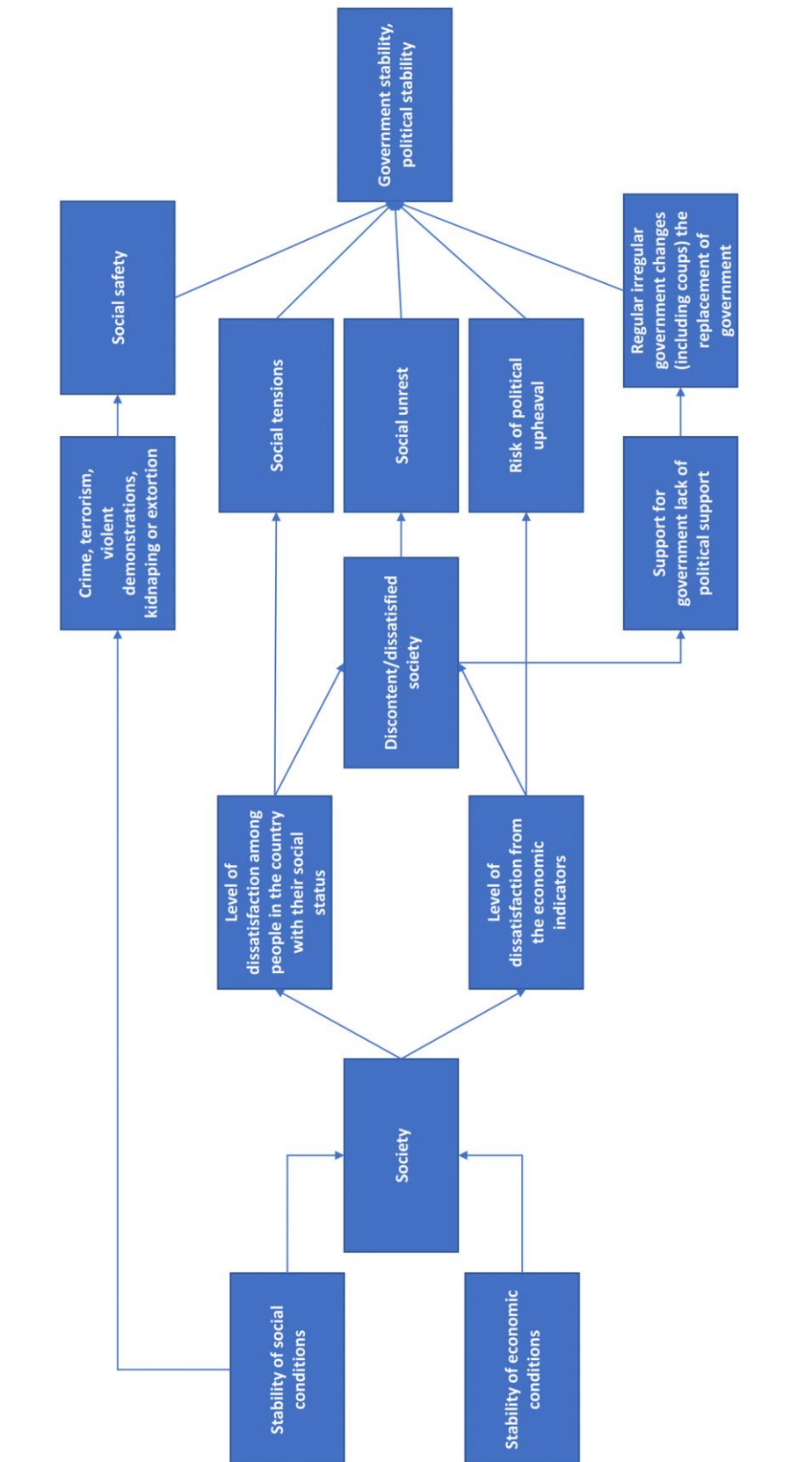


Figure 4.4. Causal Map

4.5 Discussion on Political Risk as a Dynamic Network of Interrelated Factors

The complexity and intertwined nature of political risks are obvious, as emphasized in the literature, through the created taxonomy, concept, and causal maps. Identifying political risk concepts using traditional methods (e.g., brainstorming, the Delphi technique, interviews/expert opinions, questionnaires, and checklists) may be time-consuming and prone to errors due to the nature of political risk topics. The sheer volume of concepts makes the identification of political risk and assessment tedious and open to human judgment errors.

In the field of political risk assessment, Multiple Criteria Decision Making (MCDM) methods are extensively utilized in the literature to make more informed and better decisions due to their systematic approach to handling complex decision-making scenarios. MCDM methods are tools designed to handle complex decision-making scenarios that require simultaneous consideration of various criteria. Since the early 1960s, when the modern discipline of MCDM was established, significant advances have been made in this field. MCDM methods, such as the Simple Multi-Attribute Rating Technique (SMART), Analytic Hierarchy Process (AHP), and Analytic Network Process (ANP), facilitate intricate decision processes. These methods are used to evaluate and prioritize alternatives when multiple conflicting criteria must be considered. However, its application in political risk identification and assessment processes can be challenging and sometimes inefficient for several reasons, as detailed below.

Handling multiple concepts can become cumbersome when applied to political risk scenarios characterized by extensive and intertwined networks of concepts and relationships. The complexity of political environments often means that the variables are not only numerous but also highly interconnected in ways that might not be linear or straightforward, making them difficult to systematically evaluate through MCDM methods. AHP is not well-suited for the case of the networks of relations. While ANP can accommodate the complex networks of relationships, the

manual data collection process remains difficult and time-consuming in this rapidly changing environment of political risk assessment.

The process of setting up and conducting MCDM methods can be resource-intensive. This is particularly valid also in political risk assessment, where the dynamics can change rapidly, requiring continual updates to the criteria and data involved. The iterative nature of MCDM methods, necessary for refining criteria and reassessing options, can prolong the decision-making process, making it less adaptable to environments where quick responses are critical.

MCDM methods heavily rely on experts' subjective judgments to weigh criteria and evaluate alternatives. In the context of political risk, where uncertainty is high, and biases can significantly impact outcomes, this dependence on subjective evaluations can introduce errors or distortions in the analysis. The subjective element can also lead to inconsistencies when different experts are involved or when the same experts reassess criteria over time.

In conclusion, given the complexity and dynamic nature of political risk assessment, there is a compelling need for automation and advanced analytical technologies. Automation can help manage and process large volumes of data more efficiently than manual methods, reducing the time burden and increasing the reliability of the analyses. Digital technologies such as machine learning and artificial intelligence can aid in identifying patterns and assessing risks from vast datasets, which are often challenging to manage for traditional MCDM methods without significant simplification. While MCDM methods offer a structured approach to decision-making, their application in political risk assessment is often limited by the complexity of the task, the dynamic nature of the data, and the need for quick, reliable decisions. Integrating digital technologies and automating parts of the process are essential steps toward enhancing the efficacy of political risk assessment and reducing the reliance on manual processes within the construction industry.

CHAPTER 5

DIGITAL TECHNOLOGIES FOR AUTOMATION OF THE POLITICAL RISK IDENTIFICATION AND ASSESSMENT PROCESSES

5.1 Introduction

This chapter explores the application of digital technologies for identifying and assessing political risks within the international construction sector. The primary focus is on automating the retrieval of political data from various websites, a task that has become increasingly feasible with advancements in digital technologies. These developments enable the rapid, accurate, and real-time extraction of relevant political information, which is crucial for effective risk management.

5.2 Selection of Technologies

The needs analysis survey, which aimed to understand the requirements and challenges faced by construction companies when assessing country risks, identified several challenges faced by construction companies when assessing country risks, and these interviews with risk management experts revealed valuable insights that led to the selection of web crawling and ChatGPT as focal points for this research.

This needs analysis revealed that experts rely heavily on web-based sources for gathering country-related information due to their accessibility and up-to-date nature. However, the experts also highlighted the tedious and time-consuming nature of manually reviewing extensive web documents. This finding highlighted a need for more efficient methods of collecting data from web sources. Consequently, this research focuses on web crawling as a potential solution to

automate and accelerate the retrieval of political information from online sources, addressing the experts' concerns about the efficiency of manual data extraction.

Furthermore, the needs analysis revealed a lack of formal processes for country risk identification and assessment within the companies surveyed. The experts expressed a keen interest in exploring automated systems and digital technologies that could support and enhance their current practices. This interest, coupled with the rapid advancements in AI and the increasing popularity of AI chatbots like ChatGPT, led to the selection of ChatGPT as another focal point for this research.

Therefore, this research explores both web crawling and ChatGPT as potential tools for facilitating political risk assessments in the construction industry. These technologies are examined in detail in the subsequent sections of this chapter to evaluate their effectiveness in addressing the challenges identified in the needs analysis. This chapter provides an overview of these digital technologies and their potential applications in the political risk identification and assessment processes. It addresses key questions, such as how to systematically and automatically retrieve political information, offering a review of possible information extraction methods.

This chapter begins with an introduction to the role of digital technologies in automating political risk assessment processes, particularly within the international construction sector. It then explores the use of web crawling techniques, including a demonstrative example to illustrate its application. Following this, a detailed review of generative AI is presented, examining its potential in the context of political risk assessment. Finally, a discussion of comparative analysis between web crawling and ChatGPT, an AI Chatbot, is provided, evaluating their effectiveness in identifying and assessing political risks.

5.3 Digital Technologies for Information Extraction Methods

The integration of digital technologies in automating political risk assessment processes, especially within the international construction sector, has become increasingly vital due to the global markets' complex and dynamic nature. Automating the retrieval of political information from online sources is essential for faster decision-making and effective risk management. Various information extraction methods are employed to enable systematic and automated retrieval of political information, each with varying degrees of complexity and effectiveness. Digital technologies such as web crawling and AI Chatbots play a crucial role in this process.

Web crawling is a fundamental method that involves using automated scripts or tools to navigate through websites, parse HTML content, and extract specific data points (Olston and Najork, 2010; Ozyurt et al., 2023). This method is particularly effective for gathering structured information from multiple sources. However, web crawling alone has limitations, especially when dealing with unstructured or rapidly changing data structures. To address these challenges, integrating advanced techniques such as Natural Language Processing (NLP) and machine learning (ML) enhances the process. NLP facilitates the extraction of meaningful insights from unstructured text, such as news articles, reports, and social media posts, by analysing the context and sentiment of the content (Eken, 2022). Combining web crawling with NLP and machine learning models, such as generative AI, can lead to more efficient retrieval and analysis of political information, enabling real-time updates and more accurate risk assessments. Generative AI-powered AI Chatbots can process large datasets, identify patterns, and predict political risks based on the analysis of unstructured data. These technologies offer a dynamic and adaptable approach to risk assessment, reducing manual effort and improving the accuracy and timeliness of the data collected. The subsequent sections first examine web crawling in detail, followed by an exploration of AI Chatbots.

5.4 Web Crawling

5.4.1 What is Web Crawling?

Web crawling, also referred to as web scraping, is an automated technique for browsing the web to collect and store data from web pages. This process is executed by a program known as a spider or robot, which navigates through websites by following hyperlinks and indexing the content found on those pages (Pinkerton, 1994; Cho, 2001; Olston and Najork, 2010). The primary function of a web crawler is to systematically browse the internet, visit web pages, and retrieve content that is relevant to the user's needs. Once the specific information is collected, this content is extracted, stored, and processed for various purposes, such as data analysis or market research.

The web crawling process begins with a list of URLs (Uniform Resource Locators) that the crawler visits (Moon et al., 2018; Cho, 2001; Olston and Najork, 2010). Upon reaching a web page, the crawler parses the HTML (HyperText Markup Language) content to extract the required data, which is then stored in a structured format, such as a database or spreadsheet, for further analysis. As these pages are accessed, the crawler also identifies and follows the hyperlinks contained within them, thereby discovering and indexing additional pages. This process is iterative, guided by predefined criteria such as the number of pages to visit, the presence of specific keywords, or the time spent on each page. The extracted content can be saved in various formats, such as CSV or JSON, depending on the task's requirements.

5.4.2 Web Crawling in Construction Management

Historically, web crawling has been employed across various domains, primarily for search engine indexing. However, its applications have expanded to include more specialized fields. The use of web crawling in the construction industry is relatively

recent, and the literature on this topic is still emerging. While web crawling has been extensively utilized in fields such as e-commerce and social media monitoring, its application in construction management remains limited.

Previous studies have explored the use of web crawling in various aspects of construction management. For instance, Moon et al. (2018) explored the use of web crawling to efficiently gather specific data for international construction projects, developing a system that streamlined the acquisition of relevant information. They utilized web crawling techniques to enhance document management systems in international construction projects. Hong et al. (2019) applied web crawling to automate the collection and categorization of Green Building Material Information (GBMI), enhancing the management of sustainable materials. Additionally, a study by Kim et al. (2021) utilized web crawling alongside deep learning to analyse fire accident data from news reports, identifying key risk factors on construction sites. Dou et al. (2019) leveraged web crawling to extract index data from social media platforms, addressing the lack of statistics in China's prefabricated construction industry. Zhou et al. (2021) employed web crawling to automatically retrieve and formalize building codes from online sources, transforming them into structured knowledge representations.

These studies illustrate the versatility and potential of web crawling in improving information management within the construction sector and underscore the growing role of web crawling in automating data collection processes in construction management. However, the application of web crawling specifically for country and/or political risk assessment in the construction industry remains underexplored. This research aims to bridge this gap by exploring the potential of web crawling for political risk identification and assessment. To demonstrate this, a hypothetical case study is presented below, illustrating how web crawling can automatically obtain political and/or country-related data.

5.4.3 A Demonstrative Example of Web Crawling

This section investigates the potential of using web crawling to assess political risks in the international construction sector by obtaining country-specific information available online. A demonstrative example is provided to illustrate how web crawling can automatically retrieve political data relevant to a specific country (Ozyurt et al., 2023).

The web crawling application includes five key steps in general. The process begins with identifying the necessary political information specific to the country and determining the websites that will serve as data sources. After selecting the sources, the country information data is extracted and categorized into different risk types. Next, risk managers can establish rules, such as threshold values for each risk level, to guide the assessment process. Applying these rules allows the data collected from the web crawling process to be evaluated within a rule-based system. This approach enables the generation of a risk register in tabular format and the determination of risk levels according to the rule-based system. The overall process is illustrated in Figure 5.1.

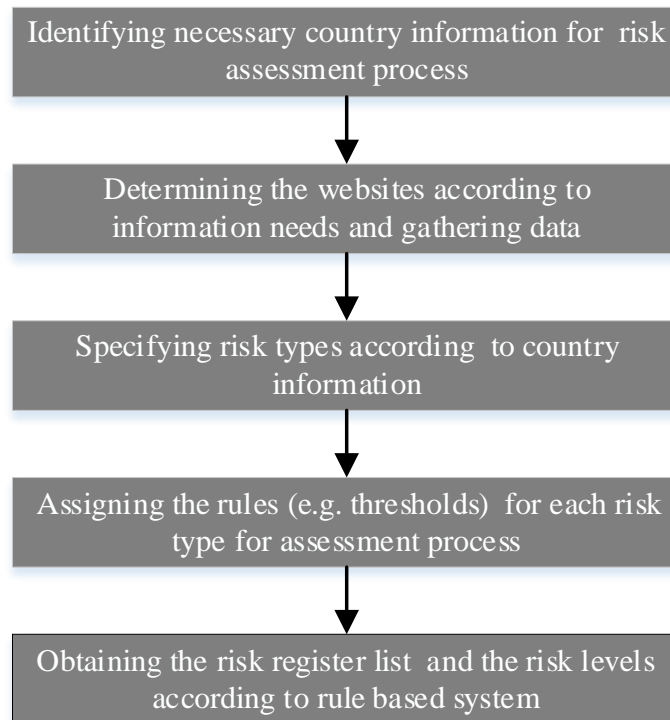


Figure 5.1. Flowchart of Web Crawling Application (Ozyurt et al., 2023)

A hypothetical case scenario was developed to demonstrate the application of web crawling in the political risk identification and assessment process. In this example, an international construction company preparing a bid for a highway project in Serbia seeks to investigate and evaluate the country and the political factors that are relevant to the country. Due to the need for efficiency and timeliness, the firm prefers to gather the necessary data through web crawling.

The assumptions for this hypothetical scenario are as follows: It is assumed that professionals within the company, particularly those in departments such as risk management, business development, or tendering, need to research the country's political environment before entering a new market or taking on a new project. The goal is to understand how the country's political factors could influence the success or failure of the project. Therefore, they need to first identify the political risks specific to Serbia and then assess these risks accordingly.

Without the application of web crawling, the firm's professionals would need to manually and regularly visit each relevant website, review the information, and manually input the gathered data into a spreadsheet. This manual process is time-consuming and labour-intensive, which is particularly cumbersome in research areas like political risk, where timely data is crucial. The purpose of this hypothetical example is to demonstrate how web crawling can provide a more efficient and faster alternative to manually searching for and collecting the necessary country-specific political data.

As an initial step, the relevant web sources and indicators corresponding to these risks should be identified to effectively utilize the data automatically gathered through web crawling for risk management purposes. As discussed in the previous chapter, economic and social indicators are closely intertwined with the political environment. Considering this, the following websites and their corresponding indicators have been deemed suitable for this illustrative example and selected to gather relevant data for assessing political-related risks associated with Serbia. The related websites were previously shared and mentioned as their information sources by experts in the Needs Analysis Survey, were also used in addition to those specific to Serbia.

The websites and indicators are listed below:

- **IMF** - imf.org/external/datamapper/profile/SRB : Real GDP Growth (Annual percent change)
- **WORLD BANK** - data.worldbank.org/country/serbia: Poverty headcount ratio at \$2.15 a day (% of population) and Literacy rate, adult total (% of people ages 15 and above)
- **BIS Bank for International Settlements** - stats.bis.org : US Dollar exchange rates, End of period
- **ILOSTAT** - ilo.org/shinyapps/bulkexplorer : Labor force participation rate (%), Population covered by at least one social protection benefit (%)

- **CoFace - coface.com.au**: Budget balance (% GDP) and Business climate rating
- **National Bank of Serbia - nbs.rs/en/indeks/index.html**: Interest rates, inflation rates, and Standard & Poor's credit ratings
- **Statistical Office of the Republic of Serbia - stat.gov.rs/en-US**: Unemployment rate
- **BTI - The Transformation Index - bti-project.org**: Population growth, Poverty
- **Global Edge - globaledge.msu.edu/countries**: Corruption Perceptions Index and Index of Economic Freedom

These sources have been carefully selected to provide a view of Serbia's political environment, including its economic and social climate, both of which are crucial for conducting a thorough political risk assessment. By utilizing web crawling techniques, this data can be automatically extracted and analysed to inform decision-making processes in international construction projects.

In this example, it is also assumed that the responsible departments possess the necessary coding skills to implement the web crawling algorithm and have identified the URLs of websites containing political information specific to Serbia. The selection of these URLs is critical because the sources will directly influence the data obtained. In this scenario, the company uses web crawling to extract specific data points from the relevant HTML content on these sources. A popular and widely-used Python library, BeautifulSoup, was employed to facilitate this process (Hajba, 2018). XPath expressions, a language for selecting nodes from an HTML, were utilized to easily locate any desired element within an HTML DOM page. Once the URLs and XPaths were inputted into the programmed web crawler, the crawler accessed each webpage, parsed and processed the necessary information, and retrieved the target data. The collected data was then saved in CSV (comma-separated values) format, making it easier to read and analyse in Microsoft Excel. A tabular output was subsequently generated.

Data extraction for each website took place between 21 March 2022 and 29 April 2023. The resulting output table for Serbia, which includes the websites (with their URLs) as data sources and the extracted values, is presented below in Table 5.1 (Ozyurt et al., 2023). It is also essential to record the data extraction dates to ensure the accuracy and relevance of the information.

Table 5.1. Output of Web Crawling Example (Ozyurt et al., 2023)

WEBSITES AND INDICATORS	VALUE
IMF - imf.org/external/datamapper/profile/SRB	
Real GDP growth (Annual percent change)	2
WORLD BANK - data.worldbank.org/country/serbia	
Poverty headcount ratio at \$2.15 a day (% of population)	1.6
Literacy rate, adult total (% of people ages 15 and above)	99
BIS - Bank for International Settlements stats.bis.org	
US dollar exchange rates. End of period	107559,00
ILOSTAT - ilo.org/shinyapps/bulkexplorer	
Labor force participation rate (%)	57.3
Population covered by at least one social protection benefit (%)	48,00
CoFace - coface.com.au	
Budget balance (% GDP)	-2,70
Business climate	A4
National Bank of Serbia - nbs.rs/en/indeks/index.html	
NBS interest rates	6.00%
Inflation in March	16.2%
Standard and Poor's Credit Rating	BB+ stable outlook
Statistical Office of the Republic of Serbia - stat.gov.rs/en-US	
Unemployment rate	9.2 %
BTI - The Transformation Index	
Population growth	-0.5 % p.a.
Poverty	8.9 %
Global Edge - globaledge.msu.edu/countries	
Corruption Perceptions Index	38
Index of Economic Freedom	63.9

As a further step in the research, the country-specific data collected through the web crawling process can be further assessed using a rule-based system. For instance, in assessing social-related risks, certain thresholds can be established: a “poverty rate”

below 10% may be classified as a “low” risk, while a rate exceeding 30% could be considered a “high” risk. Similarly, an “unemployment rate” under 15% might be deemed “low” risk, whereas a rate above 35% would be categorized as “high” risk. A rule-based system can generate outputs such as those presented in Table 5.2, which incorporates data for Serbia obtained from the web crawling example. To enhance visual clarity, this output could also employ colour coding, using green to indicate low-risk levels and red for high-risk levels. This example illustrates how web crawling outputs can be utilized in country risk assessments when threshold values are predefined (Ozyurt et al., 2023). However, further research is needed to fully explore and expand the potential applications of web crawling in risk management.

Table 5.2. Output of Rule-Based System Example (Ozyurt et al., 2023)

Social Risk Related Indicators	Country Related Values	Risk Level
Poverty	8.9 %	Low
Unemployment rate	9.2 %	Low

5.4.4 Discussion of the Demonstrative Example

This study is one of the few that explore web crawling applications for automating country and/or political risk assessments in the context of international construction projects. The hypothetical example demonstrated that web crawling can significantly streamline the process of searching for and extracting relevant information from the vast amount of data available on the internet compared to manual methods. It highlighted the potential of web crawling to develop automated country and/or political risk registers, which are essential for making informed decisions during the bidding process.

It is asserted that web crawling, compared to manual data collection, offers a more efficient and faster alternative. Web crawling can enhance overall risk management by facilitating the review of web pages during the country and/or political risk assessment process. However, it is essential to acknowledge the challenges

associated with this approach. Managing large volumes of data and ensuring the accuracy and relevance of the collected information are significant concerns. As the volume of data on the internet continues to grow, developing robust web crawlers capable of effectively processing this data becomes complex. Additionally, data privacy and copyright issues need careful consideration when deploying web crawlers for research purposes.

Moreover, changes in the HTML structure of websites or restrictions imposed by webpage servers can hinder data retrieval. The web crawling approach used in this study relied on human input for key decisions, such as selecting the webpages to be crawled and determining assessment thresholds (Olston and Najork, 2010). In the future, it is anticipated that web crawlers could be utilized more automatically and effectively to find relevant web pages and data.

In conclusion, while web crawling presents significant potential for automating country and/or political risk assessments in construction projects, further research is necessary to fully explore its capabilities and address the associated challenges. This example application, using data from 2022 and 2023, was conducted using a method that was considered one of the most recent available technologies at the time. However, the rapid and advanced technological developments in recent years have significantly enhanced digital technologies. As of 2024, more advanced technologies are available. The integration of artificial intelligence and machine learning could further enhance the effectiveness of web crawling in this domain, providing construction professionals with powerful support tools for identifying and assessing risks in a rapidly changing global environment.

In the subsequent section, the focus shifts to introducing one of the most advanced technologies, AI Chatbots, which is currently very popular and has transformed how people work. The following session presents the details of associated terms that are critical for understanding its full potential, with the aim of providing an understanding of its effects on business processes and significance in the modern digital landscape.

5.5 AI Chatbots

5.5.1 Introduction to Key Concepts: Artificial Intelligence, Machine Learning, and Neural Networks

Before exploring topics such as generative AI, large language models (LLMs), and AI Chatbots, it is crucial first to establish a foundational understanding of key concepts like artificial intelligence (AI), machine learning (ML), and neural networks (NN). This foundational knowledge can enable researchers and practitioners to harness the power of AI and generative technologies better.

AI refers to the broad field of developing computer systems capable of performing tasks that typically require human intelligence, such as perception, reasoning, learning, and problem-solving. AI encompasses a range of techniques, including rule-based systems, expert systems, and genetic algorithms, allowing machines to understand natural language, recognize images, and make decisions autonomously (Russell and Norvig, 2016).

Machine learning (ML), a subset of artificial intelligence (AI), includes the creation of algorithms that allow computers to learn from data and make predictions or judgements autonomously, without explicit programming. ML focuses on identifying patterns within data to classify information or make forecasts. ML algorithms analyse data, identify patterns, and make predictions or decisions based on that analysis. It includes various methodologies, such as neural networks, decision trees, support vector machines, and k-means clustering (Bishop, 2006; Mitchell, 1997).

Neural Networks (NN) are critical components of modern AI and ML systems. Inspired by the structure and function of the human brain, these networks consist of interconnected nodes (neurons) organized into layers. A neural network typically includes an input layer to receive data, one or more hidden layers to process information, and an output layer to produce results. NN excel at speech recognition,

image classification, and natural language processing. Through a training process, these networks learn from data, allowing them to improve accuracy and performance over time (Goodfellow et al., 2016).

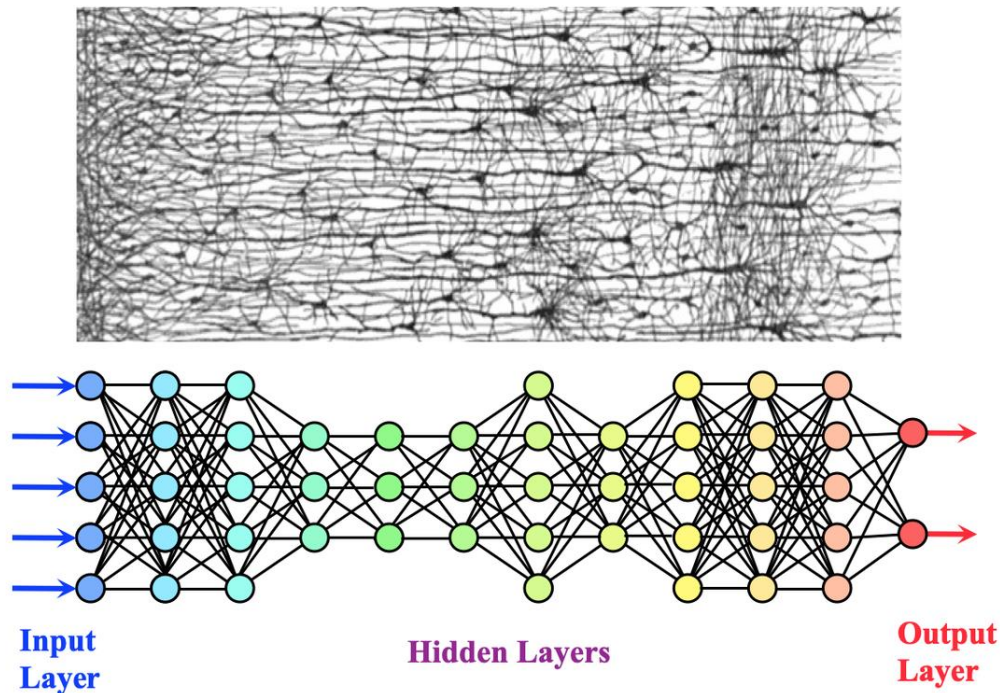


Figure 5.2. Neural Networks (Upper image: columns of neurons in the cerebral cortex drawn by 1906 Nobel laureate Santiago Ramón y Cajal., Lower image: a fully connected artificial neural network with multiple hidden layers)
adapted from Q&A in MRI (2024)

Figure 5.2 illustrates the structure of a typical neural network, with a comparison that contrasts the neural connections in a real brain with those in a typical artificial neural network (ANN). This comparison highlights how artificial neural networks are inspired by the biological neural networks found in the human brain. In both systems, the basic units (neurons in the brain and nodes in the artificial network) are interconnected and communicate with one another to process information. However, while the brain's neurons are vastly more complex and capable of learning in highly adaptive ways, ANNs attempt to replicate this process in a simplified, mathematical

form to perform tasks like image recognition or language processing. This analogy underscores the fundamental inspiration behind neural networks in AI, aiming to emulate the brain's capacity for learning and decision-making through interconnected layers of artificial neurons.

The training process is where neural networks learn from data. During training, the network is exposed to a large dataset, and the weights of the connections are adjusted to minimize the difference between the network's predictions and the actual outcomes. Neural networks are particularly effective in tasks that require pattern recognition, such as speech recognition, image classification, and natural language processing. Their ability to learn from large datasets and make complex decisions has made them a cornerstone of artificial intelligence, especially in deep learning (DL), where networks with many hidden layers, known as deep neural networks, are employed.

These foundational concepts in AI, ML, and NN are crucial stepping stones for understanding more specialized areas, such as large language models, which are pivotal in enabling machines to interpret and generate human language.

5.5.2 Large Language Models

Natural language processing (NLP) is a subdivision of AI that concentrates on the interaction between computers and human language. NLP combines computational linguistics, deep learning, and statistical modelling to enable machines to understand, interpret, and generate human language (Crossley, 2013; Salama and El-Gohary, 2016). This technology underpins applications such as chatbots, language translation, and text summarization by processing large amounts of text data and drawing meaningful insights. NLP is foundational in developing systems that can perform tasks such as sentiment analysis, where the system determines the emotional tone behind a body of text, or machine translation, where it converts text from one language to another. The backbone of many NLP tasks is formed by neural networks,

particularly Recurrent Neural Networks (RNNs) and transformer-based models (Large Language Models), which excel at handling sequential data and understanding context (Jurafsky and Martin, 2019; Manning and Schütze., 1999).

Large language models (LLMs) represent an advanced NLP model form that has transformed how computers process and generate human language with remarkable fluency. The most notable models are OpenAI's GPT series, Google's Gemini, Meta's LLaMA, and Mistral AI. These models are trained on vast datasets, allowing them to learn the intricacies of language, including grammar, context, and nuances. As a result, LLMs can generate coherent and contextually appropriate text, perform tasks such as summarization and translation, contextually relevant text generation, and even engage in complex conversational interactions as AI-powered chat interfaces (Brown et al., 2020; Radford et al., 2019). Examples include GPT (Generative Pre-trained Transformer) models.

GPT stands for Generative Pretrained Transformer. "Generative" signifies its capability to produce new outputs like text or images and its ability to create original content. "Pretrained" indicates that the model is initially trained on extensive datasets, allowing it to understand language patterns, but it can be fine-tuned for specific tasks. The "Transformer" refers to the neural network architecture that efficiently processes and generates language by considering all words in a sentence simultaneously. This combination makes GPT highly adaptable and effective in generating coherent and contextually appropriate content.

The Figure below can be used to visually represent the terms discussed so far and their interrelationships, providing a clear overview of how these concepts are connected. In Figure 5.3, the white circle (LLM) is located at DL and NLP intersects. This placement illustrates how LLMs combine the capabilities of deep learning and NLP to perform tasks such as language understanding and generation.

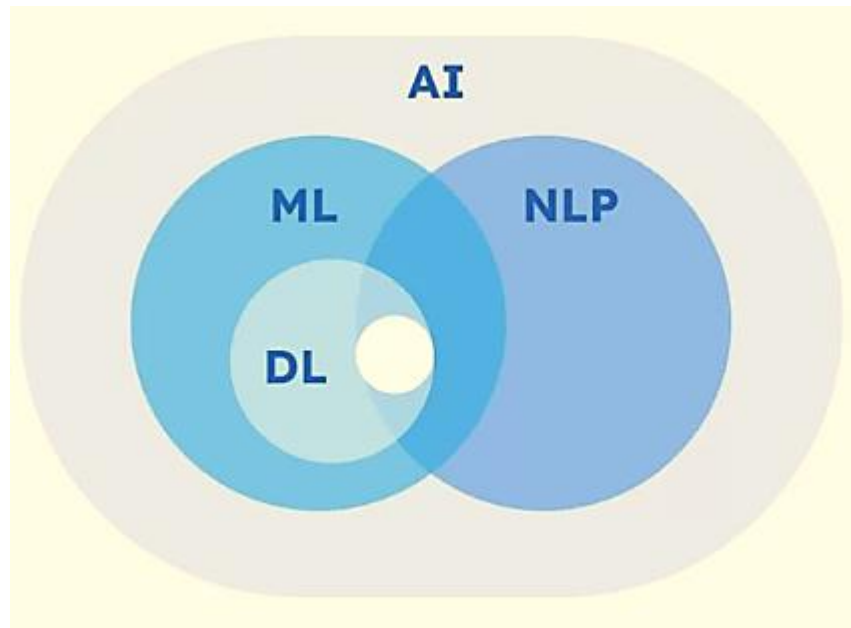


Figure 5.3. The Relations among AI, ML NLP, and LLM

Now that the key concepts and their relationships have been discussed, more details about Generative AI and LLMs can be shared. LLMs are at the intersection of many advanced technologies, making them incredibly versatile and valuable. Unlike traditional models that might predict a single word in a sequence, LLMs are capable of predicting entire sequences, which allows them to generate paragraphs or even entire documents that are contextually relevant and meaningful. According to IBM (2024), LLM is a class of foundational models trained on vast datasets, enabling them to comprehend and generate natural language and various content kinds to perform a wide range of tasks. The architecture of these models, particularly transformers introduced in 2017 and transformed language modelling, has enabled them to process longer sequences of text more efficiently, making them integral to modern NLP applications.

LLM capabilities are rooted in sophisticated neural network architectures, particularly transformers. LLMs leverage a transformer-based architecture that enables them to efficiently capture and model the context of words within a sentence. This is largely facilitated by mechanisms such as self-attention, which allows the

model to understand the relationships between different words and phrases in a global context rather than just locally. The models typically undergo a pre-training phase where they are exposed to vast corpora of text, often sourced from the internet, through self-supervised learning. This process helps them learn general language patterns and develop a rich understanding of language semantics and syntax. Another key aspect of LLMs is their use of distributed word representations, known as word embeddings. Popular methods for generating these embeddings include Word2Vec, GloVe, and FastText (Brown et al., 2020). These embeddings help capture the semantic meaning of words, allowing LLMs to understand and process language more effectively.

Leveraging the capabilities of LLMs, generative AI can produce novel content, including text, images, music, and even code. This type of AI predicts the next word or token in a sequence based on the input it receives, allowing it to generate content that mimics human creativity and expression. For instance, LLMs can be fine-tuned to write poetry, generate articles, or compose music, opening up new possibilities in creative industries. The ability of generative AI to create original content based on learned patterns has transformed various sectors, including content creation, entertainment, and software development, marking a significant advancement in the field of AI (Vaswani et al., 2017; Holtzman et al., 2020).

In conclusion, LLMs are utilized across various industries, offering a range of applications that depend on the specific needs, constraints, and use cases. LLMs are driving advancements in human-like AI and transforming industries through their numerous applications, particularly in language understanding and generation. However, digital technologies are rapidly evolving, and industries like construction, where technological adoption often lags, may fall behind. Therefore, studies should explore the potential of these digital technologies as swiftly as possible to ensure they benefit as much as other industries. This chapter may serve as a foundational document to introduce these digital technologies.

Specifically, in the knowledge-intensive area of political risk assessment, digital technologies like LLMs can facilitate swift, accurate, and automated access to crucial information. Generative AI, leveraging LLMs' language generation capabilities, can open new possibilities in this area, making it a potentially valuable support tool for political risk identification and assessment processes.

Given the dynamic nature of global markets and the increasing complexity of political landscapes, there is a growing need to leverage large language models to streamline and enhance risk assessment accuracy. There are several alternatives to explore; within the thesis, one of the most widely used models, OpenAI's ChatGPT, has been selected and proposed as a facilitative method to explore its potential application in political risk identification and assessment. Given its availability, it is considered easy to investigate how ChatGPT could be utilized in this field.

Before exploring the potential of ChatGPT for political risk assessment, the last section of this chapter focuses on the discussion of "Web Crawling" and "ChatGPT", highlighting their respective strengths and drawbacks in identifying and assessing political risks, particularly within the international construction sector. Having reviewed the foundational concepts and applications of both "Web Crawling" and "ChatGPT", it is now appropriate to conduct a comparative analysis of these two methods. The following section offers a detailed comparison.

5.6 Discussion of Comparative Analysis of Web Crawling and ChatGPT for Political Risk Identification and Assessment

Web Crawling requires significant human intervention, particularly in defining the rules for data extraction and maintaining the web crawlers. Changes in website structures can disrupt the crawling process, necessitating updates to the code. Despite these challenges, Web Crawling provides a level of accuracy and specificity that is valuable in risk assessment processes where detailed and exact information is critical.

On the other hand, ChatGPT represents a more flexible and user-friendly approach. Unlike Web Crawling, which relies on coding and predefined rules, ChatGPT uses natural language processing to generate responses based on a wide range of information sources. This capability allows it to synthesize information and provide more adaptable insights to various contexts. While it may not always match the precision of data retrieved by Web Crawling, ChatGPT offers a broader understanding and can quickly adapt to new queries without the need for structural adjustments.

Moreover, when it comes to speed and automation, ChatGPT outperforms traditional Web Crawling. It generates insights rapidly, which can be particularly advantageous in situations where quick decision-making is essential. However, it is important to note that ChatGPT's responses, while faster, may occasionally lack the accuracy required for highly specific or up-to-date information due to generalized responses, as it is mainly based on a pre-existing dataset rather than real-time data extraction.

Regarding flexibility and adaptability, Web Crawling is rigid and heavily reliant on the HTML structure of websites. Any changes in the page layout can break the script, necessitating updates to the code. Conversely, ChatGPT is more flexible, adapting quickly to various inquiries without needing structural adjustments. As for data retrieval, Web Crawling retrieves data directly from specific URLs, confining its scope to the content of specified pages. On the other hand, ChatGPT can synthesize information from a broad range of sources, offering more comprehensive responses but potentially lacking in the specificity of Web Crawling. Concerning accuracy and reliability, Web Crawling provides precise data from targeted sources but is prone to errors if the web structure changes. ChatGPT offers a broader understanding and analysis, yet it might be less accurate if the specific information is not included in its dataset.

In relation to their search type, Web Crawling focuses on static searches designed to find exact matches within specific structures. In contrast, ChatGPT uses semantic

search capabilities to understand context and relationships between concepts, which allows for more dynamic and nuanced responses. Table 5.3 provides a clear comparison between the two methods, highlighting their respective strengths and limitations both in general and in the context of political risk identification and assessment.

Table 5.3. Comparison between Web Crawling and ChatGPT

Criteria	Web Crawling	ChatGPT
Ease of Use	Requires coding skills and technical knowledge to set up and maintain.	More accessible, user-friendly interface with natural language prompts, no coding required.
Flexibility and Adaptability	Rigid, dependent on the HTML structure; changes in layout require code updates.	Highly adaptable, can handle a wide range of queries without structural adjustments.
Data Retrieval	Retrieves data directly from specified URLs; limited to content available on those pages.	Provides synthesized answers based on a broad range of sources, not limited to specific URLs.
Accuracy and Reliability	Provides precise data from targeted sources but is prone to errors if the web structure changes.	Offers broader understanding but may be less accurate for specific, up-to-date information.
Automation and Speed	Automated but may be slow and requires regular maintenance; human input needed for thresholds.	Faster and more automated in generating insights, though responses may lack precision.
Search Type	Performs static searches, focusing on exact matches and page structures.	Utilizes semantic search, understanding context and relationships between concepts.
Maintenance	Requires frequent updates and monitoring due to dependency on web page structure.	Minimal maintenance needed; does not rely on specific website structures.

The comparison between Web Crawling and ChatGPT reveals that each method has strengths and limitations. ChatGPT has already demonstrated significant benefits in managerial practices in general. While its application in political risk assessment has not been extensively studied, the potential for its use is promising. A workshop was organized to evaluate its feasibility in political risk identification and assessment and whether ChatGPT can facilitate these processes. The findings from this workshop provide insights into its applicability and effectiveness in the context of political risk identification and assessment, which will be discussed in the next chapter.

CHAPTER 6

EXPLORING THE USE OF CHATGPT FOR POLITICAL RISK ASSESSMENT VIA A PARTICIPATIVE WORKSHOP

6.1 Introduction

ChatGPT, an advanced AI language model developed by OpenAI, is designed to assist users in tasks such as information gathering, analysis, and problem-solving through natural language processing. The rapid advances in artificial intelligence (AI) and subsequent developments in tools like ChatGPT have accelerated its application across various sectors. However, as with previous technological innovations, the unique characteristics of the construction industry have delayed the adoption of ChatGPT in this field. Similarly, research specifically focusing on ChatGPT's application in country risk assessment within construction is limited and remains largely unexplored. However, given the vital impact of political risks on construction projects, evaluating ChatGPT's performance in country/political risk identification and assessment is essential for understanding its potential and identifying its limitations.

Moreover, existing research in the risk management domain using both less advanced models like OpenAI's GPT-3.5 and more advanced ones like GPT-4 indicates that older models often exhibited critical errors, such as failing to adjust responses despite changes in the country or region specified in the prompts. Therefore, assessing the performance of the latest version, ChatGPT-4, in political risk identification and assessment is crucial for its potential adoption in the construction industry. Thus, political risk assessment processes can be facilitated.

The literature frequently emphasizes the significance of prompts, specific instructions or questions that guide ChatGPT's responses, on ChatGPT's

performance. Therefore, in studies evaluating ChatGPT, it is crucial for experts to not only review the results but also design the prompts themselves, ensuring that those analyzing the outcomes are the same individuals who created the prompts. This underscores the importance/necessity of hands-on sessions where experts themselves input prompts, guaranteeing that the findings are directly influenced by those with relevant expertise. However, in the literature, focus group studies exploring ChatGPT for risk management often have prompts input by the study's author, which are then evaluated by experts.

Current literature reveals a lack of studies specifically evaluating the use of ChatGPT for country/political risk identification and assessment. Moreover, studies examining the role of ChatGPT in risk management processes, particularly through applied studies, including hands-on sessions, are scarce. To address these gaps, there should be hands-on sessions like workshops that focus on practical applications and real-world scenarios. These workshops would provide participants with the opportunity to engage directly with ChatGPT, exploring its capabilities and limitations in risk management contexts.

Within the scope of this thesis, a workshop has been designed to examine the performance of GPT-4, one of the latest models, in country risk identification and assessment processes. Four experts with many years of experience in the field directly interacted with GPT-4 during the Workshop, gaining first-hand experience, particularly in the realm of political risk assessment. During the hands-on application, they reviewed the responses they received from ChatGPT after entering their prompts. The primary objectives of the Workshop include evaluating ChatGPT's performance in political risk assessment, exploring the practical applications of ChatGPT, and gathering expert opinions/feedback on its usability in construction project management, potentially bridging research gaps.

This Chapter begins by presenting related ChatGPT studies in the risk management literature in the "Related Works" section. Then, the conduct of the Workshop, the sections included, and the details of the data collection process are explained in the

“Workshop” section. The findings are discussed in the “Results and Discussion” section, with the conclusions drawn in the final section.

6.2 Related Works

This section presents previous studies to understand the evolution and integration of AI in the construction industry’s risk management field. Exploring these studies provides a contextual backdrop to current examination of ChatGPT’s potential in political risk assessment, setting the stage for understanding how AI’s capabilities and applications have been evaluated and adopted in similar contexts.

With the development of conversational AI, there has been a notable shift towards leveraging chatbots and other AI-generated tools for various applications. ChatGPT, for instance, has emerged as a significant player in this space, potentially transforming risk management processes. Some assessments in the literature utilize expert opinions to gauge AI effectiveness, while others rely on empirical data without expert intervention. These related studies are given below (Ozyurt et al., 2024).

Barcaui and Monat (2023) conducted an empirical comparison between generative AI, specifically GPT-4, and human project managers in developing project plans within the digital technology sector. The study utilised a primarily qualitative methodology to examine critical aspects of project planning such as scope, schedule, cost, resources, and risk management and evaluated risk management strategies in project plans created by a generative AI system and a human project manager. The findings indicate that, the AI-generated plan was thorough, encompassing risk identification, assessment, and response across various domains. It covered qualitative and quantitative evaluations, enabling focused risk prioritization and detailed response strategies. Conversely, the human-generated plan predominantly emphasised risk identification, lacking a comprehensive framework for assessment or management, and was devoid of categorisation and specified reaction tactics. This

lowered its efficacy in preparing the project team for prospective difficulties. Conversely, the AI's systematic methodology markedly improved the project's capacity to handle risks efficiently. The study emphasised the collaboration between human expertise and AI in project management, suggesting for an integrated approach for comprehensive and efficient project planning (Barcaui and Monat, 2023).

Klepo et al. (2023) employed ChatGPT to assess risk response strategies and to highlight its strengths and weaknesses. The researchers concentrated on identifying and assessing important risks encountered by project managers (PMs) and comparing the risk response strategies proposed by PMs and artificial intelligence (AI). The authors employed OpenAI's ChatGPT version 3.5 as an AI tool. The study employed a risk matrix model tailored for water infrastructure to classify risks and response strategies, revealing that AI may markedly improve the efficacy of risk management by rapidly detecting potential issues and proposing effective mitigation strategies. The study underscored the importance of human oversight in ultimate decision-making to mitigate AI limitations, including context comprehension and the requirement for high-quality data inputs. The overlap of project management and AI-generated strategies was roughly 52%, indicating AI's role as a complementary instrument rather than a substitute for human proficiency in project risk management (Klepo et al., 2023).

A unique study evaluated ChatGPT's capabilities through a conversational methodology to examine its efficacy in quantitative risk management. Hofert (2023) assessed the efficacy of GPT-3.5 in comprehending and performing activities associated with quantitative risk management. The study utilised a conversational methodology to evaluate the capabilities of GPT-3.5. The AI was presented with multiple enquiries regarding risk management, and its answers were evaluated for accuracy and comprehension depth. The questions encompassed definitions of risk, classifications of risk, and comprehensive scenarios such as the 2007-2009 financial crisis, examining the AI's capacity to address both theoretical and practical

dimensions of risk management. The research revealed multiple significant findings: ChatGPT encounters difficulties with exact mathematical enquiries, frequently generating convincing but incorrect responses because to its predictive characteristics. It sometimes misinterprets subtle enquiries, resulting in errors that underscore the necessity of precise inquiry formulation. The model's static knowledge base inhibits real-time changes, resulting in the recurrence of mistakes and constraining its educational effectiveness. Furthermore, ChatGPT's inconsistent responses may be a disadvantage in situations requiring uniformity. Notwithstanding these constraints, ChatGPT excels in summarising documented subjects, promoting comprehensive understanding and discourse, hence potentially augmenting critical thinking and analytical abilities in educational settings (Hofert, 2023).

Studies also evaluate the outcomes of employing ChatGPT in risk management with expert participation. These studies underscore the nuanced capabilities of ChatGPT in enhancing risk management processes while emphasizing the need for expert oversight. Aladağ's (2023) research evaluated the accuracy of using ChatGPT for risk management in construction projects. It identified that while AI, particularly ChatGPT, has been recognized for its potential to enhance decision-making within risk management, its performance is only moderate. The research assessed ChatGPT's capabilities in managing various risk management sub-processes, including risk identification, analysis, response, and monitoring. The research methodology involved determining Key Performance Indicators (KPIs) for each risk management sub-process, designing a questionnaire based on these KPIs, and subsequently gathering data from ChatGPT. The results obtained by ChatGPT were assessed through expert focus group sessions. This method enabled the assessment of ChatGPT's accuracy in risk identification, analysis, response, and monitoring in various construction project types. The researcher employed ChatGPT-4 to collect data. This study's findings indicated that ChatGPT demonstrates moderate performance in several risk management sub-processes, notably excelling in risk response and monitoring. Nevertheless, it is less effective in risk identification and analysis. Expert evaluations indicated that although ChatGPT can produce a wide

array of risk variables and responses, its accuracy and relevance in identifying and ranking these risks are restricted. The research highlights the necessity for additional human expertise to analyse and modify AI-generated data for practical, context-specific use in construction risk management. This research contributes to understanding the potential and limitations of AI tools in enhancing decision-making processes within the construction industry (Aladağ, 2023).

Al-Mhdawi et al. (2023) further explored this issue by assessing ChatGPT's performance in risk management according to the ISO 31000 standard through a survey of construction and project risk researchers in Iraq. ISO 31000 is an internationally recognised standard for risk management that provides a comprehensive framework for identifying, analysing, assessing, mitigating, monitoring, and communicating risks. This study identified 12 indicators for evaluating ChatGPT's effectiveness in managing construction risks according to ISO 31000, then established the primary criteria for evaluating these indicators, and developed a fuzzy-based evaluation model to quantify ChatGPT's performance by measuring the variability and significance of the identified performance indicators. ChatGPT showed considerable effectiveness in managing project risks in accordance with the ISO 31000 standard, mostly by offering pertinent risk mitigation measures that markedly enhanced outcomes. The study emphasised the importance of exercising caution when depending solely on ChatGPT for risk assessment and prioritisation, as manual review and verification are vital for assuring accuracy and reliability (Al-Mhdawi et al., 2023).

Nyqvist et al. (2024) employed a unique methodology to assess AI through investigating ChatGPT-4 in construction project risk management (CPRM) and comparing its efficacy with that of 16 human risk management specialists from Finnish construction firms. Their research utilised a mixed-methods approach that incorporated both qualitative and quantitative assessments using anonymous peer reviews. The aim was to create a robust assessment of risk management skills that reflects real-life conditions. This was accomplished by reducing bias towards AI or

human answers through anonymous peer assessments. The results demonstrated that ChatGPT-4 produces thorough risk management strategies, markedly surpassing human experts in quantitative assessments. In the assessment conducted by human reviewers, human experts received an average score of 5.7, while ChatGPT obtained an average score of 8.6. The average was calculated using risk identification, risk analysis, and control according to the methodology proposed by the authors. Nonetheless, despite its advanced data processing capabilities, the AI's risk management strategies were deficient in practicality and specificity, domains in which human experts demonstrated superior performance. This study highlights the potential of AI to enhance human capacities in CPRM, supporting for a collaborative model in which AI functions as an augmentative tool, improving the effectiveness of human decision-making in risk management (Nyqvist et al., 2024).

Concluding the discussion on AI in risk management, Yazdi et al. (2024) conducted a comprehensive analysis of AI applications in risk management, contrasting AI-enhanced methods with conventional ways and addressing the growing difficulties and opportunities. The authors examined how AI, namely deep learning and convolutional neural networks, might be utilised to improve risk assessment processes by providing more precise and prompt insights. They emphasised the necessity of integrating AI with domain-specific expertise to overcome AI's limitations in contextual interpretation. The comparative study was based on case studies that demonstrate AI's ability to enhance the efficiency and effectiveness of risk assessments across various industries. The study emphasised the revolutionary capacity of AI in risk management, recommending continued research to enhance its incorporation into current frameworks (Yazdi et al., 2024).

Current literature reveals a lack of studies specifically evaluating the use of ChatGPT for country/political risk identification and assessment. Moreover, studies examining the role of ChatGPT in risk management processes, particularly through interactive studies with experts including hands-on sessions, are scarce. The Workshop designed for this thesis, intended to fill these gaps, is presented below.

6.3 Participative Workshop with Industry Professionals

The workshop was focused on evaluating ChatGPT's capabilities in assessing political risks within the domain of construction project risk management. The primary objectives of the workshop include evaluating ChatGPT's performance in political risk identification and assessment, exploring the practical applications of ChatGPT in real-world scenarios, its potential for the future by gathering expert opinions/feedback on its usability in construction projects, and potentially bridging research gaps. The workshop was structured into three main sessions to maximize the participants' engagement and the depth of analysis regarding using ChatGPT in country/political risk assessment within construction project management:

1. Open-ended questions about country risk assessment to understand the current experiences and practices of the participants.
2. A hands-on session where participants interacted with ChatGPT to evaluate its ability to identify and assess political risks by considering specific countries and scenarios.
3. A group discussion and feedback session where participants shared their experiences and discussed the benefits, limitations, and potential improvements for ChatGPT in the context of political risk assessment in construction projects.

The workshop begins with open-ended discussions about current practices in country risk assessment, laying a foundation for subsequent evaluations of ChatGPT. The second part involves a hands-on session, where participants directly engage/interact with ChatGPT, simulating the assessment of political risks across various countries and gaining first-hand experience and insights into its functionalities and limitations. This phase is designed to provide insights into the AI's operational capabilities and limitations. The final part of the workshop involves a detailed group discussion and feedback session. This critical part of the workshop facilitates a comprehensive exchange of views on ChatGPT's performance and discusses potential enhancements

and future applications. The qualitative data gathered from these discussions aim to deepen the understanding of ChatGPT’s role in political risk assessment and its broader implications for the construction industry. The discussions and findings from the workshop aimed to gather insights into the usability, accuracy, effectiveness, trustworthiness, and integration into risk management processes, with a focus on providing expert feedback, including ethical considerations and the long-term implications of using AI in political risk assessment. The sequence of the workshop is presented in Figure 6.1



Figure 6.1. Workshop Agenda

The workshop featured a carefully selected group of experts who engaged with ChatGPT to assess its effectiveness and performance compared to conventional methods. A select group of four experts experienced in construction project management participated in this study, bringing together diverse backgrounds and specific expertise. Experts’ profile including both personal and company information can be found in Table below.

Table 6.1. The Demographic Information of The Experts

	Academic Background	Professional Experience in Construction	Knowledge in Country Risk Management	Knowledge in ChatGPT
Expert 1	Civil Engineering M.Sc., Ph.D. Candidate	More than 26 years	High	Medium

Table 6.1. The demographic information of the experts (cont)

Expert 2	Civil Engineering M.Sc.	6-15 years	Medium	High
Expert 3	Civil Engineering M.Sc., Ph.D. Candidate	6-15 years	High	Medium
Expert 4	Civil Engineering Ph.D.	6-15 years	High	Medium

	Annual Return of Company	Type of Company	Age of Company	Fields of Activity
Expert 1	700 million TL+	Contractor	0-10 years	Energy structures
Expert 2	700 million TL+	Contractor, investor	51 years and more	Housing, commercial and state buildings, transportation, energy structures, water structures, industrial plants
Expert 3	700 million TL+	Design/ project company, consultancy firm	41-50 years	Housing, commercial and state buildings, transportation, energy structures, industrial plants
Expert 4	0-200 million TL	Consultancy firm	0-10 years	Consulting in civil engineering

6.3.1 Open-ended Questions about Experience with ChatGPT

The first session, “Open-ended questions about experience with ChatGPT,” focused on gathering preliminary information from the experts regarding their prior experiences with ChatGPT or similar AI tools in their professional settings. The primary objective was to determine the level of familiarity with ChatGPT and prior usage of AI technologies among the experts, especially in the context of country risk assessment.

The data collection process commenced with an initial session to gather insights into the participants’ previous experiences with AI tools. During this session, the experts posed two specific questions: “Do you have any experience with ChatGPT or similar AI tools within your organization or in your professional work?” Moreover, “Have you used ChatGPT to conduct country risk assessments?”

The experts responded individually. Their answers indicated that while all participants had prior experience using ChatGPT or similar tools in their professional activities for general purposes, none had explicitly utilized these tools for conducting country risk assessments and had seen them used for this purpose before. This insight was significant as it established a context of familiarity with AI tools among the participants and highlighted a gap in applying such tools to the specific area of country risk assessment in construction project management.

Following this exploratory inquiry, the workshop moved into the hands-on session, where participants were poised to engage directly with ChatGPT in a structured exploration of its political risk identification and assessment capabilities.

6.3.2 Hands-On Session

Following the initial phase, the workshop transitioned into a practical “Hands-on Session” in which ChatGPT was actively utilized within carefully designed scenarios. In this session, experts applied ChatGPT to simulated scenarios that

involved identifying and assessing political risks in construction projects. This session allowed participants to directly interact with the ChatGPT, exploring its functionalities and assessing its performance in real-world scenarios.

The workshop utilized a structured, hands-on approach to evaluate ChatGPT's performance in identifying and assessing political risks within construction project management. The participants were divided into two groups, each consisting of two members. Each pair adopted a specific scenario reflective of real-world conditions to enrich the context of their evaluations.

The first group (Expert 1 and Expert 2) identified themselves as risk experts working as a general contractor for a Turkish construction company planning an oil and gas project in Basrah, Iraq, with a lump-sum payment contract under the FIDIC Silver form and EPC contract; the employer of this project was the Iraqi State Organization for Marketing of Oil (SOMO). On the other hand, the second group (Expert 3 and Expert 4) assumed the role of a contractor company experienced in the transportation sector, tasked explicitly with preparing tenders for a 100 km railway project in Kashmir, India, within the scope of the FIDIC silver book 2017 edition.

Both groups independently conducted hands-on sessions on separate computers to ensure that the responses could be discussed within the groups, applying ChatGPT to their respective scenarios. Each group interacted with ChatGPT (GPT-4 version), inputting specific/tailored prompts to simulate identifying and assessing political risks for their respective projects.

A comprehensive set of tasks, outlined below, was designed to assess the utility and performance of ChatGPT in handling the political risk assessment for construction projects, from identification and assessment to prioritization and adaptation/response to changes. During the sessions, informative handouts were provided to participants as foundational knowledge. These handouts were intended to offer a basic understanding while encouraging unbiased interaction. Participants were then invited to freely engage with ChatGPT to evaluate its capability in identifying and

assessing political risks in international construction projects. Accordingly, they engaged with ChatGPT on these tasks to evaluate ChatGPT's performance.

- Compare ChatGPT's responses with pre-existing knowledge of the project's country to evaluate the accuracy and relevance of the AI's risk assessments.
- Assess ChatGPT's ability to recognize and assess potential political risks and their nuances.
- Test the AI's proficiency in illustrating the relationships among identified risks and their potential interactions.
- Evaluate the capability of ChatGPT to generate a Risk Breakdown Structure (RBS) and its effectiveness in categorizing risks into a hierarchical format.
- Investigate ChatGPT's capacity to update risk assessments in response to new information or changing circumstances.
- Evaluate ChatGPT's proficiency in risk assessment and prioritization, specifically its ability to systematically assess and rank risks according to their significance relative to the construction project.

This workshop environment provided a platform for assessing the AI's capabilities and allowing participants to engage deeply with the tool, thereby generating rich qualitative data for analysis. Ongoing sharing of insights and findings was encouraged, fostering a collaborative and iterative review process throughout the hands-on session.

6.3.3 Group Discussion and Feedback Session

The workshop concluded with a comprehensive "Group Discussion and Feedback Session" where participants were encouraged to share their experiences, feedback, and insights from the hands-on activities.

Following the hands-on sessions, experts engaged in a detailed group discussion to evaluate ChatGPT's performance in political risk assessment for construction

projects. This discussion focused on ChatGPT's utility, accuracy, relevance, suitability, usability, and limitations. They shared their findings regarding the scenarios they used and their insights on the performance of ChatGPT.

Key areas discussed included its ability to identify and assess political risks, map risk relationships, generate a Risk Breakdown Structure (RBS), and respond to new or changing information. The discussion also provided a forum for participants to exchange views, pose questions, and voice their opinions.

6.3.4 Insights from the Hands-On Session

This section presents the findings from the Hands-On Session of the workshop, detailing the responses from ChatGPT to the prompts designed by the participants and their evaluations of these responses. Initially, the results from the first group, which selected the project in Iraq, are discussed, followed by the findings of the second group, which chose the project in India. An overall evaluation and discussion of the results conclude this section.

6.3.4.1 Group 1

This discussion starts with the results from the first group, which focused on a project in Iraq. This group emphasized/ highlighted the importance of project descriptions and related parameters (such as type of contract, type of employer, type of payment, designer, form of contract, currency of payment, and governing law of the contract) in their scenarios and aimed to determine if ChatGPT was aware of how these characteristics could influence country/political risks.

They introduced themselves and the project details, then began their session by asking ChatGPT to "Rank the top ten country risk factors from highest to lowest for a political risk report." The response received was deemed generally successful in reflecting country-specific risks, setting a benchmark for further nuanced inquiries.

Their initial prompt, which can be found in the Appendix C, laid the groundwork for further investigations. Subsequently, the participants methodically modified various parameters in their prompts to evaluate ChatGPT's responsiveness to changes and its ability to adjust its risk identification and rankings appropriately. Expert 1 emphasized the importance of these parameter changes, expressing a keen interest in determining whether ChatGPT was aware of the impacts these changes could have on risk identification and whether ChatGPT could recognize changes and adjust risk identification and rankings accordingly or not.

To facilitate a clearer observation of ChatGPT's adaptive responses, they made changes incrementally. Specifically, each modification was implemented by maintaining the previous changes as constant and only altering one additional parameter at a time. This sequential adjustment strategy was designed to test the model's capacity to integrate and reflect incremental changes accurately within its risk assessments.

In the following paragraphs, the author presents the interactions, the highlighted results from ChatGPT, and insights from this group during the hands-on session. Details of their prompts and the corresponding responses are provided in Appendix C. The following paragraphs aim to evaluate ChatGPT's performance under specified conditions, with different aspects emphasized depending on the intended focus of the analysis. Information about the setup and the experts' analytical processes, detailing both the experts' actions and ChatGPT's responses, is discussed, respectively. Each of these trials or experiments is delineated by numbering below.

1. Firstly, the experts altered the prompt to include the US Dollar as the currency by asking, *"Can you please revise your answer with the currency of payment as US dollars?"* The group appreciated ChatGPT's ability to understand and adjust the ranking of "Currency and Exchange Rate Fluctuations" when the currency information was specified as the US Dollar. The adjustment of this risk ranking downward by ChatGPT was interpreted positively by the experts, as it demonstrated ChatGPT's recognition of the mitigating effects of utilizing a stable currency.

Moreover, ChatGPT's explanation that "the direct impact of currency and exchange rate fluctuations and direct exchange rate risks are mitigated by the use of US dollars" showed its awareness of the effects, which the experts praised. Experts found it favorable and commendable, and they said that ChatGPT not only confirmed its understanding of the economic implications but also showcased its ability to adapt risk assessments based on the information provided. This was commended for effectively capturing the nuances of financial risk in international contexts, affecting political risks.

2. In the next experiment, the experts adjusted for British governing law in the context by asking, "*Can you revise your answers if you consider the governing law as British?*" Incorporating British law as the governing law in their experiment, the participants observed ChatGPT's nuanced response, which included the observation that "The application of British law may offer clarity in some aspects of contract enforcement but also requires careful management of jurisdictional issues and recognition of judgments." This response was notable for its depth, as ChatGPT also addressed regulatory changes, legal systems, and dispute resolution risks, highlighting the complexities of adopting foreign law. The experts were particularly impressed by ChatGPT's ability to foresee the implications of jurisdictional management and the need for careful recognition of judgments, features critical to international legal frameworks. The mention of these specific risk factors was unexpected and highly valued, providing meaningful insights into risk management considerations necessary when British law governs a contract. This understanding demonstrated by ChatGPT was surprising to the experts and deemed beneficial and useful for risk management considerations.

3. In another experiment where the employer was changed from SOMO (Iraqi State Organization for Marketing of Oil) to British Petroleum (British multinational oil and gas company headquartered in London, England), the participants revisited the analysis under the influence of British Law, and try to challenge ChatGPT. ChatGPT's adaptation to this change was tested to see if it could reassess the risks

accordingly. This adjustment led ChatGPT to reassess and shift the ranking of the “Political stability” risk from the first to the second position, which was perceived as an accurate reflection of the scenario. The ability of ChatGPT to adapt its assessment to account for the implications of changing the employer and applying British Law underscored its nuanced understanding of the political dynamics involved.

The experts stated that they were particularly impressed by ChatGPT’s responsiveness in accurately recalibrating the risk rankings in response to these significant changes, effectively recognizing the intricate interplay between the new employer’s background and the legal framework and the risks introduced by this change.

4. During their experiments, the experts adjusted the type of payment. Altering the type of payment from lump sum to cost plus fee (assuming compatibility with FIDIC Silver contract for this scenario) resulted in the “corruption” risk moving higher on the list, while “legal system and dispute resolution” related risks lowered. This adjustment was logical to the experts, reflecting the increased risk of corruption in cost plus fee scenarios due to the greater exposure to opportunistic behaviours. The experts stated that cost plus fee arrangements typically expose projects to higher corruption risks and also noted the greater difficulty in managing corruption under these types of contracts.

The experts appreciated how ChatGPT elevated the ranking of the corruption risk compared to the previous case, recognizing the scenario-specific details effectively. They also acknowledged that the legal system’s risk might be perceived as lower in such setups due to more flexible contract terms. Similarly, they were pleased to see the ranking of the “Local Content Requirements and Labor Relations” risks lowered in this experiment. It can be said that these reflected ChatGPT’s ability to accurately contextualize risk assessments according to the specifics of the payment structure.

However, while these tests showed ChatGPT's capability to understand and adjust to changes, the experts noted critical gaps. During the analysis, they found that the risk related to "Economic Stability and Market Fluctuations" was inappropriately escalated in the rankings following the change to a cost-plus fee structure. The description stating, "The broader economic conditions in Iraq, influenced by global oil prices and internal factors, can significantly affect project costs and financial planning," was critiqued. They found ChatGPT's response misaligned with practical expectations. Experts argued that the cost-plus fee setup should not be sensitive to market fluctuations, and this setup should technically insulate the contractor from market fluctuations, indicating a misunderstanding by ChatGPT from the contractors' perspective. Therefore, ChatGPT was critiqued for not accurately reflecting the contractor's perspective. These observations suggest that while ChatGPT can adapt to changes within given parameters, its current version still requires fine-tuning to fully grasp the implications of complex contract settings accurately. It is not yet ready to be used in risk management processes without careful oversight.

5. When they switched from the FIDIC Silver to the Red Book, changing the project type from EPC to Employer-designed, they expected a reduction in the project risk. However, the outcome from ChatGPT remained unchanged. This response ignored shifts risks that typically arise with such changes in project framework and recognized that the focus remained on country/political risks. They reasoned that since the prompts were written specifically for country/political risks, ChatGPT did not alter the ranking, a response the group considered intelligent.

6. Seeking to further test ChatGPT's adaptability to regional nuances within the same country, the group experimented by changing the project's location from Basrah in the south to Sulaymaniyah in the north. They reused the initial prompt with only the city modification and wondered if ChatGPT would alter its responses. This approach aimed to examine whether the risk assessment would reflect the geopolitical and socio-economic differences between Southern and Northern Iraq.

Namely, the prompt was, *“I am a risk expert working in a construction company in Turkey. We are planning oil and gas project in Sulaymaniyah, Northern (KRG) Iraq as a general contractor.*

Type of contract: EPC

Employer: Iraq Somo Oil and Gas Authority

Type of Payment: Lump sum

Designer: US

Form of Contract: FIDIC Silver

Currency: US Dollar

Governing Law: British

Can you please rank the top 10 country risk factors from highest to lowest for a political risk report?”

As a response, ChatGPT ranked the “Political Stability” risk as the highest, which the experts found to be an accurate assessment. They also agreed with the lowered ranking of the “Security risk,” noting that this region is relatively more secure compared to Basrah. ChatGPT’s response correctly elevated the “International Relations and Sanction Risk,” particularly due to the strained relations between Turkey and neighbouring countries affecting Northern Iraq, which the group found accurate. Expert 1 was particularly impressed with ChatGPT’s ability to capture and articulate such nuanced details, remarking on its unexpected proficiency. The decrease in the ranking of “Corruption Risk” was positively noted, as corruption is generally perceived to be less prevalent in Northern compared to Southern Iraq.

“Legal System and Dispute Resolution Risk” was also ranked lower for the case of Sulaymaniyah, reflecting the region’s more effective legal system. The experts considered this assessment by ChatGPT to be logical, aligning with their understanding of the regional differences in legal effectiveness. They agreed with the lower risk designation for the northern part of the same region, recognizing it as appropriately smaller. Additionally, the inclusion of “Currency and Financial Transfer Risk” was highly valued. This risk was not defined in previous responses

but was included here, reflecting the fundamental challenges in financial transactions in Northern Iraq. The experts appreciated this addition, highlighting real challenges in transferring funds/money within the region, affirming ChatGPT's capability to follow and accurately reflect country-specific dynamics, which is crucial for effective political risk identification and assessment.

Experts noted that when critical changes like regional shifts were made, ChatGPT adjusted the list and rankings, demonstrating command over the necessary details. They were surprised by how accurately ChatGPT could elevate relevant risks from lower to higher rankings based on the modified parameters and provide an explanation for these changes. This indicates that ChatGPT accurately tracks the hypothetical target country; experts also noted that it is crucial for the identification and assessment of political risks.

7. In their subsequent inquiries, instead of conducting a new parameter change, the experts asked ChatGPT, "*What is your reasoning behind this ranking?*" They were impressed with the response and explanations provided. Expert 1 specifically appreciated the mention of a "dual legal system with KRG and Iraqi government relations" and how "British law adds another layer of complexity," commending the AI's apparent awareness of the regulatory complexities involved.

8. The group then expressed interest in the impact of British law and local laws on risk assessments. They hypothesized that changes in legal frameworks should alter the associated risks and used this premise to evaluate ChatGPT's capabilities further. They tried to challenge ChatGPT by changing the Governing Law to local. The results, which showed an increase in the ranking of legal system risks and dispute resolution-related risks when shifting from British to local laws, met both of the experts' expectations and were found intriguing.

Expert 1 noted that he had not anticipated the current outputs of ChatGPT based on his previous experiences with GPT-3.5, where the previous outputs were less aligned with real-world complexities. He stated that the immediate adjustment of rankings

in response to the change from British to local law was particularly noteworthy. He emphasized how the model's ability to correctly elevate the importance of certain risks based on the changed parameters was both surprising and indicative of significant improvements in the model's functionality.

9. In their following experiments, the experts decided to shift the geographic focus from Iraq to Egypt, which they considered to be relatively safer, to see how ChatGPT would handle a different challenge. They entered a new prompt specifying the city of Cairo in Egypt as a different city and country, aiming to observe how the AI would adapt its risk assessments to this new regional setting.

During their experiment, the experts encountered an oversight concerning the employer information in their project description and made a mistake while writing their prompt. Initially, they intended to specify British Petroleum (BP) as "the employer"; however, due to a copy-paste error in the prompt, "the employer" was mistakenly given/ remained as SOMO, an Iraqi state company, which was inappropriate for the context. This discrepancy led to unexpected results from ChatGPT during evaluation, especially when assessing the project in Egypt, where the implications of having an Iraqi state company as the employer differ significantly from those associated with BP.

10. This mistake was not immediately recognized, leading the experts to initially believe that errors were present in ChatGPT's responses. They proceeded to alter the local law to British law, still under the assumption that the employer was correctly listed as BP. Upon they noticed no change in the ranking for "Legal System and Dispute Resolution" despite the law change, they questioned ChatGPT: "*When changing from local law to British law, why has the rank of 'Legal System and Dispute Resolution' stayed the same?*" In response, ChatGPT updated and corrected its previous answers upon re-evaluation.

In the course of their analysis, they interpreted that ChatGPT made an update in its response as when a prompt was entered that implied/suggested that ChatGPT may

have made a mistake/a potential error, it revised its previous responses when it was pointed out. This behaviour was interpreted as an indication that ChatGPT can acknowledge its mistakes and try to make corrections when provided feedback points out inaccuracies.

The realization of the mistake of “the employer” occurred during the final stages of their experiment, particularly when they were focusing on the “risk reporting” step. Previously, the experts’ attention had been primarily on individual identified risk items, which allowed the employer’s error to go unnoticed. Once they realized/identified the mistake, they corrected the employer information from SOMO to BP and retested the scenario, leading to more appropriate outcomes. The ability to adjust responses upon receiving new or corrected information underscores the importance of interactive feedback mechanisms in the deployment of AI technologies in real-world applications.

This incident highlighted the critical interplay between user inputs and ChatGPT’s responses, emphasizing the importance of accuracy in data entry for reliable AI performance. The detailed exploration of this error and its implications on the interaction between ChatGPT and users will be elaborated in the final section of this Chapter, providing a comprehensive overview of the lessons learned from this aspect of the study.

11. They further explored the relationships and correlations among risks by asking, “*Are these risks interrelated?*” ChatGPT’s responses, such as “Infrastructure and logistics are related to economic stability” and “Corruption and bureaucracy are related to international relations,” were deemed accurate and logical. The experts found it noteworthy that ChatGPT could effectively identify these interrelations. They stated that it was very interesting that it could achieve this and that they wondered how it could know this data, praising its capability.

12. In the next experiment, the group asked by prompting, “*Can you generate the risk breakdown structure?*”. However, when the group requested ChatGPT to

generate a Risk Breakdown Structure (RBS), it responded that it intended to create a diagrammatic response but was unable to execute the code necessary for such a visual representation. It was unsuccessful and failed to produce a satisfactory outcome. The group found the inability of ChatGPT to provide an RBS insufficient directly and noted its inadequacy in this area.

Although ChatGPT was unable to generate a Risk Breakdown Structure (RBS), it demonstrated knowledge about RBS by providing a clear description. It explained, “This visualization organizes the identified risks into categories, showing how each group branches into more specific risks. This structure can be a useful tool for systematically identifying, analyzing, and managing project risks across different dimensions.” This response indicated that while ChatGPT possesses an understanding of RBS concepts, it could not produce a project-specific outcome.

When ChatGPT used a statement as “Here is the Risk Breakdown Structure” and referenced the term “This visualization,” experts prompted it again with “*form a visual for the risk breakdown structure*” to clarify the request. Despite this, it resulted in ChatGPT’s failure to generate an RBS, highlighting a limitation in its ability to produce visual content. The participants/experts concluded that, although it has theoretical knowledge of risk management structures, the practical application of creating a tailored RBS for the specific project scenario remained a challenge. This observation highlights a gap between ChatGPT’s conceptual knowledge and its application capabilities, suggesting areas for further development in its programming to enhance its utility in risk management tasks.

13. In the later stages of the workshop, participants moved on to assessing ChatGPT’s ability to generate a risk report by posing the question, “*Can you turn the identified political risks into a risk report?*” The generated report comprised an “Executive Summary,” a section with four identified political risks, four items under “Risk Analysis,” four under “Risk Mitigation Strategies,” and a brief concluding paragraph. Participants remarked that the report’s format and headings were reasonably structured but found the content, consisting mainly of brief, bullet-point

descriptions, overly simplistic rather than being tailored to the specific context of Egypt. They noted that some items were too generalized and lacked specificity, particularly in relation to the last prompt that focused on Egypt, expecting more country-specific details, which were absent.

Unexpectedly, ChatGPT included the “Risk Mitigation Strategies” section, which had not been specifically requested and did not appear in previous prompts. Participants considered this section to contain generic information that seemed derived from a standard report template. Therefore, they concluded that while the report might serve as a supplementary resource, it would require significant modifications before it could be practically applied.

During the workshop, the experts embarked on a meticulous examination of ChatGPT’s responsiveness to parameter changes within risk assessment scenarios. They initiated their tests by implementing adjustments such as modifying the currency to the US Dollar, incorporating British Governing Law, changing the employer to British Petroleum, and altering the type of payment to Cost Plus Fee. These modifications were aimed at probing ChatGPT’s adaptability and accuracy in reflecting the nuances of these changes in the risk rankings.

The results of these manipulations were generally well-received by the group, who found ChatGPT’s ability to update its responses according to the changes both accurate and impressive. In particular, they appreciated the model’s capacity to adjust risk rankings appropriately, demonstrating a keen awareness of how various project components could impact risk assessment. However, the experts noted that while the responses were largely aligned with the introduced changes, there were instances of inconsistency where ChatGPT did not fully grasp the implications of the complex contractual settings.

Furthermore, the session highlighted the critical importance of precise prompt formulation, especially in a field as intricate as risk management. The experts discussed the emerging role of prompt engineering, emphasizing that even those with

deep knowledge of risk and technological expertise can make oversight errors that significantly influence the output of a prompt-driven tool like ChatGPT. This observation underscored the necessity of meticulous attention in crafting prompts to ensure that the interactions with AI yield relevant and accurate responses.

Despite these positive outcomes, ChatGPT's performance had notable limitations. The model occasionally failed to adopt the contractor's perspective adequately, which could potentially lead to a misjudgement of the project risks. This limitation points to a need for continuous critical assessment and calibration of AI tools to better align with specific industry needs.

In their discussions, the experts also remarked on an interesting behavioural pattern of ChatGPT: its tendency to misinterpret clarification questions as indications of errors, often leading to unnecessary apologies. This behaviour highlighted a potential area for improvement in how ChatGPT interprets user intent and responds to queries. It was particularly evident when the model would acknowledge mistakes apologetically in response to doubt-expressing questions like "Are you sure?", without actually making substantive changes to its previous answers.

In conclusion, this Group 1's interactions provided valuable insights into ChatGPT's utility in political/country risk assessment, showcasing its potential while also delineating its current limitations. The experiments conducted by the group demonstrated that while ChatGPT can effectively adapt to certain changes, its application in real-world risk management scenarios must be managed with expert oversight to fully leverage its capabilities. The findings suggest ongoing training and refinement are essential for AI tools to meet the complex demands of industry-specific risk assessments, confirming the necessity of expert involvement in the deployment of such technologies.

Overall Findings of Group 1: At this "hands-on session", Group 1 and Group 2 progressed in parallel. Following this stage, the workshop transitioned to a "group discussion phase" where both groups discussed and exchanged their experiences and

insights. Before summarising the second group findings and progressing to the group discussion phase, it is important to note some key points regarding the interactions within this group:

1. During their interactions, the experts sometimes proceeded based on some assumptions (e.g., assuming compatibility with the FIDIC Silver contract for this scenario) for their assessments. However, it should be noted that these assumptions may require explicit clarification and careful consideration in the case of an actual project.

2. In the course of the parameter-changing experiments, it is crucial to understand that experts might not always maintain a neutral perspective in subsequent prompts following a successful response. For instance, the lack of response change when the type of FIDIC contract was altered, was positively regarded, possibly due to a tendency to view results favourably after a series of successful interactions. However, it would be appropriate to investigate if a more critical and sceptical view might have led to a different interpretation. This workshop involved a diverse focus group composed of experts who were well-versed in their fields, experienced in risk management, and familiar with ChatGPT. Despite their expertise, there might be an inclination to adopt a positive perspective following initial satisfactory responses from ChatGPT as a human being. This raises a question for future research: Could different interpretations have emerged if the unchanged response by ChatGPT had been the first encountered during the session instead of following a series of successful responses? This scenario presents a potential research question for future studies evaluating AI chatbots.

This consideration underscores the significance of the order in which prompts are crafted during the interactions with ChatGPT. Planning the sequence of prompts in the setup of hands-on sessions can impact the assessment of tools like ChatGPT, suggesting that the design of such evaluations should carefully account for potential biases introduced by the order of interactions.

3. The comprehensive analysis of the results demonstrated that ChatGPT generally updated its responses to align with the changes introduced, which the experts found accurate and impressive. In general, the group found ChatGPT's awareness of the elements involved in political/country risk management to be better than they had anticipated. They appreciated how ChatGPT shifted/adjusted risk rankings appropriately and showed an understanding of the impact of project components on these rankings. While the adjustments were generally accurate and reflected a solid grasp of political and country risk management principles, there were occasional inconsistencies. The experts emphasized the need for careful and knowledgeable handling by users familiar with the subject matter when employing ChatGPT for such specialized political risks-related tasks. This reflection highlighted ChatGPT's potential utility in country/political risk assessment while underscoring the importance of expert oversight to harness its capabilities effectively.

During the workshop, the critical importance of precise prompt formulation was underscored, emphasizing that even experts in risk management and technology may be prone to errors of oversight and carelessness. This case also highlights the importance of the emerging field of prompt engineering, where professionals aid in crafting prompts that effectively communicate with AI technologies like ChatGPT. Given the complex and multidimensional nature of topics such as country and political risks, the quality of prompt input significantly influences the output. This session illuminated that prompt crafting is not merely a technical task but a nuanced form of communication that requires meticulous attention to detail. The nature of ChatGPT being prompt-driven necessitates a high level of precision in prompt formulation to ensure accurate and relevant responses, underscoring the importance of vigilance in interactions with AI systems.

4. Despite these positive aspects, the experts identified significant limitations/shortcomings in ChatGPT's capabilities. Notably, they pointed out the occasion when ChatGPT failed to adopt the perspective of the contractor, which could lead to gaps in understanding and assessing the project risks accurately. This highlights the

need for continuous critical assessment when utilizing AI tools like ChatGPT in complex decision-making processes.

5. During the workshop, it was emphasized that while ChatGPT has the capacity to correct its errors, it sometimes misinterprets clarification questions from experts, which intended to make the responses clear, as indications of its errors/faults, leading to unnecessary apologetic responses such as “I apologize, that was my mistake.” This tendency to assume error can lead to redundant corrections and highlights an area for improvement in the model’s interpretation of user intents during interactions. This insight was particularly noted during brainstorming sessions, pointing to the need for further refinement in how ChatGPT assesses and responds to queries. Additionally, it was observed that ChatGPT might acknowledge a mistake directly apologetically in response to questions like “Are you sure?” that suggest doubt about its accuracy without actually making any changes or corrections to its initial answers. This behavior suggests a misalignment between the model’s perceived errors and its actual response modifications.

6. Each of this group’s experiments revealed ChatGPT’s understanding of complex scenarios but also highlighted critical areas where its model could misinterpret the implications of certain changes, particularly in highly specialized contexts like country risk management under varying contractual and legal frameworks in the construction area. This detailed examination of this group’s interaction underscores the necessity for ongoing training and refinement of AI tools to better align with the intricacies of industry-specific risk assessments.

These insights into ChatGPT’s performance illustrate both its potential and its limitations in adapting to complex, scenario-specific changes in political risk assessment, highlighting areas for future improvement and the necessity for ongoing calibration in real-world applications.

To sum up, the experts of this group mainly aimed to evaluate ChatGPT’s ability to recognize and adapt to changes/variations in parameters during the risk assessment

process, while they completed the other tasks in the distributed step-by-step guide. They tested ChatGPT's understanding of how project components influence risk ranking. Their strategy included modifications such as currency adjustment to the US Dollar, incorporation of British governing law, changing the employer to British petroleum, and modification of the type of payment to cost plus fee. The experts were generally pleased with the responses, noting that ChatGPT accurately reflected the changes made, which they found surprisingly useful for risk management considerations. However, they also expressed caution, emphasizing the importance of being careful and not trusting the responses too hastily, directly or unconditionally.

6.3.4.2 Group 2

The second group selected India as the country of interest and progressed through a scenario involving the tendering phase of a 100 km railway project. Initially, they aimed to identify risks and then specifically focus on political risks. Unlike the other group, this group did not investigate detailed parameter changes in the project description. Instead, they used ChatGPT directly to make "go or no-go" decisions in their scenario, subsequently following a step-by-step guide.

The initial prompt used by this group was designed to establish a baseline understanding of the risks associated with the project. Their exploration began with a prompt aimed at identifying a set of 10 risks related to a railway project in India, designed to inform a go or no-go decision. *"We are a contractor company experienced in transportation sector and preparing a tender which is about engineering procurement construction of railway project having 100 km in length in India under FIDIC silver book 2017 edition. Accordingly, can you indicate a set of 10 risks related the railway project constructed in India for go or no-go decision?"*

Upon receiving the initial list of risks, the group found that while the responses were overall/ generally appropriate, they were not as specific enough to India as they had

hoped. The risks identified were suitable for any similar project or most projects of this nature rather than being specifically tailored to the unique challenges of operating in India. ChatGPT did not address the difficulties of operating in India; namely, they lacked localization.

The experts also stressed the importance of understanding both national and regional political/country risks. This underscored the necessity of clear and precise prompts to derive specific and actionable insights from ChatGPT, particularly in complex and localized risk assessments.

Understanding the need for more specificity, the participants modified their scenario to focus on Kashmir, a conflict-prone region with unique political challenges due to its geopolitical tensions with neighbouring Pakistan. From this perspective, in entering prompts, they approached similarly to the first group by specifying not just the country but also the city/region. Both groups highlighted the importance of mentioning the relevant region of the country when assessing country/political risks, emphasizing that project risk management must consider the specific regional contexts to ensure accurate and comprehensive risk evaluation. They adjusted their scenario to specify, *“This project will be located in Kashmir State, please list it accordingly”*, hoping for more targeted insights (aiming to receive more targeted insights). The response to this adjusted prompt was more aligned with their expectations, providing a more accurate/ nuanced view of the risks specific to Kashmir, particularly in terms of country risks. The list noted *“taking into account the unique geographical, political, and social landscape of Kashmir”* tailoring the conditions of the region.

To further focus on political risks and to investigate political risks, they posed another query: *“Please identify 20 political risks for this project.”* However, the response remained too broadly framed/overly general, leading the group to seek more concrete examples. The experts critiqued the generic nature of the risks listed, which lacked the specific regional focus necessary for meaningful risk assessment in Kashmir. The experts noted that while ChatGPT listed risks such as labour law,

trade restrictions, and nationalization, both the titles and descriptions of these risks were too broad and not sufficiently tailored to the specific political climate of Kashmir or the project's unique demands. The experts expected Kashmir-specific risks to be highlighted, particularly those unique to the region or pertinent to the current geopolitical landscape as well as the project's context.

It was observed that, unlike the other group that provided detailed project descriptions, including aspects such as "employer" and "governing law," this group's initial lack of specificity in the prompts led to less targeted responses from ChatGPT. This comparison underlined the importance of providing more specific project input in achieving more focused and useful outputs from AI interactions. The detailed inputs prompted more specific and explanatory responses from ChatGPT. Learning from this, the group sought to enhance the specificity of their prompts to extract more targeted information.

They decided to refine their approach to elicit more customized responses. To enhance the specificity of the responses, the experts input a new prompt requesting ChatGPT to "*give examples for each of the 20 identified risks*", anticipating detailed examples pertinent to Kashmir, India. However, ChatGPT elaborated on how each risk could impact a railway project in a geopolitically sensitive region like Kashmir. ChatGPT's elaboration with general statements such as "illustrating how they could impact a railway project in a geopolitically sensitive region like Kashmir" did not meet the experts' expectations. In its response, ChatGPT concluded, "Each of these examples illustrates potential challenges that could arise due to political factors, underscoring the importance of thorough risk assessment and management strategies in planning and executing large-scale infrastructure projects in sensitive regions." This led the experts to conclude that although they attempted to align conceptually with ChatGPT on what was needed, the content of the responses remained misaligned/incompatible with their requirements. The provided examples were not in line with the specific "real-life examples of realized risks" the experts were seeking, such as current instances of "corruption," notable political developments

within the country, or changes in “security laws” from 2012 to 2022. The nature of the response underscored the necessity of extremely precise prompts to guide AI toward delivering applicable insights.

To achieve more specificity, the experts refined their strategy and reformulated their prompt by requesting, “*Can you provide real-life examples of realized risks for the predefined 20 risks?*”, hoping to obtain concrete instances of how such risks materialized in this geopolitical context. Experts agreed that ChatGPT’s response, however, remained not as region-specific as desired/needed, extending examples beyond Kashmir to include various global instances, which did not meet the group’s criteria for localized examples. Although ChatGPT identified significant examples such as “geopolitical tension: increased military activities,” the examples provided were not confined to Kashmir as specified; it also included irrelevant global instances such as from Russia, the US, the UK, and Hong Kong. This led to further adjustments in the prompt to explicitly request examples solely pertaining to the Kashmir region.

This led to further refinement of the request. The experts specified their need for examples exclusively from the Kashmir region, prompting them to refine their request with “*please provide these examples only for Kashmir region.*” In response, ChatGPT stated: “Focusing specifically on the Kashmir region presents a challenge in citing direct examples for each of the 20 identified political risks, as information can be sensitive and not all situations have publicly available or widely reported examples. However, I can discuss general situations that have occurred in regions with similar geopolitical complexities, which can offer insights into the kinds of challenges that might arise in Kashmir or have already occurred in a broader context.” The experts stated that even though ChatGPT could eventually grasp the concept of what was requested, the lack of region-specific examples highlighted a significant limitation in its responses. Additionally, this response indicates an awareness of the sensitivity and complexities involved in discussing political issues.

The response to this adjusted prompt was more aligned with their expectations, providing a more accurate and nuanced view of the risks specific to Kashmir,

meeting the group's expectations more closely, and was thus viewed more favorably. Satisfied with the Kashmir-specific examples provided by ChatGPT following this refined and tailored prompt, they decided to proceed with other tasks in their risk identification and assessment process. They then focused on ranking the risks, ordering them by their level of importance.

The group proceeded to examine the importance of the identified risks and focused on risk ranking. They asked, "*Can you briefly identify the importance level of predefined 20 risks from the highest importance to lowest?*" The resultant ranking was generally well-received; notably, the placement of security concerns at the top was deemed appropriate. Expert 4, reflecting on the ranking process, noted that ChatGPT provided qualitative responses from the highest to the lowest importance and expressed curiosity about whether a quantitative ranking on a 1-5 Likert scale could be implemented to assess the risks numerically. Pleased with the qualitative assessment, they further inquired whether ChatGPT could further quantify these rankings and could provide a quantitative ranking on a 1-5 Likert scale.

Subsequently, the group introduced a new prompt: "*Can you quantify importance rankings of the predefined 20 risks using a 1-5 Likert scale, where 1 is for lowest and 5 is for highest importance?*" The response, which omitted the lowest rating of 1, assigning values between 2 and 5 to the risks, prompted the experts to inquire, when they prompted, "*Why is there no risk having a 1 rating level?*" ChatGPT explained that considering the regional context of Kashmir, it was not feasible to assign a 1, suggesting that all risks held substantial relevance. This explanation was approved by Expert 3, who had first-hand experience in the region and agreed that a rating of 1 would not realistically apply to the political dynamics of Kashmir.

The quantitative responses aligned well with their expectations, leading to a discussion about the reasoning behind the rankings. Further inquiries were made about the methodology ChatGPT used in this process. They asked ChatGPT, "*What is your method when you decide on the level of ratings?*" and found ChatGPT's methodological approach and explanations to be thorough. They stated that

ChatGPT's capability to articulate and quantify risk importance provided insightful answers, emphasizing that it was crucial to frame queries explicitly to achieve the desired level of specificity.

Following this, they inquired about the relationships among these risks to further understand the interrelations of the risks. The experts challenged ChatGPT with three concurrent questions: "*Can you define interrelations among these 20 risks? What are the cause-and-effect chains among these risks? What are the interdependencies?*" ChatGPT managed to respond appropriately to all queries simultaneously. The answers, such as the explanation that "regional political instability can exacerbate issues related to land acquisition disputes or labor laws, thereby increasing their impact," were considered appropriate. This demonstrated ChatGPT's ability to handle queries about risk interrelations effectively.

This response was well-received, with Expert 4 appreciating the clarity in the explanation of cause-and-effect relationships and Expert 3 remarking on the efficiency of ChatGPT compared to traditional research methods and efforts. The discussion on interdependencies highlighted accurate identifications, such as the links between foreign investment policies and economic sanctions. The experts praised the comprehensive handling of key interrelations, cause-and-effect chains, and interdependencies. The specificity and appropriateness of the responses to this prompt were satisfactory, allowing the group to move on to other tasks written in the step-by-step guide in the hands-on session.

The session progressed to a request to create a risk breakdown structure (RBS) using the identified risks. The experts prompted, "*With the input of identified risks, can you break down these risk factors into a risk breakdown structure and add this information into a flowchart?*" ChatGPT encountered issues while attempting to create a Risk Breakdown Structure (RBS), acknowledging an error with the statement, "It seems there was an error in my attempt to correct the connections within the risk breakdown structure." It admitted to the failure by noting, "Unfortunately, the tool I'm using to visualize the flowchart has specific syntax

requirements that I did not meet correctly in these attempts.” Consequently, ChatGPT recommended alternative solutions to the user, suggesting, “I recommend using diagramming software like Microsoft Visio, Lucidchart, or even free tools like draw.io to better manage and visualize the flowchart.”

While ChatGPT similarly struggled with this task and failed to produce a visual RBS, unlike the first group, it made several attempts but ultimately suggested the use of specialized diagramming software like Microsoft Visio, Lucidchart, or draw.io for better results. ChatGPT informed the experts that alternative tools could be used to successfully generate an RBS, trying to provide a practical solution to this limitation. Additionally, similar to the first group, ChatGPT provided a theoretical explanation of how an RBS is constructed and displayed a thorough understanding of what constitutes an RBS and the methodology to create one despite the setbacks.

This demonstrated a limitation in ChatGPT’s ability to generate specific graphical representations and create specific visual outputs tailored to particular scenarios, though it clearly understood the conceptual framework (i.e., the concept of an RBS). This limitation underscored the necessity for external tools to supplement AI capabilities in certain complex visual tasks, considering the current version of ChatGPT that was used in this workshop.

In their final assessment, the experts evaluated how ChatGPT’s outputs could serve in the composition of a risk report. They examined whether the generated reports could be directly utilized in risk management documentation. Similar to the first group, this group found the structured format of the report, comprising sections such as Executive Summary, Identified Risks, Risk Interrelations and Dependencies, Risk Management Strategies, Conclusion, and Recommendations, to be well-organized and potentially useful.

The presence of the “Risk Interrelations and Dependencies” and “Recommendations” sections, which were not included in the first group’s report, highlighted the variability in report outcomes based on the prompts given. This

difference showed that the report's format can be influenced by specific prompts, indicating that there is no fixed standard for automated risk report generation.

Expert 4 noted that the Risk Interrelations and Dependencies section contained only a few examples that were overly general and not tailored to the specific geopolitical context of Kashmir. Similarly, she pointed out that the Risk Management Strategies section provided generic, textbook-like information, which did not offer actionable insights specific to the Kashmir scenario. Given that the workshop focused primarily on the identification and assessment stages of risk management, no detailed prompts related to other risk management processes (such as analysis, responses, or strategies) were provided until the final prompt. This might explain the nature of the responses received, which could be seen as understandable.

The group concluded that while the report generated by ChatGPT could serve as a supplementary resource, it was not yet suitable for direct implementation within risk management processes. They believed that while ChatGPT's current capabilities might assist in providing an overview, it lacks the depth required for specific, actionable strategy formulation. However, they remained optimistic about the potential improvements in AI capabilities, suggesting that future advancements could enhance the applicability of such tools in risk management frameworks.

6.3.5 Insights from the Group Discussion and Feedback Session

During the final phase of the workshop, both groups shared and discussed their experiences and insights after completing the reporting tasks. Initially, each group briefly described their scenarios and findings, then proceeded to share their individual and collective interpretations.

- Expert 4 pointed out that most of the responses received seemed to be generic knowledge, suggesting that ChatGPT would likely provide similar responses even if asked about a Risk Report for any country. This was also evident when asking about methodologies, where ChatGPT's responses appeared textbook-

like and accurate, particularly when the experts inquired about the basis of its 1-5 scale assessments. “It seems well-versed in textbook information and responds aptly to general methodological queries,” Expert 4 remarked, noting however that the model’s performance dropped when asked for specific examples pertaining to Kashmir. Another expert in the same group concurred on the matter of textbook knowledge, noting, “Indeed, such responses are independent of a country’s specific nature, whether it may be India, Iraq, or Russia,” supporting this statement with examples. Therefore, it can be said that ChatGPT provides quick and appropriate responses regarding generalized methodological inquiries.

- Expert 2 expressed similar views regarding the generation of the report and the textbook nature of the information ChatGPT provided. She also noted that the output from ChatGPT was probably not satisfactory enough for direct use in an official report/document and would likely necessitate further research and refinement.
- Expert 1, agreeing with the ‘textbook information’ observation, particularly in the reporting segment, highlighted that despite this, both Expert 1 and Expert 2, as a group, found ChatGPT’s performance in ranking risks according to defined parameters to be impressive. They both appreciated its sensitivity to the nuances of the parameters, considering it a success beyond mere textbook knowledge. “Even with numerous changes made, ChatGPT managed to successfully track and adjust to these modifications,” Expert 1 stated, underscoring the model’s robust performance in scenario-based tasks.
- Expert 2 agreed with this assessment but also recalled a significant oversight they made during their experiment regarding the project in Egypt, where they inadvertently left the employer listed as SOMO, an Iraqi state company, instead of British Petroleum. She had expected ChatGPT to somehow indicate this discrepancy or alert the user, viewing this lack of feedback as a shortcoming. However, since ChatGPT does not inherently operate with such an alert mechanism or built-in warning system, their mistake went unnoticed until they identified it themselves. In the context of ChatGPT’s operational mechanism, it’s

clear that the model's performance is closely tied to the prompts it receives, making it susceptible to user errors. This incident reflects common issues found in the literature, where user errors can continue to affect subsequent interactions without detection, leading to "frustrations." Expert 1 elaborated on this point, understanding that ChatGPT was not at fault, as there was a very slim possibility but not a zero possibility that an Iraqi state company could operate in Egypt. As ChatGPT responds according to the input prompt (unless specifically instructed otherwise), the importance of carefully reviewing and controlling the prompts becomes evident.

- Expert 1 elaborated on the results from their group's experiments with ChatGPT, particularly noting how the model made significant immediate adjustments when the governing law was changed from local to British. This led to further investigation and engagement with ChatGPT by other group's participants.
- Expert 3 and Expert 4, realizing they had not explored different scenarios as extensively as other group, decided to test ChatGPT in another regional setting within India. They chose Mumbai and posed the question during the discussion, *"If the location of the project is changed from the Kashmir State to Mumbai State, what will the changes be in the political risks?"* When they switched the location from Kashmir to Mumbai, ChatGPT provided a comparative analysis of the risks that were changing. As an example, it said lower geopolitical tensions in Mumbai compared to Kashmir, providing a comparative risk analysis that the group found to be impressively tailored and insightful. This response was eventually seen by this group as going beyond generic mere textbook knowledge, demonstrating the model's adeptness at adjusting to regional specifics. They shared this positive outcome with other experts, supporting Expert 1's previous commendations of ChatGPT's performance.
- Expert 1 and Expert 2 shared the accuracy of their experimental results as supportive, with Expert 1 reexpressing surprise at ChatGPT's capability to distinguish between different regional contexts within the same country, such as North (Sulaymaniyah) and South (Basrah). He emphasized, "It's the same

country, but one is in the north and the other in the south; it can adjust the risk factors accordingly. This shows it accurately follows the country, which is very important.” He highlighted the ChatGPT’s ability to elevate financial transfer risks in the north due to banking system issues, marking it as a significant indicator of ChatGPT’s practical utility in real-world applications, exceeding his expectations.

- The discussion also touched on the broader implications of how ChatGPT handles complex scenarios involving international relations and financial difficulties, underscoring the interconnected/intertwined nature of financial and political risks. It used financial difficulties arising from countries’ international relations as risks when identifying political risks for a country. The group appreciated ChatGPT’s nuanced approach to integrating these aspects into its political risk assessments.
- Another significant point was raised about ChatGPT’s response to parameter changes that, while not directly affecting country risks due to the scenario’s focus, might influence other project risks in broader assessments. An expert noted that technical issues were correctly excluded from the country risk assessments by ChatGPT, appreciating its alignment with the specified scope of the inquiry. This observation led to suggestions that future studies evaluating ChatGPT’s performance could yield significant insights and intriguing/interesting results if applied to overall project risks, emphasizing the potential to explore how ChatGPT might handle comprehensive/broader risk evaluations that consider both country-specific and technical risk factors.
- Both Expert 3 and Expert 4 emphasized the necessity of having a solid background in the subject matter when using ChatGPT for risk-related tasks. They observed that experts could validate the data’s accuracy due to their knowledge, but caution would be necessary when the responses will be used by users unfamiliar with the subject or country. Expert 3 remarked, “As experts familiar with the countries, we could customize the prompts with specific questions, identifying correct progressions. Users need to take great care and

validate the information provided here. Moreover, staying updated on political risks is crucial as these can change rapidly, sometimes within days or even hours due to the dynamic varying country conditions.” Therefore, it’s advisable that ChatGPT is best utilized by those who are well-versed in the relevant topic.

- Political issues are generally prone to manipulation; therefore, they should be approached with heightened extra sensitivity and scrutiny to ascertain what point of view it was written and whether the content is biased or neutral. Further research is needed on employing ChatGPT in new markets where there is limited prior knowledge and investigating the risks of relying on ChatGPT as an official or primary information source.
- Moreover, Expert 3 and Expert 4 jointly stated that the success and accuracy of ChatGPT’s responses are highly dependent on the user’s input and knowledge. They argued that not only customizing prompts but also validating the responses requires experienced individuals. This necessitates that users must exercise caution, ensuring that the information used is updated and validated, and highlights the importance of expert oversight when utilizing ChatGPT in dynamic and complex domains like political risk assessment.

6.4 Discussion of Findings from the Workshop

This section discusses the findings from the workshop designed to evaluate the capabilities of ChatGPT, specifically GPT-4, in assessing political risks within the context of political risk assessment. The workshop sought to understand ChatGPT’s performance in identifying and assessing political risks, explore its practical applications in real-world scenarios, and gather expert opinions on its usability in construction project management. The discussion focuses on three key areas:

- **ChatGPT’s Ability to Understand and Adapt to Project Specifics:** The results demonstrate that ChatGPT can identify and assess political risks, tailoring its evaluations based on project specifics. The AI successfully adjusted risk rankings when experts modified project parameters like

currency, governing law, employer type, and project location, even differentiating between regional variations within a country. This adaptability highlights its potential for providing context-specific risk assessments. However, sources also reveal that ChatGPT may not always fully grasp the implications of complex contractual settings, suggesting a need for careful oversight by users experienced in risk management.

- **The Crucial Role of Prompt Engineering:** A consistent finding across the sources is the critical influence of prompt quality on the accuracy and specificity of ChatGPT's responses. Vague or generic prompts resulted in broadly framed answers, lacking the specificity required for actionable insights. Conversely, detailed and tailored prompts yielded more focused and useful outputs. This emphasizes the importance of "prompt engineering," where even seemingly minor oversights in prompt construction, such as omitting regional details or not specifying the desired depth of analysis, significantly impacted the quality of the assessment. It is suggested that the successful integration of ChatGPT into risk management processes highly relies on users' ability to articulate their queries with clarity and precision.
- **Limitations in Domain Knowledge and Application:** The workshop findings reveal a contrast in ChatGPT's performance regarding knowledge and application. The results indicate that it excels in providing textbook-like information when queried about general risk management methodologies or the theoretical underpinnings of processes like risk interrelations and breakdown structures. In addition, it encounters difficulties when tasked with translating this knowledge into practical applications, particularly in generating visual representations like Risk Breakdown Structures (RBS) and providing country-specific, real-world examples. While ChatGPT can describe the concept and steps involved in creating an RBS, it couldn't execute the task, highlighting a gap between its theoretical

understanding and practical execution capabilities. Similarly, despite attempts to elicit concrete, region-specific instances of risks, ChatGPT often provided general or global examples, indicating limitations in accessing and processing localized information. These findings suggest that, in its current stage, ChatGPT might be more valuable as a tool for gaining a general understanding of concepts and methodologies rather than a replacement for specialized tools or expert judgment in generating actionable insights.

The results emphasize that while ChatGPT demonstrates potential as a supplementary tool in political risk assessment, it is not yet equipped to replace human expertise. The generated risk reports, while structurally sound and potentially useful as starting points, often lacked the depth and domain-specific insights needed for direct implementation. Experts highlighted the crucial role of users' domain knowledge in critically evaluating and contextualizing ChatGPT's outputs, particularly given its limitations in consistently providing localized examples and navigating complex contractual scenarios. The results support the cautious and informed use of ChatGPT in political risk assessment, emphasizing the need for continuous critical evaluation and refinement of the technology, especially in unfamiliar markets.

CHAPTER 7

PROPOSED FRAMEWORK FOR DOMAIN-SPECIFIC LLM: TOWARDS AN AUTOMATED POLITICAL RISK ASSESSMENT

7.1 Background

The development of Large Language Models (LLMs) has significantly advanced the natural language processing (NLP) field, demonstrating substantial capabilities across various tasks. These models, constructed using extensive datasets and sophisticated architectures, have exhibited proficiency in understanding and generating human language on an unprecedented scale. However, despite their notable general-purpose capabilities, LLMs frequently encounter limitations when applied to specialized domains. This limitation can be attributed to their training on broad and general text data, which lacks the depth and specificity necessary to excel in niche areas.

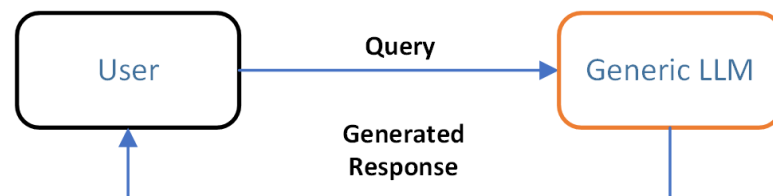


Figure 7.1. Generic LLM Structure

A generic LLM structure is given in Figure 7.1, which illustrates the interaction between the user and the LLM. The diagram outlines how a user initiates the process by submitting a query, and the LLM processes it to produce a relevant response, which is subsequently delivered back to the user.

One of the most critical challenges associated with LLMs is the occurrence of “hallucinations,” where the models generate incorrect or misleading information. This issue is further worsened by biases in the training data, which can result in ethical concerns and deviations from established community guidelines in the generated text. Additionally, LLMs often produce overly generalized or inaccurate information on specialized topics, underscoring their lack of domain-specific knowledge. According to the findings of the workshop session in this study, experts who participated in the workshop evaluating ChatGPT for construction project risk management identified several limitations of this generic LLM tool.

- ChatGPT’s responses often lacked region-specific details, relying instead on generalized information applicable to various contexts. For example, when asked to identify risks related to a railway project in India, the initial responses were deemed too broad and not sufficiently tailored to the unique challenges of operating in India.
- Even when provided with a specific region, such as Kashmir, ChatGPT struggled to provide concrete, localized examples of realized risks. The experts noted that the examples provided, while relevant to political risks in general, often extended beyond Kashmir, illustrating a limitation in the AI’s ability to confine its responses to the specified geographical context.
- The content was often criticized for being simplistic, lacking specificity, and heavily reliant on generic information. Experts noted that the report, while potentially useful as a supplementary resource, would require significant modifications and further research before it could be directly implemented in risk management processes.

Given these challenges, there is increasing recognition within academia and industry for domain-specific LLMs. Such models are essential for addressing particular sectors’ unique challenges and requirements.

Domain-specific LLMs offer significant advantages. By training on specialized data, these models achieve higher accuracy and relevance, as they can better understand

the nuanced language, terminology, and relationships within a particular field. This targeted approach also enhances the reliability of the outputs, as the models are less prone to incorporating irrelevant information. Furthermore, domain-specific LLMs possess a specialized vocabulary that allows for more natural and intuitive interactions, fostering greater user satisfaction and trust (Mosser et al., 2024). A growing number of applications for domain-specific LLMs are documented in the literature. For example, Med-Palm 2, a custom language model built by Google, was trained on curated medical datasets and achieved an 86.5% accuracy rate on the MedQA dataset, demonstrating its ability to answer medical questions on par with medical professionals (Singhal et al., 2023). Similarly, BloombergGPT, a causal language model trained on decades of financial data, outperformed similar models on financial tasks while maintaining or exceeding performance on general language tasks (Wu et al., 2023). Another example is ClimateBERT, a transformer-based language model trained on millions of climate-related data points. Compared to general language models, ClimateBERT completes climate-related tasks with significantly fewer errors, showcasing the benefits of domain-specific LLMs in specialized fields (Webersinke et al., 2022). These examples illustrate the potential of domain-specific LLMs to improve accuracy, reliability, and relevance in specialized fields.

Developing domain-specific LLMs involves two essential methods: Retrieval Augmented Generation (RAG) and fine-tuning (FT). RAG combines the strengths of retrieval-based methods with the generative capabilities of LLMs, enabling the model to pull relevant information from a specialized dataset and generate contextually accurate responses. FT, conversely, involves adapting a pre-trained LLM to a specific domain by further training it on domain-specific data. Both of these techniques are crucial for creating specialized and reliable LLMs. The details of RAG and FT, are discussed in the sections below.

7.1.1 Retrieval-augmented Generation

RAG was introduced in 2020 as a way to enhance the accuracy and relevance of text generation by leveraging external knowledge sources (Lewis et al., 2020). It represents an approach that combines the strengths of traditional information retrieval systems with the capabilities of LLMs. At its core, RAG allows LLMs to extend beyond the confines of their original training data by integrating with external knowledge sources, such as specialized databases or document repositories. This integration enables the generation of responses that are not only contextually relevant but also grounded in real-time or domain-specific information. The working principle of RAG involves a user making a query to the retrieval system, which searches through external documents to find relevant information. The retrieved data is then provided to the LLM. With this additional context, the LLM generates a more accurate and informed response. RAG structure can be seen in Figure 7.2.

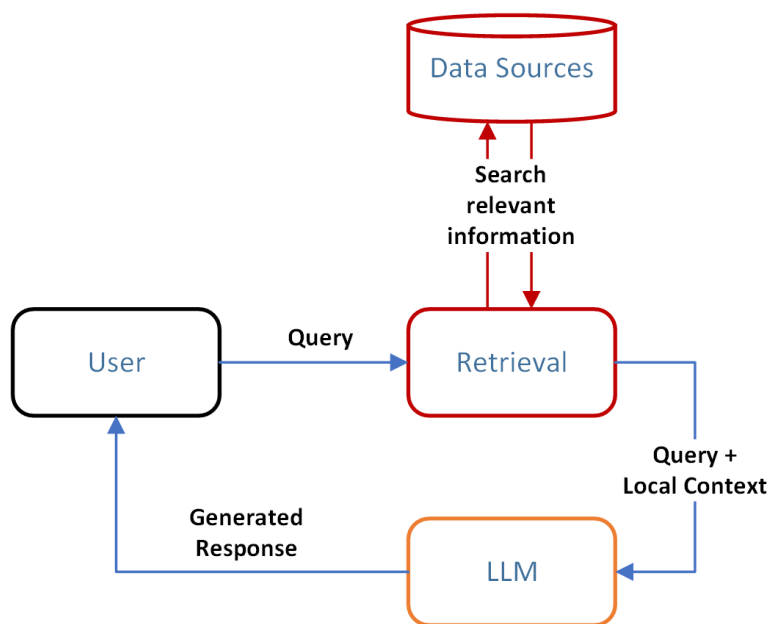


Figure 7.2. RAG Structure

The RAG process begins with the identification of a relevant knowledge domain. The domain knowledge is processed and stored in a format that supports efficient retrieval. This process typically involves three sub-steps: chunking, embedding, and indexing (Jeong, 2023). Chunking involves breaking down lengthy documents into smaller, more manageable text segments. These chunks are then converted into numerical vector representations using an embedding model, transforming textual information into a computationally suitable format. These vectors are stored in a vector database, a specialized system designed for fast similarity searches, enabling quick and accurate retrieval of relevant information.

When a user submits a query, the RAG system begins by converting the query into a vector using the same embedding model applied to the domain knowledge. The system then performs a similarity search within the vector database, identifying text chunks that closely match the semantic content of the query. These retrieved chunks are provided to the LLM as additional context. The LLM then synthesizes this context with the original query to generate an informed and relevant response.

One of the advantages of RAG is its cost-effectiveness. Unlike fine-tuning, which requires extensive computational resources to modify the underlying parameters of an LLM, RAG operates with lower computational demands by simply augmenting the input data (Radeva et al., 2024). This makes RAG a more accessible option for integrating specialized knowledge into LLMs. Additionally, RAG is highly adaptable; updating the vector database with new data is a straightforward process, allowing the system to remain current without retraining. Another significant benefit is traceability: because the responses generated by RAG are grounded in specific text passages from the knowledge base, they are more interpretable. They can be easily traced back to their sources, enhancing the transparency and reliability of the output.

Despite these advantages, RAG also presents several challenges. One major limitation is the context window of LLMs, which restricts the amount of external information that can be included in the prompt. This can limit the effectiveness of RAG in scenarios where extensive context is required. Additionally, the accuracy of

the retrieval process is critical to RAG's success. If the embedding models or indexing strategies are not well-optimized, the system may retrieve irrelevant or incomplete information, leading to suboptimal responses. Furthermore, while RAG is effective at incorporating domain knowledge into prompts, it does not alter the underlying parameters of the LLM. This lack of deep domain adaptation means the model may still struggle with complex domain-specific nuances.

In summary, RAG offers a cost-effective framework for enhancing the capabilities of LLMs by integrating them with external knowledge sources such as the political risk domain. However, the method also requires careful consideration regarding context window constraints and retrieval accuracy to realize its full potential in specialized applications such as automated political risk assessment.

7.1.2 Fine-tuning

Fine-tuning is another approach to adapting LLMs to specialized tasks. This process involves taking an existing, pre-trained LLM and further training it on a curated dataset that is rich in domain-specific knowledge (Munley et al., 2024). The objective is to align the model's capabilities more closely with the intricacies and nuances of the specific domain, thereby enhancing its effectiveness and accuracy in a particular area. In contrast to the RAG method, users interact directly with the fine-tuned LLM, which has been adapted from the general-purpose model to meet the specific requirements of a particular domain. Figure 7.3 illustrates the process of fine-tuned LLM to better respond to specific tasks.

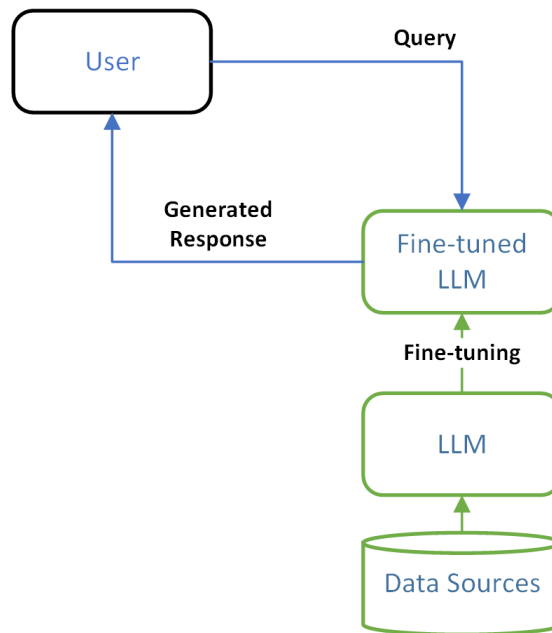


Figure 7.3. Fine-tuning Structure

The fine-tuning process begins with selecting a suitable pre-trained LLM that serves as the foundational model. This model is chosen based on its architecture, size, and suitability for the desired task and domain. Once the base model is selected, the next step is to prepare a domain-specific dataset. This dataset must be meticulously gathered and curated to accurately reflect the political risk domain, capturing the relevant terminology, contexts, and scenarios the model will encounter during its deployment. The domain-specific data must be formatted into input-output pairs that align with the fine-tuning method chosen. Next, hyperparameters, such as learning rate, batch size, and the number of epochs, are carefully optimized to balance efficient learning and the prevention of overfitting. During the fine-tuning process, the model's parameters are updated as it trains on the domain-specific dataset, allowing it to learn from the examples provided and adapt to the specific requirements of the political risk assessment domain. Following the fine-tuning process, the model's performance is evaluated on a test set. This evaluation determines how well the model has adapted to the domain. Based on the results of this evaluation, further refinement of the fine-tuning process may be necessary. This

could involve adjusting the dataset, fine-tuning methodology, or hyperparameters to improve the model's performance and generalization capabilities.

Fine-tuning offers significant advantages, particularly in terms of more profound domain adaptation. By updating the LLM's parameters, the model achieves a deeper understanding of the specific domain, leading to better performance in generating accurate and relevant responses. Additionally, fine-tuned models tend to produce more fluent and contextually appropriate outputs. However, the fine-tuning process also has its challenges. One of the primary concerns is the high computational cost associated with fine-tuning LLMs. This process demands substantial computational resources, making it both expensive and relatively time-consuming compared to RAG. Moreover, fine-tuning requires access to large, high-quality, domain-specific datasets, which can be difficult to obtain or create. Another significant challenge is the risk of overfitting. If the fine-tuning process is not adequately regularized, the model may become too specialized to the training data, resulting in poor generalization to new, unseen examples.

In order to better understand the difference between RAG and FT, Zhang et al. (2024) presented an analogy of a student who takes an examination (Zhang et al., 2024). In the RAG analogy, the student is provided with a domain-specific book, and an open-book exam is conducted. During the test, the student can skim through the book to retrieve relevant information for each question. The response can be double-checked to ensure that it is factual, with the relevant section from the book cited. On the other hand, in fine-tuning analogy, a domain-specific book is given to the student, for in-depth study, preparing them for a closed-book exam. Once the exam begins, the book cannot be consulted, and reliance is placed solely on what has been internalized by the student. While the questions can still be answered, there is a possibility of incorrect responses, and accurate references may not be provided.

Both RAG and FT come with their own set of challenges. RAG offers a cost-effective and adaptable way to integrate domain-specific knowledge, but context window constraints and the accuracy of the retrieval process limit it. On the other

hand, FT provides deeper domain adaptation and improved contextual understanding, but it requires significant computational resources and runs the risk of overfitting. Given these limitations, there is a growing recognition of the potential for hybrid systems that combine the strengths of both RAG and FT. Such systems could contextually relevant retrieval capabilities of RAG while benefiting from the deep, specialized knowledge that fine-tuning imparts (Zhang et al., 2024). Within the context of this thesis, considering the need for research on political risks in the construction industry, a hybrid framework is proposed for political risk assessment, which is explained in detail below.

7.2 Proposed Framework

Integrating RAG and FT offers a promising hybrid approach in pursuing a robust domain-specific framework for automated political risk assessment. This system utilizes the complementary strengths of both techniques, resulting in a highly specialized model and dynamically adaptable to new information.

The hybrid framework initially utilizes the RAG component to retrieve relevant and up-to-date information from expansive external datasets. This step is crucial in the context of political risk assessment, as political climates are often unstable and subject to rapid changes. The RAG system ensures that the model can access the most current information, which is particularly important for timely and accurate risk assessments. By embedding this external data into the model's input, RAG allows the system to generate outputs that are not only grounded in real-time information but are also contextually rich and relevant to the specific query regarding political risks at hand.

However, while RAG effectively incorporates fresh data, its reliance on external information alone might not fully capture the nuanced understanding required for specialized domains such as political risk. This is where the fine-tuning aspect of the hybrid framework plays a crucial role. By fine-tuning the LLM on a curated, domain-specific dataset, the model's internal parameters are adjusted to align more closely

with the political risk domain's unique patterns, terminologies, and contextual intricacies.

Figure 7.4 demonstrates a hybrid framework to create a domain-specific model for automated political risk assessment. The process begins with a user query, which the retrieval module uses to search for relevant, up-to-date information from Data Sources regarding the political environment. This information, combined with query, forms the input for a Fine-tuned LLM. This LLM, fine-tuned on domain-specific data, generates a response tailored to the nuanced requirements of political risk assessment.

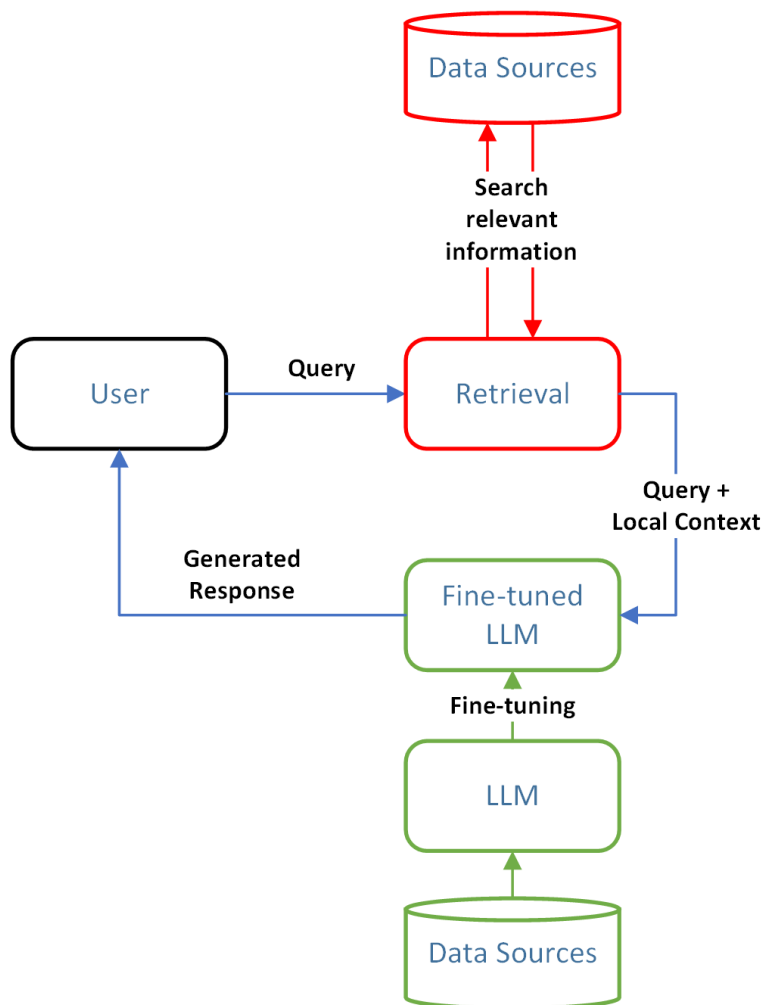


Figure 7.4. Hybrid RAG and FT Structure

In conclusion, the hybrid domain-specific LLM approach effectively combines the advantages of Retrieval-Augmented Generation and Fine-Tuning. By integrating RAG's ability to access and utilize external data alongside the deep domain specialization achieved through fine-tuning, this hybrid system offers a sophisticated solution for automated political risk assessment.

Building such an automated political risk assessment system involves three key phases, overall: (i) developing a comprehensive knowledge base, (ii) creating a domain-specific LLM, (iii) conducting political risk assessments, and performing evaluation and validation. The key phases of the proposed framework can be found below.

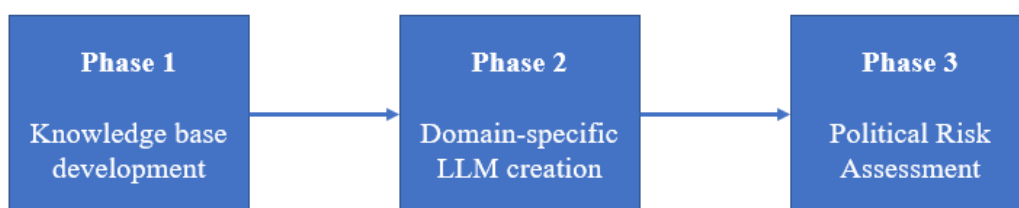


Figure 7.5. Proposed Framework

Each phase in this proposed framework for domain-specific LLM for political risk assessment, along with its constituent steps, will be detailed below under separate sections. Following this, a visual summary of this proposed framework will be provided, which can be found in Figure 7.6.

7.2.1 Knowledge Base Development

Developing a comprehensive knowledge base is an initial step in the proposed framework for a domain-specific LLM designed to automate political risk assessment. This step is fundamental as it lays the groundwork for the subsequent creation and fine-tuning of the LLM.

The first step of knowledge base development involves identifying data sources related to the construction sector's political risks. The data collection is twofold, drawing from publicly available political risk data and company-specific data to ensure a thorough knowledge base.

Publicly Available Data:

- **Industry Reports and Databases:** Reports from organizations specializing in political risk analysis, construction, and engineering, as well as academic databases containing research papers, case studies, and conference proceedings related to political science, international relations, construction management, and risk assessment, offer valuable insights.
- **Political Data:** Sources such as government websites, political news outlets, news articles, social media feeds, political event databases, and expert analyses can provide information about political systems, government structures, political stability, and geopolitical risks.
- **Legal and Regulatory Documents:** Legal databases, government websites, legal news sources, contracts, permits, and regulatory filings are essential for understanding the legal landscape and identifying political risk clauses and mitigation strategies.
- **Economic Data:** Economic indicators, investment climate reports, GDP growth, inflation rates, unemployment rates, foreign direct investment, and trade balances offer insights into a country's economic stability. Sources like the World Bank, IMF, and national statistics agencies are valuable.
- **Social Environment Data:** This category includes safety and social inclusion metrics like unemployment and education rates, corruption indices, and sources like social media data, news articles, and academic studies focusing on social trends.

Company-Specific Data:

- **Technical Documentation:** This includes blueprints, designs, engineering plans, and specifications that can reveal potential vulnerabilities to political

risks based on project requirements, technological dependencies, or resource allocation.

- **Project Plans:** Analysing past and current project plans can help the LLM understand how political risks were factored into scheduling, budgeting, and resource allocation, providing context for assessing future risks.
- **Building Codes, Safety Regulations, and Material Specifications:** These documents can shed light on a country's regulatory environment and how political decisions might influence compliance requirements, impacting project costs and timelines.
- **Historical Data from Past Projects:** Past project reports, particularly those related to risk management, lessons learned documents, e-mail correspondence between project stakeholders can contain valuable information about how political events, government decisions, or regulatory changes were perceived and addressed during a project's lifecycle.

To develop a domain-specific LLM for political risk assessment, it is crucial to establish a comprehensive knowledge base related to political risks in the construction industry. This knowledge base can encompass both public and company-specific data. The developed taxonomy can play a pivotal role in helping the data collection and organization processes, thereby aiding in the construction of a robust repository of information.

Utilizing the taxonomy of political risk related topics enables researchers to navigate extensive datasets and literature efficiently. The taxonomy developed in this thesis can serve as a direct guide for identifying and categorizing the data types that need to be collected. Rather than using taxonomy as a guide, it can also be used as a data source that significantly enhances the responses of a domain-specific LLM. This structured knowledge allows the model to generate more accurate, relevant, and contextually appropriate responses. Additionally, taxonomy helps the LLM to

disambiguate terms, prioritize critical information, and ensure that the responses align with the specific needs and nuances of the domain.

After reviewing the types of data sources that can be used for knowledge base development and discussing the use of taxonomy for this purpose, the main steps in this phase can be described. In this knowledge base development phase, there are two main steps: 1) Identifying Data Sources and 2) Gathering and Structuring Data.

1) Identifying Data Sources

This step focuses on identifying diverse and comprehensive data sources to capture the multifaceted nature of political risk in construction. The taxonomy developed provides a valuable structure for this process. The taxonomy presented in this thesis (refer to Figure 4.1 and Appendix A) serves as a valuable framework for identifying relevant data categories. By employing a Taxonomy-Guided Search, factors influencing political risk can be systematically identified, as the taxonomy highlights the interconnected nature of these factors. According to taxonomy, the following categories can be used:

- **Political Spheres/Politics:** This category encompasses data sources related to government stability, political systems, legal frameworks, international relations, and geopolitical risks. Data Sources might include government websites, political news outlets, legal databases, legal databases containing international arbitration cases related to political risks in construction and expert analyses, including political information.
- **Economic Conditions/Economy:** Data related to economic stability, growth prospects, investment climates, and financial risks are crucial. Data Sources like the World Bank, IMF, national statistics agencies, and financial news outlets would be relevant.
- **Social Conditions/Society:** Information about social stability, labour relations, corruption levels, public sentiment towards foreign investment, and cultural norms can significantly impact the political environment. Data Sources such as

social media data, news articles, academic studies on social trends, and reports from NGOs would be valuable.

Once the relevant data sources are identified, the next step is to gather and structure the data into a format suitable for both fine-tuning the LLM and for real-time retrieval through RAG. This step involves pre-processing and structuring the data to ensure consistency and quality. Text cleaning is the first task in this step, which involves removing irrelevant characters, correcting formatting issues, and converting different file formats into a standardized format suitable for LLM processing. This ensures that the data is uniform and free from noise. Following text cleaning, the data is subjected to chunking, a process where large documents are broken down into smaller, manageable units of text for RAG operations. Typically, these chunks consist of a few paragraphs, allowing them to fit within the limited context window of the LLM.

2) Gathering and Structuring Data: This step involves collecting data from the identified sources and transforming it into a format suitable for the LLM. This might involve:

- **Data Cleaning and Pre-processing:** This step involves key processes in data pre-processing to ensure data quality by removing irrelevant information, standardizing formats, and addressing inconsistencies. Taxonomy-Driven Data Structuring and Annotation can significantly benefit this process. By using the developed taxonomy as a framework for tagging and annotating information, data can be pre-processed and structured more effectively for inclusion in the knowledge base. This approach not only enhances data organization but also ensures that the information is accurately categorized and easily retrievable. For example, a news article discussing a change in government regulations concerning foreign contractors in a specific country can be tagged under the relevant taxonomy categories like “Government Policies,” “Legal Aspects,” and “Bureaucracy” (refer to Figure 4.1). This approach ensures the LLM can easily identify and retrieve information based on the user’s specific political risk

concerns, as categorized by the taxonomy, rather than relying solely on keyword matching.

- **Text Chunking:** In this step, long documents are divided into smaller, manageable chunks to fit within the LLM's context window, making the information processing more efficient. When segmenting text into chunks, it's essential to consider the structure of the taxonomy. For instance, a chunk could contain information related to a specific subcategory within the taxonomy, ensuring that related information is grouped together.
- **Entity Recognition and Linking:** In this step, key entities like countries, political figures, regulations, events, and their relationships are identified and linked to relevant information within the knowledge base, creating a web of interconnected information. Understanding the relationships between different political actors, events, and regulations helps to create a more interconnected and meaningful knowledge base. For example, if the user's query is about the impact of "government stability" on a construction project, the LLM could use the taxonomy-based database to identify related concepts such as "change in government" or "regulatory changes". This interconnected understanding would enable the LLM to provide more comprehensive and insightful risk assessments, moving beyond merely identifying individual risk factors. By adopting this approach, the LLM would not only access relevant information but also grasp the complex interrelationships between various political risk factors as defined by the taxonomy.
- **Vector Embedding:** In this step, text chunks are transformed into numerical representations (vectors) to enable efficient similarity searches during the information retrieval process.

Developing the knowledge base is a critical process as it forms the cornerstone of the entire framework, enabling the LLM to operate with a deep understanding of the

complexities inherent in political risk within this specialized domain. Careful attention must be given to collecting, pre-processing, and structuring diverse data sources.

7.2.2 Domain-specific LLM Creation

The next phase is the Domain-Specific LLM Creation. It is the heart of the automated political risk framework, which creates the central intelligence of the system. The first step of domain-specific LLM creation is selecting a foundational LLM that serves as the base model. The selected LLM should exhibit strong performance in understanding and generating human-like text, particularly in question-answering scenarios. Open-source options such as Mistral (Jiang et al., 2023), Llama (Touvron et al., 2023), or Orca (Mukherjee et al., 2023) are considered due to their balance between performance and computational efficiency; commercial models such as GPT (OpenAI, 2022) are also viable options due to their advanced capabilities.

Regarding Domain-Specific LLM for political risk assessment, a pre-trained LLM, either open-source or commercial could be selected, based on factors such as the LLM's architecture, performance, computational requirements, and the specific requirements of political risk assessment in construction as well as the suitability for fine-tuning and RAG integration.

Once a foundational LLM is selected, the next step involves initial fine-tuning with domain-specific knowledge base data. This step is where the model aligns more closely with the specific requirements of political risk assessment in construction. Together with the fine-tuning of LLM is completed, an RAG layer, which adds a dynamic and real-time aspect to the LLM's capabilities is integrated.

Before the domain-specific LLM creation phase starts, the knowledge base data should be categorized into two groups: one for fine-tuning (FT) and the other for Retrieval-Augmented Generation (RAG) operations. This division should be based on the data's structure and update frequency.

Several techniques and methods are employed to fine-tune the parameters to meet specific requirements. These methods can broadly be classified into two categories: supervised fine-tuning (SFT) and reinforcement learning from human feedback (RLHF).

In the SFT method, the model is trained using a task-specific labelled dataset, where each input is paired with a corresponding correct label or answer. The model learns to adjust its parameters to accurately predict these labels, allowing it to apply its pre-existing knowledge, acquired during pre-training on a large dataset, to the specific task. On the other hand, RLHF is a novel approach that involves training language models through interaction with human feedback. By integrating human feedback into the learning process, RLHF enables continuous improvement of language models, ensuring they produce more accurate and contextually appropriate responses.

Supervised Fine-Tuning (SFT) can enhance the foundational LLM for the scope of this research. SFT involves training the LLM on a carefully curated set of question-answer pairs related to political risk. This approach ensures that the model effectively learns this domain's complex patterns and relationships. The training data should encompass scenarios involving various political risks, potential outcomes, and recommended assessment strategies, enabling the model to provide informed and contextually accurate responses.

Once the fine-tuning of LLM is completed, the next step is to integrate an RAG layer, which adds a dynamic and real-time aspect to the LLM's capabilities. The RAG layer allows the model to retrieve relevant information from a pre-established knowledge base during inference, where up-to-date and specific information can be critical. This knowledge base would consist of domain-specific documents, including governmental policies, historical case studies, and expert analyses, all relevant to political risks in construction, as highlighted in the previous phase. The prepared knowledge base for RAG operation should be embedded into numerical vectors, which are then used for similarity searches for user queries. The following section

details the steps involved in fine-tuning the LLM and integrating the RAG layer, specifically tailored to address Political Risk Assessment.

7.2.2.1 Fine-tuning the LLM

More specifically to political risk assessment, fine-tuning the LLM can be achieved by training it on a curated political risk dataset, resulting in a PRA-specific LLM. This fine-tuning can be done through a Question-Answer approach, where the LLM is trained to provide accurate and relevant answers to political risk-related questions specific to construction. Alternatively, a Scenario Analysis approach can be employed, enabling the model to assess risks based on hypothetical scenarios, such as changes in government policies, political instability, or regional conflicts, and their potential impact on construction projects. The chosen training method should align closely with the needs of political risk assessment in construction.

This thesis highlights the importance of fine-tuning the LLM on a dataset specifically curated for the political risk domain to achieve high accuracy and relevance. The developed taxonomy can significantly enhance this fine-tuning process. Instead of simply feeding the LLM raw text data, the taxonomy can be used to create structured data for training. For example, training pair examples can be created where the input is a description of a specific and recent political risk event (e.g., a government change), categorized according to the taxonomy (e.g., “Government Stability”), and the output is an assessment of the potential impact of this event on a hypothetical construction project (e.g., “Contract Enforcement”, “Project Delays”). This example can include relevant project details, tagged according to the taxonomy.

This approach allows the LLM to learn from a more structured and informative dataset, improving its ability to recognize patterns and make accurate predictions. By moving beyond simply providing the LLM with raw text, this method enhances the model’s understanding of the relationships between different political risk categories and their relevance to the construction industry.

7.2.2.2 Integrating the RAG Layer

In this thesis, the importance of real-time and current information access in political risk assessment is frequently emphasized due to the rapidly changing nature of political landscapes. Therefore, within the proposed framework for PRA, integrating a Retrieval-Augmented Generation (RAG) layer is crucial. This integration allows the LLM to access the most up-to-date information from external and pre-determined sources during the assessment process. The pre-established knowledge base, consisting of domain-specific documents such as governmental policies, historical case studies, and expert analyses relevant to political risks in construction, is central to this process. For RAG to function effectively, this knowledge base should be embedded into numerical vectors, enabling similarity searches during the political risk assessment phase in response to user queries.

The ability to retrieve relevant information from this pre-established knowledge base during inference is critical, particularly when up-to-date and specific information can significantly impact the assessment. This ensures that the model's responses are informed by the latest developments in the political landscape, essential for making timely and informed decisions. Thus, equipping the LLM with a RAG layer is vital for research related to political risk assessment.

Incorporating a RAG layer prioritizes accessing and integrating up-to-date information from the sources that provide real-time updates on political events. These sources, identified in earlier phases, might include live news feeds specifically focused on political developments relevant to construction, databases tracking regulatory changes, and expert analyses on political climates.

The technical aspects of RAG implementation involve developing a vector database to store the pre-processed and vector-embedded knowledge base in a searchable format, facilitating efficient retrieval of relevant information. Additionally, a retrieval mechanism is implemented to extract the most pertinent text chunks from

the vector database based on semantic similarity, ensuring that the responses provided are informed by the most current and relevant data available.

The developed taxonomy can be directly incorporated into the LLM's vocabulary, enhancing its ability to interpret and respond to user queries accurately. Techniques such as word embeddings can map the taxonomy's terms onto vectors that capture their semantic meaning. By embedding the taxonomy's language into the LLM's understanding, the model can better differentiate between nuanced terms and generate responses aligned with the specific language of political risk assessment in the construction industry. For example, if the taxonomy defines "expropriation" (seizure of assets by the government) as a specific type of political risk, incorporating this definition into the LLM's vocabulary enables the system to distinguish a specific concern about expropriation and accurately identify and assess this concern, leading to clearer information retrieval and more relevant risk assessments.

To highlight one of the key differences between Fine-Tuning (FT) and Retrieval-Augmented Generation (RAG) in the use of this proposed framework, the following paragraph provides a primary comparison.

Fine-tuning the LLM may be a more meticulous and time-intensive process, requiring careful attention and effort to ensure the model is optimally adjusted. Once the LLM has been fine-tuned, the integration of data sources via the RAG layer can be performed as needed, offering flexibility in the timing and extent of data integration. In summary, while fine-tuning is a more time-consuming and infrequent process, RAG integration can be executed more quickly and applied more frequently to keep the model updated with the latest information.

7.2.3 Political Risk Assessment

In this phase, the user, typically a risk manager, interacts with the domain-specific LLM that was created in the previous phase. This interaction involves retrieving nuanced answers from the LLM, tailored to specific needs and concerns related to

political risks in a construction project. The process begins when a user submits a query about potential political risks in a construction project, which may involve issues such as regulatory changes, political instability, or stakeholder conflicts.

In the first step, a user inputs a query related to political risks for this specific construction project. This query should include a detailed project description, outlining the scope and location as well as the specific risk concerns the user wants to assess, such as regulatory changes, political instability, or corruption.

To ensure a comprehensive assessment, the user is encouraged to provide detailed information about the project, including its scope, location, descriptions, and relevant stakeholders. This detailed input forms the foundation for the political risk assessment. The thesis highlights the importance of prompt engineering in eliciting useful responses from LLMs. The quality and specificity of the user's query significantly influence the accuracy and relevance of the LLM's output. By encouraging users to provide detailed project descriptions and specific risk concerns, the effectiveness of the assessment can be significantly improved.

Once the query is submitted, the system initiates the query processing and information retrieval process. Before retrieving information, the query is first analyzed and mapped onto relevant categories within the political risk taxonomy developed earlier in the thesis. This mapping is essential for interpreting the query accurately, considering the specific terminology and nuances associated with political risk. This is also vital to ensure the system addresses potential ambiguities in political risk terminology. The taxonomy provides a standardized vocabulary that helps the LLM accurately interpret terms. For instance, "government stability" might have different implications depending on the region; the taxonomy facilitates the LLM in understanding the specific context relevant to the user's query. Additionally, the taxonomy helps the LLM recognize how different risks are interconnected, enabling it to identify cascading effects. For instance, if a user is concerned about "expropriation", the taxonomy could guide the LLM to also consider related risks such as "contract repudiation" or "restrictions on the repatriation of profits." Lastly,

the taxonomy provides additional context, enabling the LLM to retrieve more relevant information and generate more focused responses. In summary, the mapping of the user's query onto the relevant categories within the taxonomy offers several benefits. Firstly, it can aid in disambiguation, ensuring that the system correctly interprets the user's query with a standardized vocabulary. Secondly, the taxonomy helps the LLM understand how different risks are interconnected.

The query is then transformed into a vector embedding, a numerical representation that captures its semantic meaning. This embedding is compared against embeddings stored in the vector database, which contains pre-processed text chunks from an extensive knowledge base related to political risks. The system retrieves the most semantically similar text chunks that align with the user's query, ensuring that the context is relevant and specific to the project in question.

After mapping and vectorizing the query, the information retrieval process begins. The system searches the vector database for semantically similar text chunks, and these retrieved text chunks are then combined with the original query to create an augmented prompt for the LLM. The retrieved information, along with the original query, is fed into the fine-tuned, domain-specific LLM. In the next step, the created fine-tuned LLM processes the augmented prompt, leveraging its domain-specific knowledge and the real-time information retrieved through the RAG layer, to generate a comprehensive response. The fine-tuned, domain-specific LLM processes this augmented input, generating a response that is tailored to the user's query and the project-specific data provided, which is political risk assessment.

Finally, the visual representation of each of the three phases of the proposed framework for political risk assessment can be seen as a summary in the following Figure 7.6.

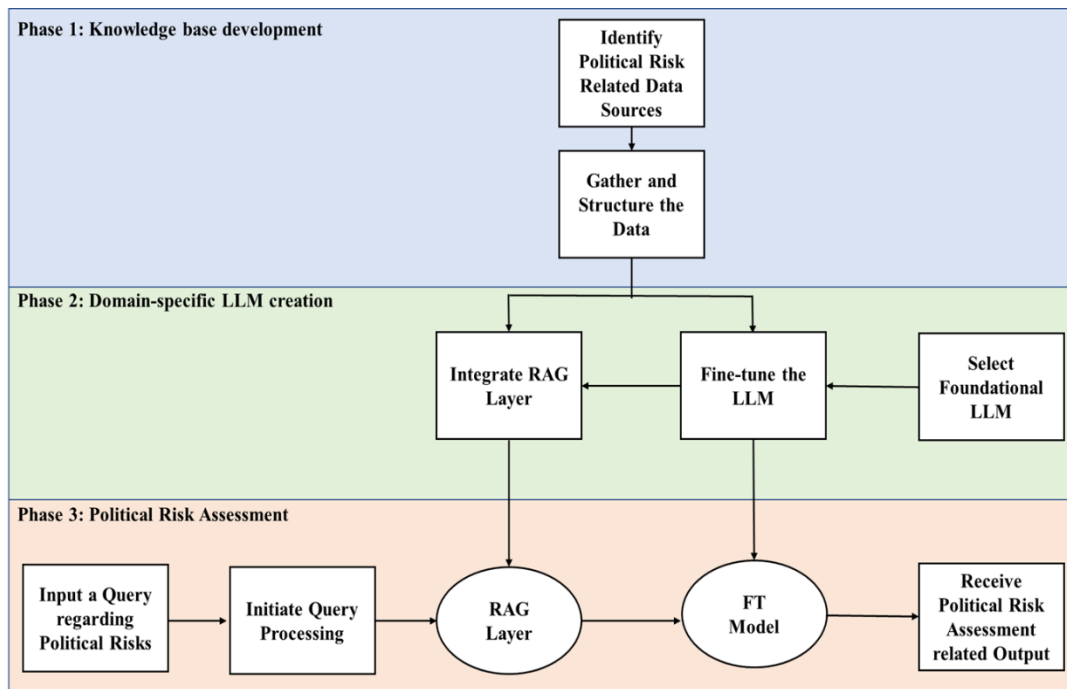


Figure 7.6 Proposed Framework with Its Steps

The following section presents an example and exemplifies how a risk manager can interact with domain-specific, FT, and RAG-combined LLM models to explain more clearly.

An Example of Assessing Political Risks in Russia Using Proposed Framework for Domain-Specific LLM

To provide a more specific example of political risk assessment, the following scenario, the use of a domain-specific LLM for assessing political risks during the tendering process for a hypothetical residential project in Russia, can be considered as an example.

This hypothetical scenario serves as a practical example of how a domain-specific Language Model (LLM) can be used to assess political risks during the tendering process. The scenario is designed to closely reflect real-world conditions, considering that Russia is a major market for Turkish contractors working abroad and political conditions in Russia can significantly impact these projects. The residential project type is chosen because it is one of the most common types of

projects undertaken by Turkish companies in international markets. Other scenario details are carefully chosen to reflect a realistic situation.

The steps can be illustrated as follows:

1. User Inputs Detailed Project Information
2. User Queries LLM About Specific Political Risks
3. Query Transformed into Vector Embedding
4. Vector Compared to Embeddings in Database
5. Most Semantically Similar Text Chunks Retrieved
6. Retrieved Chunks Combined with Original Query
7. Combined Input Fed to the Fine-Tuned LLM
8. LLM Generates Tailored Political Risk Assessment
9. User Receives Assessment

This example demonstrates the application of a domain-specific LLM for political risk assessment during the tendering process for a hypothetical residential project in Russia. The following paragraphs provide a detailed explanation of these steps within this example.

1. User Inputs Detailed Project Information: The scenario begins with the user, typically a risk manager, providing detailed project information. The project involves the construction of a large-scale residential complex in a suburb of Moscow, Russia. The project scope includes multiple apartment buildings, recreational facilities, and green spaces. The project is set to be executed under a FIDIC Red Book contract, with payments tied to milestone deliveries and governed by Russian law.

2. User Queries LLM About Specific Political Risks: Following the input of this detailed project description, the risk manager at the Turkish construction firm queries

the domain-specific LLM regarding potential political risks. The manager's queries include concerns about the current political climate in Russia and its impact on the project. Specific questions might include, "What are the main political risks that could affect a residential construction project in Moscow, Russia, under the current political climate?" and "How might the sanctions imposed on Russia due to the geopolitical situation impact the availability of construction materials or financing for this project?" Additionally, the manager may inquire about specific regulations or legal risks related to foreign construction companies operating in Russia.

3. Query Transformed into Vector Embedding: The LLM system begins by converting the user's queries into vector embeddings, which capture the semantic meaning of the inquiries related to political risks and sanctions in Russia.

4. Vector Compared to Embeddings in Database: These embeddings are then compared against those stored in the system's vector database. This database comprises information from a variety of sources, including industry reports from organizations such as the PRS Group (ICRG) and the Economist Intelligence Unit (EIU), as well as news articles from reputable sources like Reuters and Bloomberg. The database also includes legal databases containing information on Russian construction law, foreign investment regulations, and international sanctions, along with economic data from the World Bank, IMF, and the Central Bank of Russia. Additionally, company-specific data from the Turkish construction firm, including records of past projects in Russia and related legal advice, are considered.

5. Most Semantically Similar Text Chunks Retrieved: The system retrieves the most semantically similar text chunks from these sources, which may include excerpts from ICRG reports on Russia's political risk rating, news articles discussing the impact of recent sanctions on Russia's construction sector, and legal analyses of Russian regulations affecting foreign construction companies.

6. Retrieved Chunks Combined with Original Query: These retrieved text chunks are then combined with the original user queries to form a comprehensive input for the LLM.

7. Combined Input Fed to the Fine-Tuned LLM: The combined input is fed into the fine-tuned, domain-specific LLM, which has been specifically trained on datasets related to political risk factors in emerging markets, particularly in the post-Soviet region and Russia. The LLM has also been trained on international construction law, FIDIC contracts, dispute resolution mechanisms, and sanctions compliance relevant to construction projects.

8. LLM Generates Tailored Political Risk Assessment: Using this specialized knowledge, the LLM processes the input and generates a tailored political risk assessment report for the project in question.

The generated assessment report identifies several key political risks, tailored to the project's specific context. These include potential political instability and regulatory changes, the impact of sanctions on the availability of construction materials and financing, risks associated with the repatriation of profits, and operational risks related to the involvement of foreign entities in Russia. The report provides a comprehensive analysis of how these risks might interact and affect the project's timeline, budget, and overall success.

9. User Receives Assessment: Upon receiving this tailored political risk assessment, the risk manager at the Turkish construction firm can use the information to inform critical decisions. This might involve making a go/no-go decision on whether to pursue the project, negotiating contractual protections to mitigate identified risks, or developing risk mitigation strategies to address the potential challenges highlighted in the report.

This example illustrates how a domain-specific LLM, as proposed in this thesis, could be utilized for political risk assessment during the tendering process for a hypothetical residential project in Russia. This example also demonstrates how a domain-specific LLM can significantly enhance political risk assessment during the tendering process by providing a more nuanced, data-driven assessment than traditional methods that responds to the rapidly evolving political landscape, thereby

enabling construction firms to make more informed decisions about pursuing international projects.

7.3 Concluding Remarks

The proposed framework for developing a domain-specific LLM is designed for automated political risk identification and assessment in the construction sector. This chapter has presented the Retrieval-Augmented Generation (RAG) and Fine-Tuning (FT) methods for the adaptability and real-time information access of RAG with the deep domain knowledge imparted by FT. The evaluation and validation of the proposed framework need to be performed to ensure its reliability and applicability in real-world scenarios. This process should involve quantitative and qualitative evaluation methods and integrating feedback from domain experts and end users to enhance the system's continuous performance.

Quantitative evaluation could involve metrics typically used in information retrieval and text generation, such as precision, recall, F1-score, and BLEU scores. However, quantitative metrics alone cannot fully capture the nuanced requirements of political risk assessment, where the context, relevance, and applicability of the insights are as important as their technical accuracy. Therefore, qualitative evaluation plays a crucial role. This will involve expert evaluation by construction and risk management professionals, who will assess the outputs for their practical relevance, accuracy, and usefulness. These experts could provide feedback on how well the LLM-generated insights align with their expectations and real-world needs, focusing on the model's ability to identify subtle risks and offer actionable insights.

A workshop similar to the previously organized one, which featured a hands-on interaction step and a general, replicable/repeatable setup methodology aimed at evaluating the performance of ChatGPT-4, may be arranged. This time, however, the focus should be on assessing domain-specific large language models (LLMs) for political risk assessment. This approach will allow for a targeted evaluation of these

models within specialized contexts, providing valuable insights into their applicability and performance in specific domains.

Moreover, the evaluation process should also consider the potential drawbacks of domain-specific LLMs. The framework's reliance on the quality and quantity of training data should be critically assessed, acknowledging that biased or insufficient data can significantly impact performance. The resource-intensive nature of developing and maintaining domain-specific LLMs must be evaluated, considering the trade-offs between the model's specialization and operational costs and transferability. Regular updates and maintenance might be integrated into the framework to address these concerns and ensure the LLM remains relevant as language and data evolve.

Given the fast pace of technological advancements in this field, AI is rapidly advancing, and its recent developments should be closely monitored and integrated into the proposed framework. What is considered cutting-edge today can quickly become outdated. Therefore, the proposed method is based on the best current knowledge but must remain adaptable to new developments.

To increase awareness among construction risk managers, it is essential to introduce them to these technological advancements in AI that can significantly enhance their work. The proposed framework is a tool that developers can utilize for implementation, but creating a domain-specific LLM, as part of this framework, requires specialized technical knowledge. This interdisciplinary work involves collaboration between political risk specialists and AI experts, as the success of such a complex system depends on integrating their expertise. AI experts alone cannot develop effective solutions for this domain; they must work closely with political risk experts and professionals from the construction industry.

Given the high budgets typical of construction projects, it is advisable not to rely solely on these relatively new and error-prone methods. AI should be seen as an

assistant that can provide valuable support rather than a fully autonomous decision-making tool.

It is important to note that domain-specific LLMs may vary for each company or project. In the initial step of Knowledge Base Development, these models should be tailored to specific needs. Risk managers play a crucial role in determining the necessary information sources and how data should be utilized to address their unique requirements effectively.

To build a domain-specific Large Language Model (LLM) for political risk assessment in construction, a key initial step is identifying and understanding the types of data needed, their structure, and how often they require updates. This understanding is crucial for deciding whether to employ Retrieval-Augmented Generation (RAG), Fine-Tuning (FT), or a hybrid approach, considering their respective strengths and limitations.

In conclusion, evaluating and validating the proposed framework is a comprehensive process combining iterative refinement with quantitative and qualitative methods. By incorporating expert feedback and addressing the potential limitations of domain-specific LLMs, the framework aims to achieve a balanced, accurate, and practical tool for political risk assessment that can adapt to the complexities of real-world applications.

CHAPTER 8

CONCLUSIONS

8.1 Overview of Research Findings

This thesis proposes a framework for automating political risk assessment in the construction industry, addressing the increasing need for efficient risk identification and assessment in international construction projects. The research highlights the significance of political risks as a critical, yet often underexplored, aspect of country risk assessment, emphasizing the need for standardized methodologies, improved data collection, and the potential role of automation in enhancing the effectiveness of assessments.

The study emphasizes that traditional approaches to political risk identification and assessment, often relying on manual data collection and assessment, are time-consuming and may not fully capture the dynamic nature of political environments. To address these limitations, the research explores digital technologies like web crawling and AI chatbots as potential solutions for automating information gathering and analysis.

While acknowledging the potential of web crawling in automating data collection, the research also recognizes its limitations, particularly in handling unstructured data and adapting to changes in website structures. The study suggests that integrating web crawling with advanced techniques like Natural Language Processing (NLP) and Machine Learning (ML), particularly through AI-powered chatbots, can enhance the efficiency and accuracy of political risk identification and assessment.

The research further explores the capabilities of AI chatbots, specifically OpenAI's ChatGPT, in political risk assessment. Through a workshop involving industry experts, the study evaluates ChatGPT's performance in identifying, assessing, and

ranking political risks. The findings reveal both the potential and limitations of ChatGPT in this domain. While ChatGPT demonstrates proficiency in providing general information about political risks and risk management methodologies, it may encounter challenges when tasked with providing region-specific insights, generating visual representations of risk assessments, and adapting to complex contractual scenarios.

Based on the findings, the thesis proposes a hybrid framework for developing a domain-specific Large Language Model (LLM) tailored explicitly for automated political risk identification and assessment in the construction industry. This framework combines the strengths of Retrieval-Augmented Generation (RAG), which allows the LLM to access and process external knowledge sources, with Fine-Tuning (FT), enabling the model to specialize in the nuances of political risk assessment within the construction domain. The proposed framework comprises three key steps: (i) developing a comprehensive knowledge base encompassing both publicly available political risk data and company-specific information, (ii) creating a domain-specific LLM through supervised fine-tuning and integrating RAG capabilities, and (iii) enabling users to interact with the LLM to obtain contextually relevant and specific political risk assessments for their projects.

The thesis concludes by emphasizing the need for continuous evaluation and refinement of the proposed framework to ensure its reliability and applicability in real-world scenarios. This includes employing both quantitative and qualitative evaluation methods, integrating feedback from domain experts and end-users, and adapting the framework to accommodate advancements in AI technology and the evolving landscape of political risks. The research underscores the transformative potential of AI in political risk assessment within the construction industry while advocating for a balanced approach that leverages both human expertise and technological advancements to navigate the complexities of international construction projects effectively.

8.2 Theoretical Contributions

This thesis presents several theoretical contributions to the field of political risk assessment within the context of international construction projects.

- **A Framework for Domain-Specific LLMs Creation to Automate Political Risk Assessment:** This study proposes a framework for developing a domain-specific Large Language Model (LLM) to enhance automated political risk assessment in construction. This framework addresses the limitations of existing generic LLMs, such as ChatGPT, which often struggle with region-specific details and actionable insights. The proposed framework combines two key approaches: Retrieval-Augmented Generation (RAG) and Fine-Tuning (FT). RAG enables the LLM to access and utilize external knowledge bases, ensuring access to up-to-date and contextually relevant information. FT involves training the LLM on a curated dataset specific to political risks in construction, aligning the model's capabilities with the domain's intricacies. This hybrid approach aims to create a system capable of providing more accurate, relevant, and actionable insights for managing political risks in international construction projects.
- **Taxonomy for Structured Political Risk Assessment in Construction:** This thesis asserts a structured representation of political risk-related topics, proposing the development of a taxonomy to organize and categorize these complex concepts. This taxonomy aids in navigating the extensive datasets and literature related to political risk, facilitating a more systematic and comprehensive approach to identifying and assessing these risks. It also suggests that the taxonomy can serve as a valuable tool for researchers and practitioners in the field, enhancing the understanding and management of political risks in international construction projects.

- **Enhancing Political Risk Assessment with Web Crawling for Faster Data Collection:** This study emphasizes the efficiency and speed that web crawling brings to political risk assessment in international construction projects. Manually collecting data from numerous websites is time-consuming and labour-intensive. Web crawling offers a faster alternative, as illustrated in a demonstrative example. By identifying relevant websites and indicators, a web crawler can be programmed to systematically gather, process, and organize the needed data, which then informs risk assessment and aids in decision-making for construction firms. This thesis highlights this as an advantage, particularly in situations where staying updated on evolving political situations is crucial. Additionally, this thesis makes significant theoretical contributions by integrating advanced AI techniques, such as ChatGPT and web crawling, into the political risk assessment processes of international construction projects.
- **Evaluation of ChatGPT and Prompt Engineering in Political Risk Assessment:** The study describes how generative AI, specifically ChatGPT, can be used to improve political risk assessment in the construction industry, which has been slow to utilize such technologies. While traditional risk assessment methods often struggle to keep up with the dynamic nature of political environments, AI offers the potential for automation and scalability in identifying and assessing these risks. The study, however, heavily stresses the critical role of prompt engineering in making ChatGPT effective. The quality of the prompts significantly influences the accuracy and usefulness of ChatGPT's responses. Vague prompts yield generic and less helpful answers, while detailed and tailored prompts, often incorporating project-specific parameters, lead to more focused and actionable insights for risk management. This thesis concludes that successfully integrating ChatGPT

into political risk assessment relies heavily on the user's ability to craft precise and comprehensive prompts.

8.3 Managerial Implications

This study highlights several key managerial implications regarding political risk assessment in the construction industry:

- **Embracing Digital Technologies for Efficient Political Risk Assessment:**

Companies need to move beyond manual processes and embrace digital technologies for political risk identification and assessment. This study emphasizes that manually reviewing documents for political risk assessment is time-consuming, potentially inaccurate, and struggles to keep up with rapidly changing political situations. This study highlights the need for more efficient data collection, analysis, and aggregation methods, potentially leveraging automation and AI. The integration of AI tools into political risk assessment processes can significantly improve the efficiency and accuracy of decision-making by more informed decisions. By automating the identification and evaluation of risks, managers can allocate resources more effectively and make informed decisions more quickly, ultimately reducing the likelihood of project delays and cost overruns.

The study demonstrates that while AI tools like ChatGPT can enhance the efficiency and scope of political risk assessments, they cannot fully replace human expertise. Managers should consider using AI as a supplementary tool, particularly in the early stages of risk identification and assessment. However, the reliance on AI-generated insights should be balanced with critical evaluation by experienced professionals to ensure the outputs are contextually relevant and actionable. Additionally, the research highlights the importance of training managers in "prompt engineering" to maximize the effectiveness of AI tools in risk management processes. This approach

will enable construction firms to leverage AI more effectively, leading to more informed decision-making in complex international environments.

The research also highlights the importance of expert oversight, as the current capabilities of AI tools like ChatGPT are not yet sufficient to replace human judgment. Risk managers must, therefore, use AI as a complementary tool rather than a substitute, ensuring that AI-generated insights are critically evaluated and contextualized by experts before being applied to real-world projects.

- **Standardized Methodologies in Political Risk Assessment:** There is a need for standardized methodologies and terminology in political risk assessment. This research notes the challenge posed by inconsistent terminology regarding country risk across different sources. This inconsistency can lead to discrepancies in information and hinder effective decision-making. The development of a political risk taxonomy has significant implications for knowledge management and risk communication within construction companies. It could facilitate more efficient communication and collaboration among project teams and improve the documentation and transfer of risk-related knowledge.
- **Mitigating Information Loss Through Effective Knowledge Transfer:** Companies should manage and transfer to mitigate the risk of information loss when employees leave. This study points out the concern of potential information loss when employees leave a company or project. This research suggests that research should investigate ways to improve knowledge management and transfer within organizations, ensuring that valuable insights and data are preserved and accessible. By embracing the digital technologies proposed in this thesis, companies could establish a formal process for political risk identification and assessment, which could mitigate the risk of information loss.

- **Hybrid RAG and Fine-Tuning Approach for Domain-Specific LLMs in Risk Assessment:** A hybrid approach combining Retrieval-Augmented Generation (RAG) and Fine-Tuning (FT) offers a promising solution for building domain-specific LLMs for automated political risk assessment. This study suggests that this hybrid approach can leverage the adaptability and real-time information access of RAG with the deep domain knowledge imparted by FT.

8.4 Limitations and Future Works

Here are the limitations of the study discussed in the thesis:

- One of the primary limitations of this research is the reliance on a limited number of experts, which may not fully capture the diversity of perspectives needed for a comprehensive analysis. Additionally, the absence of real-world data limits the ability to validate the models and approaches proposed in this study. In future work, this limitation can be addressed by expanding the expert pool to include a broader range of professionals from various regions and sectors. Furthermore, efforts will be made to incorporate real-world data into the analysis to improve the robustness and applicability of the findings.
- The current research primarily focuses on a single AI model, which may restrict the generalizability of the results to other AI technologies. Although this approach allows for a detailed examination of the chosen model, it does not account for the potential benefits and limitations of other AI models. Future research could explore a variety of AI models, including emerging ones such as Gemini and Llama, to determine their effectiveness in political risk assessment and other related applications. This exploration will provide a more holistic understanding of the capabilities and limitations of different AI technologies in this domain.

- The taxonomy developed in this study has not been independently validated by experts, which poses a limitation to its acceptance and use in broader contexts. Independent validation is essential to ensure that the taxonomy is accurate, comprehensive, and applicable across different scenarios and user groups. Future research can involve the independent validation of the taxonomy by external experts and stakeholders, helping to refine and enhance its credibility and usability. Additionally, the taxonomy could be periodically updated to incorporate new findings and developments in the field.
- This study primarily focuses on the context of Turkish construction contracts, which may limit the applicability of the findings to other international contexts. Although the methodology is primarily designed for Turkish contractors, it can be adapted for broader applications. Similar research designs can be developed using this approach, which serves as an example of how digital technologies can enhance political risk assessment in various contexts. This approach is replicable and generic, and it can be improved as digital technologies advance. Therefore, it can be utilized as a model for future research, ensuring adaptability and relevance across different scenarios.
- Based on the authors knowledge, this is one of the first studies to explore the use of ChatGPT in political risk assessment in construction. The study highlights the need for future research in this area and calls for further exploration and development in this field.

REFERENCES

- Abbasi, A., and Baldry, D. (2004). "The impact of globalisation on the construction industries of developing countries", *2nd International SCRI Research Symposium and 4th International Postgraduate Research Conference*, Manchester, UK, 33-42.
- AECOM. (2024). "Global construction prospects 2024", Retrieved from <https://publications.aecom.com/MEH/report/global-construction-prospects-2024>
Accessed on 10 August 2024
- Ahmad, S. Z., and Kitchen, P. J. (2008). "International expansion strategies of Malaysian construction firms: Entry mode choice and motives for investment", *Problems and Perspectives in Management*, 6(3), 15-23.
- Aibinu, A. A., and Odeyinka, H. A. (2006). "Construction delays and their causative factors in Nigeria", *Journal of Construction Engineering and Management*, 132(7), 667-677. doi: 10.1061/(ASCE)0733-9364(2006)132:7(667)
- Aisen, A., and Veiga, F.J. (2011). "How does political instability affect economic growth?", IMF Working Paper, Middle East and Central Asia Department, International Monetary Fund.
- Akçamete, A. (2006). "Country risk assessment in the construction industry", M.Sc. Thesis, Middle East Technical University, Graduate School of Natural and Applied Sciences, Ankara.
- Akinci. B., and Fischer, M. (1998). "Factors affecting contractors' risk of cost overburden", *Journal of Management in Engineering*, 14(1), 67-76.
- Aladağ, H. (2023). "Assessing the Accuracy of ChatGPT Use for Risk Management in Construction Projects", *Sustainability*, 15(22), 16071.

Alaghbari, W., Kadir, M. R. A., Salim, A., and Ernawati. (2007). "The significant factors causing delay of building construction projects in Malaysia", *Engineering, Construction and Architectural Management*, 14(2), 192-206. doi: 10.1108/09699980710731308

Al-Bahar, J. F., and Crandall, K. C. (1990). "Systematic risk management approach for construction projects." *J. Constr. Eng. Manage.*, 116(3), 533–546.

Alesina, A., Özler, S., Roubini, N., and Swagel, P. (1996). "Political instability and economic growth. *Journal of Economic growth*", 1, 189-211.

Aliber, R.A. (1975). "Exchange risk, political risk and investor demands for external currency deposits in the journal of money", *Credit and Banking*, 7, 161–179

Al-Mhdawi, M. K. S., Qazi, A., Alzarrad, A., Dacre, N., Rahimian, F. P., Buniya, M. K., and Zhang, H. (2023). "Expert Evaluation of ChatGPT Performance for Risk Management Process based on ISO 31000 Standard", *33rd European Safety and Reliability Conference, ESREL*, 2529–2533. https://doi.org/10.3850/978-981-18-8071-1_p733-cd

Alon, I., and Herbert, T. T. (2009). "A stranger in a strange land: Micro political risk and the multinational firm." *Bus. Horiz.*, 52(2), 127–137.

Ashley, D. B., and Bonner, J. J. (1987). "Political risks in international construction." *J. Constr. Eng. Manage.*, 113(3), 447–467.

Assaf, S.A., and Al-Hejji, S. (2006). "Causes of delay in large construction projects," *International Journal of Project Management*, 24, 349-357.

Aydogan, G., and Köksal, A. (2014). Host-Country Related Risk Factors in International Construction: Meta-Analysis. *Megaron*, 9(3).

Azhar N., Farooqui R.U. and Ahmed S.M. (2008) “Cost overrun factors in construction industry of Pakistan,” *First International Conference on Construction in Developing Countries*, 2008, Karachi, Pakistan

Bahamid, R. A., and Doh, S. I. (2017). “A review of risk management process in construction projects of developing countries”, In *IOP Conference Series: Materials Science and Engineering* (Vol. 271, No. 1, p. 012042). IOP Publishing.

Baloi, D. and Price A.D.F. 2003, “Modelling global risk factors affecting construction cost performance”, *International Journal of Project Management*, 21 (4): 261– 269. [https://doi.org/10.1016/S0263-7863\(02\)00017-0](https://doi.org/10.1016/S0263-7863(02)00017-0).

Baloi, D. and Price A.D.F. 2003, “Modelling global risk factors affecting construction cost performance”, *International Journal of Project Management*,

Barcaui, A., and Monat, A. (2023). “Who is better in project planning? Generative artificial intelligence or project managers?” *Project Leadership and Society*, 4. <https://doi.org/10.1016/j.plas.2023.100101>

Berry, C. (2010). “The convergence of the terrorism insurance and political risk insurance markets for emerging market risk: Why it is necessary and how it will come about”, In Moran, T.H., West, G.T. and Martin, K. (Eds.), *International political risk management: Needs of the present, challenges for the future* (pp. 13–25). Washington, DC: The World Bank

Bing, B.L., Tiong, R.L.K., Fan, W.W. and Chew, D.A.S. 1999, “Risk management in international construction joint ventures”, *ASCE Journal of Construction Engineering and Management*, vol. 1254, pp. 277-284.

Birgonul, M. T., Dikmen, I. (2001). “Risks borne by foreign contractors doing business in Turkey”, *Proceedings of ARCOM Conference*, 5-7 September, Salford, United Kingdom.

Bishop, C. M. (2006). "Pattern Recognition and Machine Learning", Springer.

Brada, J. C., Kutan, A. M., and Yigit, T. M. (2006). The effects of transition and political instability on foreign direct investment inflows: Central Europe and the Balkans 1. *Economics of Transition*, 14(4), 649-680.

Brewer, T. L. (1981). "Political risk assessment for foreign direct investment decisions: Better methods for better results", *Columbia Journal of World Business (Spring)*, 5–12.

Britannica, (2024). "Taxonomy" Available at <https://www.britannica.com/science/taxonomy>. Accessed on 10 August 2024.

Brown, T. B., Mann, B., Ryder, N., Subbiah, M., Kaplan, J., Dhariwal, P., and Amodei, D. (2020). "Language Models are Few-Shot Learners." *arXiv preprint arXiv:2005.14165*.

Bu-Qammaz, A. S. (2007). "Risk assessment of international construction projects using the analytic network process", M.Sc. Thesis, Middle East Technical University, Graduate School of Natural and Applied Sciences, Ankara

Bu-Qammaz, A., Dikmen, I., and Birgonul, M. T. (2006). "Cultural risk assessment in construction projects", In *Proceedings of the Joint International Conference on Construction Culture, Innovation and Management (CCIM)* (pp. 26-29).

Chan, E.H.W. and Tse, R.Y.C. (2003). "Cultural considerations in international construction contracts", *ASCE Journal of Construction Engineering and Management*, 129(4), 375–81

Chang, T., Deng, X., Zuo, J., and Yuan, J. (2018). Political risks in Central Asian countries: Factors and strategies. *Journal of Management in Engineering*, 34(2), 04017059.

Chapman, R. J. (1998). "The effectiveness of working group risk identification and assessment techniques", *International Journal of Project Management*, Vol. 16(6): 333-343.

Chapman, R.J., (2001). "The controlling influences on effective risk identification and assessment for construction design management", *International Journal of Project Management*, 19(3), pp.147-160.

Cho, J. (2001). "Crawling the web: discovery and maintenance of large-scale web data", Doctoral Dissertation. Department of Computer Science, Stanford University.

Chua, D. K. H., Wang, Y. and Tan, W. T. (2003), Impacts of obstacles in East Asian cross-border construction. *ASCE Journal of Construction Engineering and Management*, 129(2), 131-141.

Ciarrapico, A.M. (1992). Country risk: A theoretical framework of analysis. Brookfield: Dartmouth.

Crossley, S. A. (2013). "Advancing research in second language writing through computational tools and machine learning techniques: A research agenda", *Language Teaching*, 46(2), 256-271.

Dalkey N. C. (1969). The Delphi Method: An Experimental Study of Group Opinion. RM-5888-PR. Santa Monica: Rand Corp.

Darwish, M. M., Nejat, A., and Ghebrab, T. (2012). "Globalization and the new challenges for construction engineering education", *American Society for Engineering Education 2012 Annual Conference and Exposition*, San Antonio, Texas, ABD.

Deng, X., and Low, S. P. (2014). “Exploring critical variables that affect political risk level in international construction projects: Case study from Chinese contractors.” *J. Prof. Issues Eng. Educ. Pract.*, 10.1061/(ASCE)EI.1943-5541.0000174, 04013002

Dikmen, I. and Birgonul, T. (2006). “An Analytic Hierarchy Process based model for risk and opportunity assessment of international construction projects”, *Canadian Journal of Civil Engineering*, 33 (1), 58-68.

Dikmen, I., Birgonul, M. T., and Han, S. (2007). “Using fuzzy risk assessment to rate cost overrun risk in international construction projects.” *Int. J. Proj. Manage.*, 25(5), 494–505.

Dou, Y., Xue, X., Wang, Y., Luo, X., and Shang, S. (2019). “New media data-driven measurement for the development level of prefabricated construction in China”, *Journal of Cleaner Production*, 241, 118353.

Eden, C. (1992). “On the nature of cognitive maps”, *Journal of Management Studies*, 29(3), 261–265.

Eiteman, D.K. and Stonehill, A.I. (1973). *Multinational business finance*. Reading, Mass.: Addison-Wesley Educational Publishers Inc.

EIU (2005). “Country risk service”, Available: www.graphics.eiu.com/upload/eb/Benefits_CountryRiskService.pdf. Accessed on 10 August 2024

Eken, G. (2022). “Using natural language processing for automated construction contract review during risk assessment at the bidding stage”, PhD. Thesis, Middle East Technical University, Graduate School of Natural and Applied Sciences, Ankara.

ENR. (2023). “Top-250-International-Contractors-Preview”, Retrieved from [https:// www.enr.com/toplists/2023-Top-250-International-Contractors-Preview](https://www.enr.com/toplists/2023-Top-250-International-Contractors-Preview). Accessed on 10 August 2024

ENR. (2024). “Report projects continued global construction growth through 2030”, Retrieved from <https://www.enr.com/articles/58025-report-projects-continued-global-construction-growth-through-2030>. Accessed on 10 August 2024

Erb, C. B., Harvey, C. R., and Viskanta, T. E. (1996). Political risk, economic risk, and financial risk. *Financial Analysts Journal*, 52(6), 29-46.

Ereshefsky, M. (2000). “The poverty of the Linnaean hierarchy: A philosophical study of biological taxonomy”, Cambridge University Press.

Ereshefsky, M. (2007). “Where the wild things are: environmental preservation and human nature”, *Biology & Philosophy*, 22(1), 57–72.

Eyboosh M., (2010). “Identification of Risk Paths in International Construction Projects”, M.Sc. Thesis, Middle East Technical University, Graduate School of Natural and Applied Sciences, Ankara.

Eyboosh M., Dikmen I. and Birgonul M.T. (2011). “Identification of risk paths in international construction projects using structural equation modeling,” *Journal of Construction Engineering and Management*, 137 (12), 1164-1175.

Fidan, G., (2008). “A risk and vulnerability ontology for construction projects”, M.Sc. Thesis, METU.

Fitzpatrick, M. (1983). “The definition and assessment of political risk in international business: A review of the literature”, *Academy of Management Review*, 8(2), 249–254.

Fraser, A. Z. and Fraser, C. (2000), Risk perception by UK firms towards the Russian market. *International Journal of Project Management*, 20, 99-105

- Goodfellow, I., Bengio, Y., and Courville, A. (2016). “Deep Learning”, MIT Press.
- Green, R.T. (1974). “Political structures as a predictor of radical political change”, *Columbia Journal of World Business*, 9(1), 28–36.
- Green, R.T. and Korth, C.M. (1974). “Political instability and the foreign investor”, *California Management Review*, 18(1), 23–31.
- Gudienė, N., Banaitis, A., Banaitienė, N., Lopes, J. (2013). “Development of a conceptual critical success factors model for construction projects: A case of Lithuania”, *Procedia Engineering*, 57, 392-397.
- Günhan, S. and Arditi, D. (2005a). “Factors affecting international construction”, *ASCE Journal of Construction Engineering and Management*, 131(3), 273-282.
- Günhan, S. and Arditi, D. (2005b). “International expansion decision for construction companies”, *ASCE Journal of Construction Engineering and Management*, 131(8), 928-937.
- Hajba, G.L. (2018). “Using Beautiful Soup. In: Website Scraping with Python”, Apress, Berkeley, California.
- Han, S. H. and Diekmann, J.E. (2001). “Making a risk-based bid decision for overseas construction projects”, *Journal of Construction Management and Economics*, (19), 65-76.
- Han, S. H., Kim D. Y., Kim H., and Jang, W. (2008). “A web-based integrated system for international project risk assessment”, *Journal of Automation in Construction*, vol. 173, pp. 342-356.
- Han, S.H., Park S.H., Kim, D.Y., Kim, H., and Kang, Y.W. (2007). “Causes of bad profit in overseas construction projects”, *ASCE Journal of Construction Engineering and Management*, vol. 133, no. 12, pp. 932-943.

- Hastak, M. and Shaked, A. (2000). "ICRAM-1: Model for international construction risk assessment", *ASCE Journal of Management in Engineering*, 16(1), 59-69.
- Henisz, W. and Zelner, B.A. (2010). "The hidden risks in emerging markets", *Harvard Business Review*, 88(4), 88–95
- Hofert, M. (2023). "Assessing ChatGPT's Proficiency in Quantitative Risk Management", *Risks*, 11(9), 166.
- Holtzman, A., Buys, J., Du, A., Forbes, M., Choi, Y., and Choi, J. (2020). "The Curious Case of Neural Text Degeneration." *arXiv preprint arXiv:1904.09751*.
- Hong, S. H., Lee, S. K., and Yu, J. H. (2019). "Automated management of green building material information using web crawling and ontology", *Automation in Construction*, 102, 230-244.
- Howell, L.D. and Chaddick, B. (1994). "Models of political risk for foreign investment and trade: An assessment of three approaches", *Columbia Journal of World Business*, 29(3), 70–91.
- Hussain, Z., and June, T. Z. (2014). Can political stability hurt economic growth? World Bank Blogs. World Bank, available at: <https://blogs.worldbank.org/endpovertyinsouthasia/can-political-stability-hurteconomic-growth>.
- IBM, (2024). "Large Language Models" Available at <https://www.ibm.com/topics/large-language-models> Accessed on 10 August 2024.
- International Construction. (2024). "Global Construction Handbook 2024", Retrieved from <https://digimag.international-construction.com/magazine/global-construction-guide-2024> Accessed on 10 August 2024
- Isa, C. M. M., Saman, H. M., Nasir, S. R. M. (2014). "Specific-factors influencing market selection decision by Malaysian construction firms into international market", *Procedia-Social and Behavioral Sciences*, 129, 4-10.

Islam, I., Munim, K. M., Oishwee, S. J., Islam, A. N., and Islam, M. N. (2020). “A critical review of concepts, benefits, and pitfalls of blockchain technology using concept map”, *IEEE Access*, 8, 68333-68341.

Iyer, K. C., Jha, K. N. (2005). “Factors affecting cost performance: Evidence from Indian construction projects”, *International Journal of Project Management*, 23(4), 283-295.

Jackson, J. (2004). “Taxonomy’s not just design, it’s an art”, *Government Computer News*, Vol.23(3), p.17 243-258

Jarvis, D.S.L. (2008). “Conceptualizing, analyzing and measuring political risk: The evolution of theory and method”, Lee Kuan School of Public Policy Research Paper No. LKYSPP08-004. Available at <http://ssrn.com/abstract=1162541>. Accessed on 10 August 2024.

Jaselskis, E. J. and Talukhaba, A. (1998), “Bidding considerations in developing countries”, *ASCE Journal of Construction Engineering and Management*, 124(3), 185-193.

Javernick-Will, A., and Levitt, R. E. (2010). “Mobilizing Institutional Knowledge for International Projects”, *Journal of Construction Engineering and Management*, 136(4), 430–441.

Jeong, C. (2023). “A Study on the Implementation of Generative AI Services Using an Enterprise Data-Based LLM Application Architecture”, *Advances in Artificial Intelligence and Machine Learning*, 3(4), 1588–1618. <https://doi.org/10.54364/aaiml.2023.1191>

Jiang, A. Q., Sablayrolles, A., Mensch, A., Bamford, C., Chaplot, D. S., Casas, D. de las, Bressand, F., Lengyel, G., Lample, G., Saulnier, L., Lavaud, L. R., Lachaux, M.-A., Stock, P., Scao, T. Le, Lavril, T., Wang, T., Lacroix, T., and Sayed, W. El. (2023). “Mistral 7B”, 1–9. <http://arxiv.org/abs/2310.06825>

Jodice, D.A. (1984). "Trends in political risk assessment: Prospects for the future. In Ghadar, F. and Moran", T.H. (Eds.), *International political risk management: New dimensions* (pp. 8–26). Washington, DC: Ghadar and Associates.

Jurafsky, D., and Martin, J. H. (2019). "Speech and Language Processing", Pearson.

Kaming, P.F., Olomolaiye, P.O., Holt, G.D., and Harris, F.C. (1997). "Factors influencing construction time and cost overruns on high-rise projects in Indonesia", *Construction Management and Economics*, 15(1), 83-94.

Kansal, V. (2015). "Political Risk: Conceptualization, Definition, Categorization, and Methodologies", *Journal of Political Risk*, 3(4), 1-7.

KarimiAzari, A., Mousavi, N., Mousavi, S.F. and Hosseini, S., (2011). "Risk assessment model selection in construction industry", *Expert Systems with Applications*, 38(8), pp.9105- 9111.

Kim, J., Youm, S., Shan, Y., and Kim, J. (2021). "Analysis of fire accident factors on construction sites using web crawling and deep learning approach", *Sustainability*, 13(21), 11694.

Kıral, I. A., Kural, Z., and Çomu, S. (2014). "Risk identification in construction projects: Using the Delphi method", *In 11th International Congress on Advances in Civil Engineering, Istanbul, Turkey* (pp. 21-25).

Klepo, M. S., Knežević, D., Knežević, T., and Meštrović, H. (2023). "Artificial Intelligence in Risk Management System on Infrastructure Projects", *Proceedings of the Creative Construction Conference*, June, 208–214.

Kobrin, S.J. (1979). "Political risk: A review and reconsideration", *Journal of International Business Studies*, 10(1), 67–80.

Leitner, J. (2017). Political risk and international business: Where they interfere, consequences, and options. In *State Capture, Political Risks and International Business* (pp. 26-40). Routledge. Taylor and Francis Group.

Lewis, P., Perez, E., Piktus, A., Petroni, F., Karpukhin, V., Goyal, N., Küttler, H., Lewis, M., Yih, W. T., Rocktäschel, T., Riedel, S., and Kiela, D. (2020). “Retrieval-augmented generation for knowledge-intensive NLP tasks”, *Advances in Neural Information Processing Systems, 2020-Decem.*

Lewis, T. M. (2007). Impact of globalization on the construction sector in developing countries. *Construction Management and Economics*, 25(1), 7-23.

Ling, F.Y.Y., and Hoang, V.T.P. (2010). “Political, economic and legal risks faced in international projects: case study of Vietnam”, *Journal of Professional Issues in Engineering Education and Practice*, 136(3), 156-164.

Ling, Y. Y., and Lim, H. K. (2007). “Foreign firms’ financial and economic risk in China.” *Eng., Constr., Archit. Manage.*,14(4), 346–362

Linstone, H. and Turoff, M., (2002). *The Delphi Method*. Massachusetts: Addison-Wesley Publishing Company.

Lukas, M. P. (2009). “Taxonomy system for intelligent library search system”, In *IEEE International Conference on Instrumentation, Communication, Information Technology, and Biomedical Engineering*, (pp. 1-5).

Lum, T. (2006). “Social unrest in China”, CRS Report for Congress, Congressional Research Service.

Manning, C. D., and Schütze, H. (1999). “Foundations of Statistical Natural Language Processing”, MIT Press.

Marchetti, R., and Vitale, M. (2014). *Towards a " global" political risk analysis.*, LUISS University Press, Roma

Markham, K. M., Mintzes, J. J., and Jones, M. G. (1994). "The concept map as a research and evaluation tool: Further evidence of validity", *Journal of research in science teaching*, 31(1), 91-101.

Martinez-Rojas, M. Marin, N. and Vila, M. A. (2016). "The role of information technologies to address data handling in construction project management", *Journal of Computing in Civil Engineering*, 30(4).

Mayer, E. (1985). *International lending: Country risk analysis*. Reston: Reston Financial Services.

Micallef, J.V. (1982). "Assessing political risk", *The McKinsey Quarterly*, Winter, 67-77.

MIGA (2010). "World investment and political risk report", Available at <http://www.miga.org/documents/WIPR10ebook.pdf>. Accessed on 10 August 2024.

Miljkovic, D., and Rimal, A. (2008). "The impact of socio-economic factors on political instability: a cross-country analysis", *The Journal of Socio-Economics*, 37, 2454-2463.

Mitchell, T. M. (1997). "Machine Learning. McGraw-Hill.

Moon, S., Shin, Y., Hwang, B. G., and Chi, S. (2018). "Document management system using text mining for information acquisition of international construction", *KSCE Journal of Civil Engineering*, 22(12), 4791-4798.

Mosser, L., Aursand, P., Brakstad, K. S., Lehre, C., and Myhre-Bakkevig, J. (2024). "Exploration Robot Chat: Uncovering Decades of Exploration Knowledge and Data with Conversational Large Language Models", *Society of Petroleum Engineers - SPE Norway Subsurface Conference, 2024*, <https://doi.org/10.2118/218439-MS>

Mukherjee, S., Mitra, A., Jawahar, G., Agarwal, S., Palangi, H., and Awadallah, A. (2023). Orca: “Progressive Learning from Complex Explanation Traces of GPT-4”, <http://arxiv.org/abs/2306.02707>

Munley, C., Jarmusch, A., and Chandrasekaran, S. (2024). “LLM4VV: Developing LLM-driven testsuite for compiler validation”, *Future Generation Computer Systems*, 160(May), 1–13. <https://doi.org/10.1016/j.future.2024.05.034>

Ngowi, A. B ., Pienaar, E., Akindele, O., Iwisi, D.S. (2006). “Globalisation of the construction industry: a review of infrastructure financing”, *Journal of Financial Management of Property and Construction*, 11(1), 45–57. <http://doi.org/10.1108/13664380680001079>

Ngowi, A. B., Pienaar, E., Talukhaba, A., and Mbachu, J. (2005). “The globalisation of the construction industry - a review”, *Building and Environment*, 40(1), 135–141.

Novak, J.D. (2008). “Learning, Creating, and Using Knowledge: Concept Maps as Facilitative Tools in Schools and Corporations” (2nd ed.). Routledge. ISBN 9780415991858.

Novak, J.D. and Gowin, D.B. (1984). *Learning How to Learn*. Cambridge and NY: Cambridge University Press.

Nyqvist, R., Peltokorpi, A., and Seppänen, O. (2024). “Can ChatGPT exceed humans in construction project risk management?” *Engineering, Construction and Architectural Management*, 31(13), 223–243. <https://doi.org/10.1108/ECAM-08-2023-0819>

Odeh, A. M., and Battaineh, H. T. (2002). “Causes of construction delay: Traditional contracts”, *International Journal of Project Management*, 20, 67-73.

Olawale, Y. A., and Sun, M. (2010). “Cost and time control of construction projects: Inhibiting factors and mitigating measures in practice”, *Construction Management and Economics*, 28(5), 509-526. doi: 10.1080/01446191003674519

Olston, C., and Najork, M. (2010). “Web crawling”, *Foundations and Trends in Information Retrieval*, 4(3), 175-246.

OpenAI. (2022). “Introducing ChatGPT”, Available at <https://openai.com/blog/chatgpt>. Accessed on 10 August 2024.

Ozcan, G. (2008). “A generic risk and vulnerability assessment framework for international construction projects”, M.Sc. Thesis, Middle East Technical University, Graduate School of Natural and Applied Sciences, Ankara.

Ozorhon, B., Arditi, D., Dikmen, I., and Birgonul, M.T. (2007). “Effect of host country and project conditions in international construction joint ventures”, *International Journal of Project Management*, 25(8), 799-806

Ozyurt, B. (2018). “Similarity Assessment of Countries to Facilitate Learning from International Construction Projects”, M.Sc. Thesis, Middle East Technical University, Graduate School of Natural and Applied Sciences, Ankara

Ozyurt, B., Tah, J.H.M., Dikmen, I. and Birgonul M T. (2023). “Using Web Crawling for Automated Country Risk Assessment”, *Proceedings of the 33rd European Safety and Reliability Conference (ESREL 2023)*, 3 – 7 September 2023, Southampton, UK, 2568 – 2572.

Pinkerton B. (1994). “Finding what people want: Experiences with the web crawler”, *Proceedings of the Second World-Wide Web Conference*, Chicago, Illinois.

PRS Group (2021) “International Country Risk Guide (ICRG) methodology”, Available: [http://www.prsgroup.com/ICRG Methodology.aspx](http://www.prsgroup.com/ICRG%20Methodology.aspx). #Background. Accessed on 10 August 2024

Q&A in MRI (2024). “Neural Network Definition and Components”, Available at <https://mriquestions.com/what-is-a-neural-network.html> Accessed on 10 August 2024.

Qureshi, M.N., Ali, K., and Khan, I.R. (2010). “Political instability and economic development: Pakistan time-series analysis”, *International Research Journal of Finance and Economics*, 56.

Radeva, I., Popchev, I., Doukovska, L., and Dimitrova, M. (2024). “Web Application for Retrieval-Augmented Generation: Implementation and Testing”, *Electronics (Switzerland)*, 13(7). <https://doi.org/10.3390/electronics13071361>

Radford, A., Wu, J., Child, R., Luan, D., Amodei, D., and Sutskever, I. (2019). “Language Models are Unsupervised Multitask Learners, Better Language Models and Their Implications” Available at <https://openai.com/index/better-language-models/> Accessed on 10 August 2024.

Renuka, S. M., Umarani, C., Kamal, S. (2014). “A review on critical risk factors in the life cycle of construction projects”, *Journal of Civil Engineering Research*, 4(2A), 31- 36

Rezakhani, P. (2012). “Classifying key risk factors in construction projects”, *Bulletin of the Polytechnic Institute of Iasi*, 62(2), 27-38.

Robock, S.H. (1971). “Political risk: Identification and assessment”, *Columbia Journal of World Business*, 6(4), 6–20.

Root, F.R. (1972). “Analyzing political risks in international business”, In Kapoor, A. & Grub, P. (Eds.), *Multinational enterprise in transition: Selected readings and essays* (pp. 354–365). Detroit: Darwin Press.

Russell, S. J., and Norvig, P. (2016). “Artificial Intelligence: A Modern Approach.” Pearson.

Salama, D. M., and El-Gohary, N. M. (2016). “Semantic Text Classification for Supporting Automated Compliance Checking in Construction”, *Journal of Computing in Civil Engineering*,

Sharma, S., (2020). “Risk Identification and Management in Building and Infrastructure Projects”, Master of Technology Thesis, Jaypee University of Information Technology, India

Simon, J.D. (1984). “A theoretical perspective on political risk”, *Journal of International Business Studies*, 15(3), 123–143.

Singhal, K., Tu, T., Gottweis, J., Sayres, R., Wulczyn, E., Hou, L., Clark, K., Pfohl, S., Cole-Lewis, H., Neal, D., Schaekermann, M., Wang, A., Amin, M., Lachgar, S., Mansfield, P., Prakash, S., Green, B., Dominowska, E., Arcas, B. A., Natarajan, V. (2023). “Towards Expert-Level Medical Question Answering with Large Language Models”, 1–30.

Sottolotta, C. E. (2016). *Rethinking political risk: concepts, theories, challenges*. Routledge.

Sottolotta, C.E. (2013). *Political stability in authoritarian regimes: Lessons from the Arab uprisings*. Istituto Affari Internazionali Working Papers Series, 3, ISSN 2280-4331 .

Tadayon, M., Jaafar, M. and Nasri, E., (2012). “An assessment of risk identification in large construction projects in Iran”, *Journal of Construction in Developing Countries*, 17.

Tah, J. H. M., and Carr, V. (2000). “A proposal for construction project risk assessment using fuzzy logic.” *Constr. Manage. Econ.*, 18(4), 491–500.

Tanrıverdi, C. (2019). “A causal mapping approach for the analysis of construction disputes”, M.Sc. Thesis, Middle East Technical University, Graduate School of Natural and Applied Sciences, Ankara.

TCA. (2023). “Turkish contracting in the international market”, Retrieved from <https://www.tmb.org.tr/en> Accessed on 10 August 2024

The British Standard Institute. (2010). “BS 31010: Risk management – Risk assessment techniques”, Milton Keynes: BSI

The Business Research Company. (2024). “Construction market report”, Retrieved from <https://www.thebusinessresearchcompany.com/report/construction-market> Accessed on 10 August 2024.

Thunell, L.H. (1977). Political risks in international business: Investment behavior of multinational corporations. New York & London: Praeger.

Toor, S.-U.-R., and Ogunlana, S. O. (2008). “Problems causing delays in major construction projects in Thailand”, *Construction Management and Economics*, 26, 395-408. doi: 10.1080/01446190801905406

Touvron, H., Lavril, T., Izacard, G., Martinet, X., Lachaux, M.-A., Lacroix, T., Rozière, B., Goyal, N., Hambro, E., Azhar, F., Rodriguez, A., Joulin, A., Grave, E., and Lample, G. (2023). “LLaMA: Open and Efficient Foundation Language Models”, <http://arxiv.org/abs/2302.13971>

Vaswani, A., Shazeer, N., Parmar, N., Uszkoreit, J., Jones, L., Gomez, A. N., and Polosukhin, I. (2017). “Attention is All You Need.” *Advances in Neural Information Processing Systems (NeurIPS)*, 30.

Wallace, J. D., and Mintzes, J. J. (1990). “The concept map as a research tool: Exploring conceptual change in biology”, *Journal of research in science teaching*, 27(10), 1033-1052.

Webersinke, N., Kraus, M., Bingler, J., and Leippold, M. (2022). “CLIMATEBERT: A Pretrained Language Model for Climate-Related Text”, *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.4229146>

Wu, S., Irsoy, O., Lu, S., Dabravolski, V., Dredze, M., Gehrmann, S., Kambadur, P., Rosenberg, D., and Mann, G. (2023). “BloombergGPT: A Large Language Model for Finance”, 1–76.

Xenidis, Y., Angelides, D. (2005). “Identification and classification of risks in a new modelling process for build-operate-transfer projects”, *Proceedings of ARCOM Conference*, 7-9 September, London, United Kingdom.

Yazdi, M., Zarei, E., Adumene, S., and Beheshti, A. (2024). “Navigating the Power of Artificial Intelligence in Risk Management: A Comparative Analysis”, *Safety*, 1–48.

Yıldız, A. E. (2018). “Development of a dynamic strategy map incorporating scenario analysis and system dynamics: A simulation test on an international construction company”, PhD. Thesis, METU

Yong, Y. C., Mustaffa, N. E. (2013). “Critical success factors for Malaysian construction projects: An empirical assessment”, *Construction Management and Economics*, 31(9), 959-978.

Zhang, T., Patil, S. G., Jain, N., Shen, S., Zaharia, M., Stoica, I., and Gonzalez, J. E. (2024). “RAFT: Adapting Language Model to Domain Specific RAG”, <http://arxiv.org/abs/2403.10131>

Zhi, H. (1995). “Risk management for overseas construction projects.”, *Int. J. Proj. Manage.*, 13(4), 231–237.

Zhou, Y. C., Lin, J. R., and She, Z. T. (2021). “Automatic Construction of Building Code Graph for Regulation Intelligence”, In *International Conference on Construction and Real Estate Management (ICCREM 2021)*, Beijing, China, 248-254.

Zhu, F., Hu, H., and Xu, F. (2022). “Risk assessment model for international construction projects considering risk interdependence using the DEMATEL method”, *Plos one*, *17*(5), e0265972.

Zink, D.W. (1973). *The political risks for multinational enterprise in developing countries with a case study of Peru*. New York: Praeger.

Zou P.X.W., Zhang G. and Wang J. (2007). “Understanding the key risks in construction projects in China.” *International Journal of Project Management*, *25*(6), 601-614.

APPENDICES

A. Needs Analysis Survey



Survey for Needs Analysis

Voluntary Participation Form

This survey has been developed within the context of a doctoral dissertation titled “Using Digital Technologies for Political Risk Assessment in International Construction Projects”. This form is designed to inform you about the survey study conditions.

Your participation in the study should be based entirely on volunteerism. Your answers will only be evaluated by the researcher. The information that will be gathered through this survey from the participants will be used in scientific publications.

The aim of the study is to facilitate the current country risk management processes. Within this context, this survey aims to identify industry/company needs and initial requirements.

In this context, the survey contains questions about your organization's current practices regarding country risk assessment and management, and the needs of an automated country information acquisition system for construction organizations. If you agree to participate in the survey, you are expected to answer these questions.

Matters you need to know about your participation: The study does not contain any risks beyond the usual risks encountered in daily life. If you feel uncomfortable due to questions during participation or any other reason, you are free to leave by interrupting the study. At the end of the survey, your questions about this research will be answered. Participation in this survey takes about 75 minutes.

For more/further information about the study, please contact Beste Özyurt (e-mail: besteozyurt@gmail.com) as doctoral student in Middle East Technical University, Department of Civil Engineering, Construction Engineering and Management Division.

Supervisors: Prof. Dr. Irem Dikmen Toker and Prof. Dr. M. Talat Birgonul

Thank you in advance for your participation.

I have read the above information and fully agree to participate in this work voluntarily. I know that I can leave the survey when I want. I agree that the information I provide can be used in scientific publications.

(Once you have completed the form and signed, please give it back).

Date:

Signature:

Section 1: Company Professional Information

Personal /Expert Information	
Title:	
Major:	
Gender:	<input type="checkbox"/> F <input type="checkbox"/> M
Age:	<input type="checkbox"/> 20-35 <input type="checkbox"/> 36-50 <input type="checkbox"/> 50+
Education:	<input type="checkbox"/> BSc <input type="checkbox"/> MSc <input type="checkbox"/> PhD
Professional Experience:	
<input type="checkbox"/> 0-5 years <input type="checkbox"/> 6-15 years <input type="checkbox"/> 16-25 years <input type="checkbox"/> 26 years and more	
Knowledge in Construction Management:	
<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low	
Knowledge in Country Risk Management:	
<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low	
Knowledge in IT, Automation and Machine Learning:	
<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low	
Company Information	
Annual return of the company that you have been currently working for:	
<input type="checkbox"/> 0-100 million TL <input type="checkbox"/> 100-500 million TL <input type="checkbox"/> 500 million TL +	
Fields of activity of the company (you can select more than one option):	
<input type="checkbox"/> Housing <input type="checkbox"/> Commercial buildings (hotel, shopping centre, etc.) <input type="checkbox"/> State buildings (school, dormitory, etc.) <input type="checkbox"/> Transportation structures <input type="checkbox"/> Energy structures (HEPP, energy transmission lines, etc.) <input type="checkbox"/> Water structures (dam, irrigation, etc.) <input type="checkbox"/> Industrial plants (factory, etc.) <input type="checkbox"/> Other	
Type of the company:	Age of the company:
<input type="checkbox"/> Contractor <input type="checkbox"/> Client / Investor <input type="checkbox"/> Design / Project company <input type="checkbox"/> Consultancy firm <input type="checkbox"/> Other	<input type="checkbox"/> 0-10 years <input type="checkbox"/> 11-20 years <input type="checkbox"/> 21-30 years <input type="checkbox"/> 31-40 years <input type="checkbox"/> 41 years and more

Section 2: Open-Ended Questions about Country Risk Assessment (CRA) and Management

In this section, you are asked to evaluate current practices of your organization regarding country risk assessment and management by using open-ended questions.

QUESTIONS – About Current Practices of CRA and Management

- How do you define “country risk assessment and management”? Why and when is it conducted?

- What are the major steps/functions of country risk management (such as identification, assessment etc.)? In your company, is there a formal process for country risk assessment and management? Is there a division/person responsible for this? How frequently tasks are conducted? Is there a database of country risks regarding previous international projects?

- How do you conduct country risk assessment? (information sources, assessment methods, tools etc.) Is there a standard country risk checklist used for all projects? What kind of country risk data (political, economic ratings etc.) are collected and stored? What type of data (e.g., quantitative, qualitative, numeric, textual, audio, records etc.) are collected/stored?

- What information sources do you utilise? Please explain the sources of country-related information (documents found on the Internet, specific websites, documents located in companies' databases, and/or publications from an Institute that provides country-related information such as country reports etc.)

- How do you select the specific/useful country risk data among all data in these sources? How do you ensure reliability of data that come from outside of the company? Do you have any mechanism to provide consistency between the data that come from different sources?

- How do type of country risk factors (e.g., political, financial, environmental, social, and cultural risks) affect the selection of the information sources? Are the sources of information determined considering the type of country risk? Do you need to identify/assess the similar country factors for each project or do you ignore some of the country risk factors for some countries? If so, please give examples including the different countries and the country risk factors.

- Are your sources of information general or determined according to the country where the project is conducted? Do the knowledge sources and risk factors change according to the country, type of project, type of contract etc.?

- How do you utilize the data gathered as a result of the country risk identification/assessment process? Who uses the data for what and how uses these for which purpose in your organization?

- Please indicate the positive sides/benefits and negative sides/weaknesses of your current country risk assessment and management practices.

-
- Can you think of any improvements in your current practice? What could be done to make your practices more successful and how would these improvements affect your company's performance?

- Do you think automated systems such as an automated document review for knowledge acquisition, can be used for country risk assessment? What would be the potential benefits/bottlenecks of such a system?

**This is the end of the survey.
Thank you for your contributions.**

B. Taxonomy

Taxonomy of political risk-related topics

1.Political Spheres / Politics			References
1.1 Internal			
1.1.1. Government			
1.1.1.1. Government Stability			
		<p>Political stability or degree of acceptable instability, level of government stability</p> <p>Change in government / in the governing body of a country / radical political change, unstable government, stability of government</p> <p>Propensity for regime or government change, violent threats to, or changes in, government, including terrorism, political, unrest and violence (e.g. Assassinations and demonstrations)</p> <p>Electoral cycle, forthcoming elections, change in ruling political party, rapid, unexpected change in the political environment</p> <p>Government collapse, either because of conflicts or rampant competition between various political parties, Regime transition and durability</p> <p>Support for government, political/government support,</p> <p>Government unity, government longevity, political/ government continuity/ discontinuity</p> <p>Political legitimacy, Political leadership,</p> <p>The stance taken by the existing government</p> <p>Inability of government, Governance and management</p> <p>Coordination between national and regional governments, government's reliability, corruption</p> <p>Political nuisance, Political renegeing, Political/public opposition</p> <p>Government intervention/political interference</p> <p>Economic development of the host country /satisfaction from the economic indicators</p> <p>Political upheaval, level of dissatisfaction among people in the country with their social status and dissatisfaction from the economic indicators</p>	<p>(Hastak and Shaked, 2000; Qureshi et al., 2010; Alesina et al., 1996; Marchetti and Vitale, 2014; Brada et al., 2006; Miljkovic and Rimal, 2008; Ahmad and Kitchen, 2008; Assaf and Al-Hejji, 2006; Akçamete, 2006; Birgonul and Dikmen, 2001; Bu-Qammaz, 2007; Chua et al., 2003; Fidan, 2008; Gudienė et al., 2013; Gunhan and Ardit, 2005a; Günhan and Ardit, 2005b; Isa et al., 2014; Iyer and Jha, 2005; Ling and Hoang, 2010; Ozcan, 2008; Jaselskis and Talukhaba, 1998; Ozorhon et al., 2007; Renuka et al., 2014; Rezakhani, 2012; Xenidis and Angelides, 2005; Yong and Mustaffa, 2013; Alaghbari et al., 2007; Aibinu and Odeyinka 2006; Odeh</p>

	<p>Discontent / dissatisfied society, social unrest, level of nationwide strikes, general strikes, demonstrations, riots, occurrence of civil wars, revolutions in the history of the country</p> <p>Natural and unavoidable catastrophes, force majeure, epidemic/pandemic disease, outbreak of hostilities (conflict, wars, riots and terrorism)</p>	<p>and Battaineh 2002; Olawale and Sun 2010; Zhi, 1995; Kansal, 2015; Hussain and June 2014, Erb et al., 1996, Aisen and Veiga, 2011, Akinci and Fischer, 1998; PRS Group, 2021; EIU, 2005)</p>
	1.1.1.2. Government Structure	
	<p>Regime type, political factionalism, regulatory regime, nature of government, form of government and any form of political system</p> <p>The degree of openness of its socio-political system (open or closed system),</p> <p>Organized religion in politics, political corruption</p> <p>Actions of government which are shaped by political pressure exerted by opposition political parties, NGOs, trade unions and other lobby groups, minority groups</p> <p>Military in politics, military interference</p> <p>The effect of illegal organization, mafia power</p> <p>Socio-political nature and local power groups</p> <p>Respect of citizens and the state for the institutions that govern economic and social interactions among them</p>	<p>(Chua et al., 2003; Marchetti and Vitale, 2014; Erb et al., 1996; EIU, 2005; PRS, 2021; Hastak and Shaked, 2000; Baloi and Price, 2003; Aydogan and Köksal, 2014; Sottiolotta, 2016; Alon and Herbert, 2009; Chang et al., 2018)</p>
	1.1.2. Legal Aspects	
	<p>Laws/regulations/policies, political institutions</p> <p>Institutional structures, legal/regulatory framework and policy, Governance (rule of law, government effectiveness, control of corruption, voice and accountability, absence of violence/terrorism, regulatory quality, property rights), clarity of the laws and regulations, legislations and policies, policy uncertainty</p> <p>Level of applicability of the legal system (among people, places and states), enforcement mechanisms, level of inconsistencies/change in government policies/legislation</p> <p>Maturity level of legal system, high level of changes in law, frequently changing laws</p>	<p>(Deng and Low, 2014; Hastak and Shaked, 2000; Alon and Herbert 2009; Chang et al., 2018; Lewis, 2007; Akçamete, 2006; Assaf and Al-Hejji, 2006; Birgonul and Dikmen, 2001; Azhar et al., 2008; Bu-Qammaz, 2007; Chua et al., 2003; Fidan, 2008; Gudiené et al., 2013; Günhan and Arditì, 2005b; Isa</p>

	<p>Legislation changes - change of law and regulations and other government macroscopic economic policies, adverse regulatory changes, arbitrary changes to regulations</p> <p>Imperfect, insufficient and ineffective law system and supervision system vs. Appropriate, reasonable, predictable and reasonable legal framework,</p> <p>Government intervention, unlawful interference, Coherence of order and justice</p> <p>Compliance with internationally-accepted/ universal rules and laws, credibility of government policies, efficiency(effectiveness) of legal process and decisions, independence of the judiciary/ judicial framework/ judiciary for resolving disputes, unfairness of judicial process and speediness of judicial process,</p> <p>Non-neutrality of legal framework: judicial biasness against foreign investors, judiciary (including quasi-judicial bodies), insulated from political pressure signatory to international/regional conventions principle of rule of law and doctrine of separation of powers, transparency, level of bribery, nepotism, corruption, lawsand regulations conflicts, government act and regulation</p>	<p>et al., 2014; Ling and Hoang, 2010; Ozcan, 2008; Ozorhon et al., 2007; Xenidis and Angelides, 2005; Zhi, 1995; Toor and Ogunlana, 2008; Baloi and Price, 2003; Bing et al., 1999; Han et al., 2007; Han et al., 2008; Fraser and Fraser, 2002; Sottilotta, 2016)</p>
	<p>1.1.2.1.Bureaucracy</p>	
	<p>Level of fragmented governmental structure, governmental department and agencies, government institutions, bureaucracy quality, quality of bureaucracy, level of bureaucracy, Red tape/legislative bottleneck, incompetence, inexperienced bureaucracy, Regulatory approvals, approval procedures and government policies, Bureaucratic procedure durations and stages, paperwork, (excessive and complicated vs simple and easy),</p> <p>Level of variations of regulations among states, cities, permits/approvals from the municipality/different government authorities, level of cooperation from local authorities, level of inconsistencies in the state affairs, productivity of government, decision-making process / public</p>	<p>(Hastak and Shaked, 2000; Jaselskis and Talukhaba, 1998; Akçamete, 2006; Assaf and Al-Hejji, 2006; Azhar et al., 2008; Birgonul and Dikmen, 2001; Bu-Qammaz, 2007; Chua et al., 2003; Fidan, 2008; Hastak and Shaked, 2000; Ling and Hoang, 2010; Ozcan, 2008; Zhi, 1995; Erb et al., 1996; PRS, 2021; EIU,</p>

	<p>policy decision making, custom procedures / custom clearance procedures, the way of doing business in government, cultural differences regarding the business style, mentality, including nationalism, corruption and dishonesty, the behaviour of the corruption of government officials, the improprieties present in political or administrative system (nepotism, corruption, bribery, red-tapism, administrative laxity, malpractice)</p>	<p>2005; Sottilotta, 2016; Marchetti and Vitale, 2014)</p>
	<p>1.1.2.2. Government Policies</p>	
	<p>Government policies that directly impact the foreign contractor's ability to realize the full expected value of project returns Capacity of the government to effectively formulate and implement sound policies Government reluctance or inability to implement favourable policies, governmental or legislative actions, arbitrary or discriminatory actions (e.g. Expropriatory action of governments, unfair compensation, foreign exchange restrictions, unlawful interference, capital restrictions, corruption, and labour restrictions) by host governments or political groups, disparate treatment by local authorities or powerful parties in the host country, Nationalization/expropriation, localization, internationalization, incentives offered to sectors, policies regarding tax/nontax incentives in construction industry Pro-market policies and foreign investment, price controls, wage control (e.g. Pressure exerted by parties within formal government or outside the system can affect wage levels), protectionism that restrict international trade to help domestic industries, protectionism / local preference: policies requiring local joint ventures or labour utilization, Taxation on imported goods as a protectionist policy, issues regarding supply of local goods, when the government controls primary industries, Government reluctance or inability to implement favourable policies</p>	<p>Fraser and Fraser, 2002; Akçamete, 2006; Assaf and Al-Hejji, 2006; Birgonul and Dikmen, 2001; Azhar et al., 2008; Bu-Qammaz, 2007; Chua et al., 2003; Fidan, 2008; Gudiené et al., 2013; Günhan and Ardit, 2005b; Hastak and Shaked, 2000; Isa et al., 2014; Ling and Hoang, 2010; Ozcan, 2008; Ozorhon et al., 2007; Xenidis and Angelides, 2005; Zhi, 1995; Lum, 2006; Sottilotta, 2016; Alon and Herbert, 2009; Chang et al., 2018)</p>

	<p>Effectiveness of policies and procedures (including their timeliness, such as the length of arbitration procedures), inconsistent government policies, changes in government policies</p> <p>Legislation changes - change of law and regulations and other government macroscopic economic policies, uncertain governmental policies, Instability in policies (i.e., the degree to which fundamental policies of, for instance, property rights are subject to frequent changes), policy volatility,</p> <p>Providing a reliable and transparent environment for foreign companies</p> <p>Government intervention/ termination of concession by government, transparency in government policies, fiscal and monetary policies, economic policy, investment freedom, financial freedom, trade freedom, changes in the trading policies. the imposition of import duties, custom regulations, tax regulation / taxation policies, currency and trade controls, changes in tax and labour laws,</p> <p>Government actions and inactions regarding ordinances, construction law, and etc., changes in legislations on employment, and working conditions, change in local labour input and change in per unit cost of labour,</p> <p>Pressure exerted by parties within formal government or outside the system, Government policies toward organized protests</p>	
	<p>Restrictions for foreign companies</p>	
	<p>Specific regulations, requirements/difficulties/constraints specific to foreign construction companies,</p> <p>Country restrictions for foreign companies, regulatory restrictions,</p> <p>Government actions which deny or restrict the right of foreign companies, government excessive intervention in business, strict requirements to obtain work permits, to obtain construction license</p> <p>Strict requirements for local partners, regarding local tax, taxation discrimination / taxation</p> <p>Requirement of travelling and visa status, special residency permit, import and export restrictions,</p>	<p>(Zhi, 1995; Han and Diekmann, 2001; Akçamete, 2006; Bu-Qammaz, 2007; Chua et al., 2003; Hastak and Shaked, 2000; Isa et al., 2014; Ozcan, 2008; Ozorhon et al., 2007; Rezakhani, 2012; Bing et al., 1999)</p>

<p>customs procedures, rules/restrictions on importation of materials, equipment and spare parts, and labour, restrictions related to logistics/dispatch/ transmission, imposition of trade barriers, licensing requirements, restrictions on cross-border transfer of resources, local protectionism, constraints and requirements for partner and partnerships, requirements to operate/employ local labour and staff, Restrictive labour market, labour restrictions (legislated joint ventures with local firms; use of personnel from the contractor's home office only (eliminating expatriates); limitations on the number of foreign personnel given immigration or work visas; work category limitations restricting foreign personnel of certain professions or trades from working in the host country.), restrictions to scope of engineering activities for foreign entrants, Imposition of capital controls: imposition of onerous tax on conversion of currency, transfer and convertibility restrictions, temporary currency exchange restrictions, level of strict bureaucracy special to foreign contractors / pressure to the contractors</p>	
<p>Government attitude toward foreigners</p>	
<p>Hostility to foreigners, Confiscation or expropriation, Discrimination against foreign companies, Government actions which deny or restrict the right of international contractors Nationalist attitude towards foreign contractor firms, racism, and xenophobia, Negative attitude towards rival nations or employees who are undesirable in the host country due to origin or religion, Perspective attitudes of local people foreign companies and workers</p>	<p>(Akçamete, 2006; Assaf and Al-Hejji, 2006; Birgonul and Dikmen, 2001; Bu-Qammaz, 2007; Chua et al., 2003; Fidan, 2008; Gudienè et al., 2013; Günhan and Arditi, 2005a; Günhan and Arditi, 2005b; Hastak and Shaked, 2000; Isa et al., 2014; Ozcan, 2008; Ozorhon et al., 2007; Rezakhani, 2012; Xenidis and Angelides, 2005; Zhi, 1995; Han et al., 2008)</p>

	1.2. International / External	
	1.2.1. International Relations	
	<p>Stability of international relations, Embargo, economic, commercial or other sanctions or consumer boycotts, infliction by of human rights abuses, conflicts with neighbouring countries, concern for the environment and endangered species, Degree of compliance with international financial commitments, Participation to treaties, conventions, charters, pacts, agreements developed by, deposited to, or sponsored by the United Nations, participation to international organizations and the degree to which the country is involved in international organizations, international disputes Membership of the international financial institutions, trade organizations, chambers and insurance associations (ICISA, GFIA, IIS, WB, WTO, IMF, etc.) and relations, Country's neighbourhood, country's geographic neighbours., events in neighbouring countries, war, annexation, border conflicts, The status of international relations including neighbouring countries, (diplomatic relations, embargos etc.), Hostilities with neighbouring country or region Geopolitical stability- crisis due to conflict between two countries, Armed or political conflicts between the host nation and other forces originating beyond its borders, the environment of neighbouring countries and the relationship existing between these nations and the host, International interactive relations (external conflicts, international economic crisis, external interferences), terrorist attacks from international/external terrorist groups, Relationship with formal power system / the government and power groups, diplomatic relations, bilateral agreements, economic interaction, economic relations, trade relations with other countries, alliances, declarations of media</p>	<p>(Baloi and Price, 2003; Deng and Low, 2014; Hastak and Shaked, 2000; Alon and Herbert 2009; Chang et al., 2018; Birgonul and Dikmen, 2001; Gunhan and Arditi, 2005; Han and Diekmann, 2001; Marchetti and Vitale, 2014)</p>

2. Economic Conditions/Economy	
2.1. Stability of Economic Conditions and Economy Performance	
<p>Stability of foreign exchange rates, volatility, interest rate, level of inflation, escalation of prices, financial fluctuations</p> <p>Change in economic scenario</p> <p>Satisfactory level of international trade and foreign investments, economy performance,</p> <p>Recession, financial and economic crises / drastic change in the economy</p> <p>Economic distress (unemployment, level of income per head, income distr, level of gross domestic product, economic growth)</p> <p>Funding capacity, financial strength</p> <p>Availability of funding source from the government, availability of financial resources, international reserves, financial situation (debt funds, mutual funds, equity)</p> <p>Long-term finance / short-term finance</p> <p>Financing cost institutions</p> <p>Governmental control in economy</p> <p>Regulations regarding economic transactions and government actions that interfere in economic transactions</p> <p>Transfer and convertibility restrictions, tax regulations, tax incentives, trade restrictions, tariff adjustment, rate of returns restrictions</p> <p>Stability of social and political environment / political conditions</p> <p>Credit rating grade according to credit rating agencies (Moody's, Standard & Poor's, Fitch etc.), Credit rating of investors</p> <p>Fiscal and monetary policies, government funding policy, financial and development plan, economic and commercial policy</p>	<p>(Gunhan and Arditi, 2005; Han and Diekmann, 2001; Hastak and Shaked, 2000; Chua et al., 2003; Birgonul and Dikmen, 2001; Gunhan and Arditi, 2005; Han and Diekmann, 2001, Jaselskis and Talukhaba, 1998; Akinci and Fischer, 1998; Ling and Hoang, 2010; Ling and Lim, 2007; Miljkovic and Rimal, 2008; Qureshi et al., 2010; Akçamete, 2006; Azhar et al., 2008; Bu-Qammaz, 2007; Chua et al., 2003; Fidan, 2008; Gudiené et al., 2013; Günhan and Arditi, 2005a; Günhan and Arditi, 2005b; Hastak and Shaked, 2000; Isa et al., 2014; Iyer and Jha, 2005; Kaming et al., 1997; Ling and Hoang, 2010; Ozcan, 2008; Ozorhon et al., 2007; Renuka et al., 2014; Rezakhani, 2012; Xenidis and Angelides, 2005; Yong and Mustaffa, 2013; Zhi, 1995)</p>

3. Social Conditions/Society	
3.1. Stability of Social Conditions and Social Environment	
<p>Socioeconomic conditions and sociocultural issues, socio-political stability, development and social stability, level of wage inequality, level of income inequality, level of education and health, gender, racial inequality, imbalance in the socio-economic structure</p> <p>The degree of fragmentation, fractionalization by language, ethnic, and regional groups / ethnic fragmentation, problems with/relations with neighbouring community, religious diversity, racism and xenophobia, demography change and its impact on labour demand and supply, unemployment of local labour, labour market discrimination, proclivity to labour unrest, effects of groups of the society or unions</p> <p>Institutions that protect human rights, changes in economic or political circumstances, social unrest, socioeconomic conditions, poverty, social tensions /religious tensions / ethnic tensions, racial and national tensions, conflict between different ethnic groups,</p> <p>The degree of fragmentation, fractionalization by language, ethnic, and regional groups / ethnic fragmentation, The rise of religious fervour in a region racial and national tensions, conflict between different ethnic groups,</p> <p>Civil commotion / civil order / civil disturbance,</p> <p>Level of nationwide strikes, protests and demonstrations, occurrence of civil wars, crime, terrorism, violent demonstrations, armed conflicts, kidnapping or extortion, support for government/ lack of political support, social mobilization or change of public opinions, trust in institutions / percentage of population that trusts/has confidence in parliament, an unfavourable public opinion, political fervour, political/public opposition, incidence of political upheaval or violence in a society, such as assassinations, demonstrations, political upheaval (other than war or terrorism), political revolution, social movements, protests, strikes, civil commotions, internal armed conflicts (insurrections, riots, mutiny, rebellion, military coup d'état, civil war)</p>	<p>(Akçamete, 2006; Assaf and Al-Hejji, 2006; Birgonul and Dikmen, 2001; Bu Qammaz, 2007; Fidan, 2008; Gudienė et al., 2013; Günhan and Arditi, 2005b; Hastak and Shaked, 2000; Iyer and Jha, 2005; Ozcan, 2008; Renuka et al., 2014; Rezakhani, 2012; Xenidis and Angelides, 2005; Yong and Mustafa, 2013; Zhi, 1995; Lum, 2006; Ashley and Bonner, 1987; Bing et al., 1999)</p>

C. Group Interactions with ChatGPT in Workshop

GROUP 1 PROMPTS

Group1:

I am a risk expert working in a construction company in Turkey. We are planning oil and gas project in Basrah, Iraq as a general contractor. Type of contract: EPC Employer: Iraq Somo Oil and Gas Authority Type of Payment: Lump sum Designer: US Form of Contract: FIDIC Silver Can you please rank the top 10 country risk factors from highest to lowest for a political risk report?

ChatGPT:

For an oil and gas project in Basrah, Iraq, with the specified contract details, several country risk factors are particularly relevant. Given the unique economic, political, and social landscape of Iraq, as well as the specific dynamics of the oil and gas sector, these factors can impact project execution, financial flow, and operational continuity. Here's a prioritized list of the top 10 country risk factors from highest to lowest, along with a brief explanation for each:

1. **Political Stability:** Iraq's political landscape is complex, with occasional periods of instability. Changes in government, policies, or political tensions can affect project timelines and operations.
2. **Security Risks:** Given Iraq's history of conflict and the presence of various armed groups, security risks for personnel and infrastructure are significant.
3. **Regulatory Changes:** The Iraqi government's regulations and policies regarding foreign investment and the oil and gas sector can change, impacting contract terms, taxation, and operational procedures.
4. **Legal System:** The effectiveness and predictability of the legal system, especially in handling commercial disputes, can be a concern. The FIDIC Silver form of contract might have different implications under Iraqi law.
5. **Currency and Exchange Rate Fluctuations:** With payments in lump sum, the project's financial planning could be impacted by significant fluctuations in exchange rates or currency devaluation.
6. **Corruption and Bureaucracy:** Corruption and bureaucratic inefficiencies can delay project approvals, increase costs, and complicate interactions with regulatory bodies.
7. **Infrastructure and Logistics:** Challenges in local infrastructure and logistics can affect the transport of materials, personnel mobility, and timely project execution.

8. **Local Content Requirements and Labor Issues:** Compliance with local content requirements, labor laws, and managing local workforce relations are crucial for smooth project progression.
9. **Environmental and Social Risks:** Environmental regulations and social issues, including community relations and land rights, can influence project viability and acceptance.
10. **Economic Stability:** Fluctuations in Iraq's economy, impacted by oil prices and other factors, can affect project financing, cost estimation, and overall economic feasibility.

It's essential to conduct a detailed risk assessment specific to your project, considering the current political, economic, and social context of Iraq. This analysis should be continuously updated throughout the project lifecycle to manage and mitigate these risks effectively. Engaging with local experts, legal advisors, and risk management professionals who have in-depth knowledge of the Iraqi context can provide valuable insights and strategies for navigating these challenges.

Group1:

can you please revise your answer with currency of payment is US dollars?

ChatGPT:

Certainly, revising the currency of payment to US dollars slightly adjusts the risk factors' prioritization, primarily mitigating the direct impact of currency and exchange rate fluctuations on the project's financial planning. Here's the revised list:

1. **Political Stability:** Iraq's complex political landscape remains the top risk, given the potential for sudden changes in government, policy shifts, or political tensions that could affect project timelines and operations.
2. **Security Risks:** High due to historical conflict and the presence of various armed groups, posing threats to personnel and infrastructure safety.
3. **Regulatory Changes:** The possibility of alterations in government regulations and policies concerning foreign investment and the oil and gas sector, impacting operational procedures and contract terms.
4. **Legal System:** Challenges related to the predictability and effectiveness of the legal system, especially in commercial disputes, remain critical under the FIDIC Silver contract in Iraq's legal context.
5. **Corruption and Bureaucracy:** These factors can lead to delays in obtaining project approvals, increase operational costs, and complicate regulatory compliance.
6. **Infrastructure and Logistics:** Inadequate local infrastructure and logistical challenges can hinder material transport, affect timelines, and increase project costs.

7. **Local Content Requirements and Labor Issues:** Ensuring compliance with local content regulations and managing local workforce relations are essential for project success and community acceptance.
8. **Environmental and Social Risks:** Compliance with environmental regulations and managing social impact, including community relations and land rights, are crucial for maintaining project license to operate.
9. **Economic Stability:** While direct exchange rate risks are mitigated by the use of US dollars, the broader economic stability of Iraq, influenced by global oil prices and internal factors, can affect project costs and economic feasibility.
10. **International Relations and Sanctions:** The potential for international relations and sanctions to impact operations, especially given the involvement of a US designer and the global nature of the oil and gas industry, should be considered.

Paying in US dollars does provide a buffer against local currency fluctuations, making financial planning more predictable for the lump sum contract. However, it's essential to factor in the potential for broader economic impacts on the project, including how global economic conditions might influence costs and logistics. Continuous risk monitoring and engagement with local and international experts remain critical for navigating the complexities of operating in Iraq.

Group1:

can you revise your answers if you consider the governing law as British?

ChatGPT:

Adjusting for British governing law in the context of an EPC contract for an oil and gas project in Basrah, Iraq, slightly shifts the focus of risk factors, particularly around the legal and regulatory framework. British governing law could introduce a different set of interpretations and practices for contract management, dispute resolution, and compliance. Here's how the risk factors adjust:

1. **Political Stability:** Still remains a critical risk due to Iraq's complex political landscape, which can influence project timelines and overall feasibility.
2. **Security Risks:** The security situation in Iraq, with potential threats from various armed groups, remains a significant concern for the safety of personnel and infrastructure.
3. **Regulatory Changes and Compliance:** With British governing law, navigating the compatibility of local Iraqi regulations with contract terms becomes crucial. This includes monitoring changes in Iraqi law that might impact operations or contract enforcement.
4. **Legal System and Dispute Resolution:** The predictability and reliability of dispute resolution mechanisms gain importance. The application of British

law may offer clarity in some aspects of contract enforcement but also requires careful management of jurisdictional issues and recognition of judgments.

5. **Corruption and Bureaucracy:** Challenges in navigating local bureaucratic processes and potential corruption can impact project approvals, operational costs, and regulatory compliance, regardless of the governing law.
6. **Infrastructure and Logistics:** Inadequate infrastructure and logistical challenges within Iraq can affect the transportation of materials and personnel, impacting project timelines and costs.
7. **Local Content Requirements and Labor Issues:** Adhering to local content laws and managing labor relations in Iraq require careful alignment with contract terms governed by British law, ensuring compliance with both sets of regulations.
8. **Environmental and Social Risks:** Managing environmental impact and social engagement are critical, with the need to align project standards with both Iraqi regulations and expectations under British law for environmental and social governance.
9. **Economic Stability:** Economic factors, including the broader stability of Iraq's economy and the impact of global oil prices, remain relevant for project cost and feasibility assessments.
10. **International Relations and Sanctions:** The impact of international relations, including sanctions and trade agreements, could have implications for the project, especially considering the involvement of a US designer and the application of British governing law.

Using British law as the governing law introduces a layer of complexity in aligning contract terms with local Iraqi requirements and international standards. It necessitates a thorough understanding of both legal systems and careful contract drafting to ensure compliance, effective risk management, and the smooth execution of the project. Legal advice from experts familiar with both British and Iraqi law, as well as international oil and gas projects, becomes even more critical to navigate these complexities effectively.

Group1:

I am a risk expert working in a construction company in Turkey. We are planning oil and gas project in Basrah, Iraq as a general contractor. Type of contract: EPC Employer: British Petroleum Type of Payment: Lump sum Designer: US Form of Contract: FIDIC Silver Currency: US Dollar Governing Law: British Can you please rank the top 10 country risk factors from highest to lowest for a political risk report?

ChatGPT:

With the specific project details in mind, including the EPC contract for an oil and gas project in Basrah, Iraq, with British Petroleum as the employer, payment in a lump sum in US dollars, a US-based designer, the FIDIC Silver form of contract, and British governing law, the top 10 country risk factors can be adjusted to reflect these conditions. Here's a refined prioritization:

1. **Security Risks:** The safety of personnel and infrastructure due to potential threats from conflict or political instability in Iraq remains the most significant concern.
2. **Political Stability:** Given Iraq's complex political environment, changes in government or policy can impact project timelines, regulatory compliance, and operations.
3. **Regulatory Changes and Compliance:** The need to navigate Iraqi regulations in alignment with the FIDIC Silver contract and British law, particularly concerning foreign investment, oil and gas industry regulations, and environmental standards.
4. **Legal System and Dispute Resolution:** Managing the interface between British governing law and the Iraqi legal environment, ensuring contract enforceability, and the predictability of dispute resolution outcomes.
5. **Corruption and Bureaucracy:** Potential delays and increased costs due to bureaucratic inefficiencies and corruption within Iraq's public and regulatory sectors.
6. **Infrastructure and Logistics:** Challenges related to local infrastructure inadequacies and logistics that can affect material transport, supply chain reliability, and project deadlines.
7. **Local Content Requirements and Labor Relations:** Compliance with Iraqi local content regulations and managing labor relations, including the integration of local workforce and suppliers, under the contract terms.
8. **Environmental and Social Governance (ESG) Risks:** Addressing environmental impacts and community relations in line with both Iraqi regulations and expectations under British law for responsible project execution.
9. **Economic Stability and Market Fluctuations:** The broader economic stability of Iraq, influenced by global oil prices and local conditions, can affect project financial planning and cost estimation.
10. **International Relations and Sanctions:** The potential impact of geopolitical tensions, international relations, and sanctions, particularly given the involvement of entities from the US, UK, and Turkey, on project execution and financial transactions.

This prioritization reflects a nuanced understanding of the project's specific contractual arrangements and the geopolitical and regulatory context in Iraq. Effective risk management for such a project will require ongoing monitoring of

these factors, adapting strategies as conditions evolve, and leveraging expert legal, financial, and security advice to navigate the complexities of operating in Iraq's oil and gas sector.

Group1:

I am a risk expert working in a construction company in Turkey. We are planning oil and gas project in Basrah, Iraq as a general contractor. Type of contract: EPC Employer: British Petroleum Type of Payment: Cost plus fee Designer: US Form of Contract: FIDIC Silver Currency: US Dollar Governing Law: British Can you please rank the top 10 country risk factors from highest to lowest for a political risk report?

ChatGPT:

Adjusting for a "Cost Plus Fee" payment model in the context of your EPC contract for an oil and gas project in Basrah, Iraq, with British Petroleum as the employer, affects the financial risk profile of the project. This payment model can influence how some risks are prioritized, especially those related to cost estimation, financial management, and economic factors. Here's a revised prioritization of country risk factors under these specifics:

1. **Security Risks:** Remains the top concern due to potential threats to personnel and infrastructure in a region with historical conflicts.
2. **Political Stability:** Iraq's political landscape can significantly impact regulatory environments, project approval processes, and the overall feasibility of the project.
3. **Regulatory Changes and Compliance:** Navigating the Iraqi regulatory framework, especially in alignment with British governing law and the FIDIC Silver contract, is critical. Changes in regulations can affect project costs and operations.
4. **Corruption and Bureaucracy:** The risk of encountering bureaucratic hurdles and corruption can lead to unpredictable delays and increased project costs, impacting the cost-plus fee structure.
5. **Legal System and Dispute Resolution:** The effectiveness of dispute resolution mechanisms and the predictability of legal outcomes are crucial, given the British governing law and the need for alignment with local Iraqi laws.
6. **Infrastructure and Logistics:** Inadequate infrastructure and logistical challenges directly impact project costs and timelines, particularly relevant under a cost-plus fee arrangement where such increases could affect the total project cost.
7. **Economic Stability and Market Fluctuations:** The broader economic conditions in Iraq, influenced by global oil prices and internal factors, can significantly affect project costs and financial planning.

8. **Local Content Requirements and Labor Relations:** Ensuring compliance with Iraqi labor laws and local content requirements is crucial. Mismanagement in this area can lead to increased costs and project delays.
9. **Environmental and Social Governance (ESG) Risks:** Environmental impacts and community relations need careful management to avoid additional costs and delays, important under a cost-plus contract where the contractor may be reimbursed for these expenses.
10. **International Relations and Sanctions:** The potential for geopolitical tensions and sanctions, especially involving the US, UK, and Turkey, to impact project execution and financial transactions.

This cost-plus fee arrangement introduces a different financial risk dynamic, emphasizing the importance of tight cost control and management. It necessitates a thorough understanding of the local and international regulatory environment, effective project management practices to mitigate cost overruns, and strategies to manage the increased financial oversight required to ensure that the project remains within budget while meeting all regulatory, legal, and operational standards.

Group1:

I am a risk expert working in a construction company in Turkey. We are planning oil and gas project in Basrah, Iraq as a general contractor. Type of contract: Employer designed Employer: British Petroleum Type of Payment: Cost plus fee Designer: US Form of Contract: FIDIC Red Book Currency: US Dollar Governing Law: British Can you please rank the top 10 country risk factors from highest to lowest for a political risk report?

ChatGPT:

Shifting the contract type to an "Employer Designed" under the FIDIC Red Book, with British Petroleum as the employer, a US designer, payment on a "Cost Plus Fee" basis, currency in US dollars, and governed by British law, introduces specific nuances to the risk profile of the oil and gas project in Basrah, Iraq. Here's an updated ranking of country risk factors considering these details:

1. **Security Risks:** High due to potential threats from regional instability and conflict, affecting personnel and project infrastructure safety.
2. **Political Stability:** Critical given Iraq's complex political environment, which can impact regulatory conditions, project approvals, and operational feasibility.
3. **Regulatory Changes and Compliance:** The risk of changes in Iraqi law and regulation that could affect project execution, especially in aligning with the FIDIC Red Book requirements and British law.

4. **Corruption and Bureaucracy:** Navigating corruption and bureaucratic processes is vital to prevent delays and additional costs, impacting the project's cost-plus fee structure.
5. **Legal System and Dispute Resolution:** Ensuring effective dispute resolution and legal predictability under British law, while also managing jurisdictional challenges with Iraqi legal practices.
6. **Infrastructure and Logistics:** The state of local infrastructure and logistics directly affects project timelines and costs, crucial in a cost-plus fee arrangement where additional costs may be passed on.
7. **Economic Stability and Market Fluctuations:** Iraq's economic conditions and global market fluctuations can significantly influence project costs and financial planning.
8. **Local Content Requirements and Labor Relations:** Compliance with Iraqi labor laws and managing local workforce and supplier engagement are essential to avoid cost overruns and delays.
9. **Environmental and Social Governance (ESG) Risks:** Managing environmental impacts and community relations is key, especially given the potential for additional costs in a cost-plus arrangement.
10. **International Relations and Sanctions:** The impact of geopolitical tensions and sanctions, particularly with the involvement of a US designer and British law, could affect project finances and operations.

With an "Employer Designed" contract under the FIDIC Red Book, the focus on regulatory compliance, effective project management, and alignment between the design, execution, and legal framework becomes even more pronounced. This arrangement emphasizes the need for rigorous project oversight, efficient management of changes and claims, and proactive engagement with local and international regulations to mitigate risks effectively.

Group1:

I am a risk expert working in a construction company in Turkey. We are planning oil and gas project in Sulaymaniyah, Northern (KRG) Iraq as a general contractor. Type of contract: EPC Employer: Iraq Somo Oil and Gas Authority Type of Payment: Lump sum Designer: US Form of Contract: FIDIC Silver Currency: US Dollar Governing Law: British Can you please rank the top 10 country risk factors from highest to lowest for a political risk report

ChatGPT:

Undertaking an EPC project in Sulaymaniyah, within the Kurdistan Regional Government (KRG) area of Northern Iraq, introduces a set of risk factors influenced by the region's unique political, economic, and security landscape. Given the project specifics with Iraq Somo Oil and Gas Authority as the employer, payment in a lump

sum, a US-based designer, FIDIC Silver form of contract, currency in US dollars, and British governing law, the risk profile is distinctively shaped by these factors:

1. **Political Stability and Regional Autonomy:** The political dynamics within the KRG and its relations with the Iraqi central government can significantly impact project operations, regulatory environments, and security conditions.
2. **Security Risks:** Despite being relatively more stable than other parts of Iraq, Sulaymaniyah faces security challenges due to regional tensions, the presence of various armed groups, and potential for conflict spillover.
3. **Regulatory and Legal Framework:** Navigating the legal and regulatory differences between KRG and Iraqi central government laws, especially under a contract governed by British law, requires careful attention.
4. **International Relations and Sanctions:** The geopolitical situation, including KRG's relations with neighboring countries and the broader international community, can impact project execution and financial transactions.
5. **Infrastructure and Logistics:** While Sulaymaniyah and the KRG region have seen investment in infrastructure, logistical challenges remain, affecting material transport and project timelines.
6. **Economic Stability and Market Fluctuations:** The economy of the KRG, heavily reliant on oil and gas revenues, is subject to global oil price fluctuations and local economic policies, impacting project financial planning.
7. **Corruption and Bureaucracy:** Operating in the KRG requires navigating local bureaucratic processes and potential corruption, which can affect project approvals, costs, and timelines.
8. **Legal System and Dispute Resolution:** The effectiveness and predictability of legal systems and dispute resolution mechanisms, particularly under British governing law, are crucial for managing contractual disputes and legal risks.
9. **Environmental and Social Governance (ESG) Risks:** Managing environmental impacts and social responsibilities is key, with potential for additional scrutiny given the project's location in a sensitive ecological and social region.
10. **Currency and Financial Transfer Risks:** While payments in US dollars offer some protection against local currency fluctuations, there remain risks related to financial transfers, banking sanctions, and currency controls within the KRG and Iraq.

Operating in Sulaymaniyah within the KRG requires a nuanced understanding of the region's unique political, security, and regulatory environment. Proactive risk management strategies, including engagement with local stakeholders, continuous monitoring of political and security developments, and careful navigation of the legal and regulatory frameworks, are essential for the successful execution of the project.

Group1:

what is your reasoning behind this ranking?

ChatGPT:

The ranking of risk factors for an oil and gas EPC project in Sulaymaniyah, Northern Iraq (KRG), reflects the unique and complex environment in which the project will operate. Here's the reasoning behind the prioritization of each risk:

1. **Political Stability and Regional Autonomy:** The Kurdistan Regional Government (KRG) operates with a degree of autonomy from the Iraqi central government, which creates a unique political and regulatory environment. The dynamic relationship between the KRG and Baghdad can affect everything from regulatory approvals to security policies and revenue sharing from oil projects, making it the most significant risk factor.
2. **Security Risks:** Although the KRG region is generally more stable and secure than other parts of Iraq, it is not immune to security challenges. The proximity to conflict zones, internal political tensions, and the potential for terrorism or sabotage pose risks to project infrastructure, personnel, and operations.
3. **Regulatory and Legal Framework:** The dual legal system, with KRG and Iraqi central government regulations, complicates compliance and operational procedures. The project's governance by British law adds another layer of complexity, especially in aligning contractual obligations with local laws and resolving any disputes that may arise.
4. **International Relations and Sanctions:** The KRG's interactions with neighboring countries and the international community can influence the project, especially in terms of sanctions, trade restrictions, and diplomatic relations. These factors can affect the import of materials, access to technology, and financial transactions.
5. **Infrastructure and Logistics:** Despite investments in infrastructure within the KRG, logistical challenges related to transportation, supply chain reliability, and access to project sites can impact timelines and costs, necessitating careful planning and management.
6. **Economic Stability and Market Fluctuations:** The KRG's economy is heavily dependent on oil and gas revenues, making it susceptible to global market fluctuations. This can impact the project's financial viability and the region's overall economic stability, affecting labor costs, material prices, and financial planning.
7. **Corruption and Bureaucracy:** Operating in a region where bureaucratic processes can be slow and corruption risks exist, requires diligent management and local expertise to navigate, impacting project approvals, regulatory compliance, and potentially leading to unforeseen costs.

8. **Legal System and Dispute Resolution:** The effectiveness of dispute resolution mechanisms and the enforceability of contractual terms under British law in the KRG/Iraq context are critical. Uncertainties in how disputes are resolved can pose significant legal risks to project execution and financial outcomes.
9. **Environmental and Social Governance (ESG) Risks:** The project's environmental impact, social responsibilities, and community relations are increasingly scrutinized. Failure to adequately address these risks can lead to regulatory penalties, project delays, and damage to reputation.
10. **Currency and Financial Transfer Risks:** While transactions in US dollars provide some stability, risks related to banking, financial transfers, and adherence to international financial regulations within the KRG and Iraq must be managed to ensure smooth financial operations.

Each of these factors is interconnected, influencing the project's risk landscape. The prioritization reflects both the specific challenges of operating in the KRG region and the broader risks associated with large-scale infrastructure projects in politically and economically volatile environments. Effective risk management strategies must be multi-faceted, incorporating local expertise, continuous monitoring, and adaptive planning to address these complexities.

Group1:

I am a risk expert working in a construction company in Turkey. We are planning oil and gas project in Sulaymaniyah, Northern (KRG) Iraq as a general contractor. Type of contract: EPC Employer: Iraq Somo Oil and Gas Authority Type of Payment: Lump sum Designer: US Form of Contract: FIDIC Silver Currency: US Dollar Governing Law: Local Can you please rank the top 10 country risk factors from highest to lowest for a political risk report?

ChatGPT:

Adjusting the ranking of country risk factors for an oil and gas EPC project in Sulaymaniyah, Northern Iraq (KRG), with the Iraq Somo Oil and Gas Authority as the employer, to reflect a lump sum payment structure, a US-based designer, the FIDIC Silver form of contract, transactions in US dollars, and now with the addition of local governing law instead of British law, reshapes the risk assessment significantly. The local governing law introduces additional considerations around legal compatibility and enforcement. Here's the updated ranking considering these specifics:

1. **Political Stability and Regional Autonomy:** The intricate political relationship between the KRG and the Iraqi central government directly influences regulatory frameworks, security policies, and economic agreements, making it a paramount risk factor.

2. **Security Risks:** Given the region's history and geopolitical position, security remains a top concern for protecting personnel, infrastructure, and ensuring project continuity.
3. **Regulatory and Legal Framework Compatibility:** The challenge of aligning project operations with local laws, especially given the nuances of KRG versus Iraqi central government regulations, and ensuring compatibility with the FIDIC Silver contract, is crucial.
4. **Legal System and Dispute Resolution:** The effectiveness, predictability, and transparency of the local legal system in resolving disputes or enforcing contracts, especially for foreign entities, are significant concerns.
5. **Corruption and Bureaucracy:** Potential delays, increased costs, and operational inefficiencies due to bureaucratic hurdles and corruption risk within both the KRG and Iraqi regulatory environments.
6. **Infrastructure and Logistics:** Operational challenges related to infrastructure limitations and logistical complexities within Sulaymaniyah and the broader KRG area can impact project timelines and costs.
7. **International Relations and Sanctions:** The geopolitical dynamics involving the KRG, Iraq, and the international community, including potential sanctions or trade restrictions, can influence project viability and execution.
8. **Economic Stability and Market Fluctuations:** The dependency on oil and gas revenues subjects the KRG's economy to volatility, impacting project financing, local investment climates, and economic policies.
9. **Environmental and Social Governance (ESG) Risks:** Addressing environmental impacts, social responsibilities, and ensuring community engagement are critical, with potential legal and reputational implications under local governance.
10. **Currency and Financial Transfer Risks:** Despite transactions in US dollars, navigating currency control regulations, ensuring financial compliance, and managing transfer risks within the KRG and Iraqi banking systems are essential to financial planning.

Transitioning to local governing law intensifies the need for comprehensive understanding and navigation of the local legal and regulatory landscape. It emphasizes the importance of engaging with local legal experts, continuous monitoring of legal and regulatory developments, and developing robust risk mitigation strategies tailored to the local context. Effective risk management in this environment requires a proactive approach, leveraging local expertise, and maintaining flexibility to adapt to changing legal and regulatory conditions.

Group1:

I am a risk expert working in a construction company in Turkey. We are planning oil and gas project in Cairo Egypt as a general contractor. Type of contract: EPC Employer: Iraq Somo Oil and Gas Authority Type of Payment: Lump sum Designer:

US Form of Contract: FIDIC Silver Currency: US Dollar Governing Law: Local
Can you please rank the top 10 country risk factors from highest to lowest for a political risk report?

ChatGPT:

For an EPC project in Cairo, Egypt, involving the Iraq Somo Oil and Gas Authority as the employer, with specifics such as a lump sum payment, a US-based designer, the FIDIC Silver form of contract, transactions in US dollars, and local (Egyptian) governing law, the risk landscape shifts to reflect Egypt's distinct political, economic, and regulatory environment. Here's how the country risk factors could be ranked for such a project:

1. **Political Stability:** Egypt's political environment has experienced fluctuations over the past decade. Stability is crucial for ensuring uninterrupted project execution and regulatory consistency.
2. **Regulatory and Legal Framework:** Navigating Egyptian laws and regulations, particularly how they interact with the FIDIC Silver contract provisions and ensuring compliance, is essential.
3. **Legal System and Dispute Resolution:** The efficiency, predictability, and transparency of the Egyptian legal system, especially for foreign contractors, in enforcing contracts and resolving disputes.
4. **Currency and Financial Transfer Risks:** While the project transactions are in US dollars, managing currency exchange and transfer regulations within Egypt's banking system is vital for financial planning and cash flow.
5. **Corruption and Bureaucracy:** Operational risks related to navigating Egypt's bureaucratic processes and addressing corruption risks can impact project timelines and costs.
6. **Security Risks:** Ensuring the safety of personnel and project infrastructure in the context of Egypt's security environment, including potential regional instability, is a significant concern.
7. **Economic Stability and Market Fluctuations:** Egypt's economy has shown resilience but remains susceptible to global economic trends, affecting inflation rates, material costs, and financial conditions.
8. **Infrastructure and Logistics:** While Egypt has been improving its infrastructure, logistical challenges in specific areas or related to specific project needs can affect timelines and costs.
9. **International Relations and Sanctions:** Egypt's relations with neighboring countries and the global community can influence project operations, especially considering the involvement of a US designer and the Iraq Somo Oil and Gas Authority.
10. **Environmental and Social Governance (ESG) Risks:** Managing environmental impact and community relations is crucial, with potential for legal and reputational implications under local governance.

These risk factors are tailored to the Egyptian context, highlighting the need for thorough understanding and strategic planning in relation to local political, legal, and economic conditions. Engaging with local experts, continuous monitoring of the political and economic landscape, and developing flexible risk mitigation strategies are essential for navigating the complexities of executing a large-scale infrastructure project in Egypt.

Group1:

I am a risk expert working in a construction company in Turkey. We are planning oil and gas project in Cairo Egypt as a general contractor. Type of contract: EPC Employer: Iraq Somo Oil and Gas Authority Type of Payment: Lump sum Designer: US Form of Contract: FIDIC Silver Currency: US Dollar Governing Law: British Can you please rank the top 10 country risk factors from highest to lowest for a political risk report

ChatGPT:

For an EPC project in Cairo, Egypt, with the Iraq Somo Oil and Gas Authority as the employer, featuring a lump sum payment, a US-based designer, the FIDIC Silver form of contract, transactions in US dollars, and governed by British law, the risk factors incorporate Egypt's specific operational context along with the international aspects of the project. Here's the adjusted ranking of risk factors:

1. **Political Stability:** Given Egypt's history of political transitions, ongoing stability is critical for project predictability and regulatory environment.
2. **Regulatory and Legal Framework Compatibility:** Aligning project operations with Egyptian laws and ensuring compatibility with the FIDIC Silver contract terms under British governing law presents significant challenges.
3. **Legal System and Dispute Resolution:** The efficacy and predictability of dispute resolution mechanisms, particularly with British governing law, and how these are recognized and enforced in Egypt, are a major concern.
4. **International Relations and Sanctions:** Egypt's geopolitical position and relations can impact the project, especially considering the international entities involved (U.S. designer, Iraqi employer) and the potential for geopolitical tensions or sanctions.
5. **Security Risks:** Security in Egypt, while generally improved, still requires careful consideration due to regional instability and potential for domestic unrest, affecting personnel and infrastructure.
6. **Economic Stability and Market Fluctuations:** Egypt's economic conditions, including inflation rates, foreign exchange reserves, and dependency on foreign investment, can influence project costs and financial planning.

7. **Currency and Financial Transfer Risks:** Managing the risks associated with currency conversion and repatriation of funds, given Egypt's currency controls and the project's denomination in US dollars.
8. **Corruption and Bureaucracy:** Navigating Egypt's bureaucratic landscape and addressing corruption risks are essential for maintaining project timelines and controlling costs.
9. **Infrastructure and Logistics:** Challenges related to Egypt's infrastructure and logistics could impact the delivery of materials and equipment, affecting project execution timelines.
10. **Environmental and Social Governance (ESG) Risks:** Adhering to environmental regulations and managing social impacts are critical, especially with increased global focus on ESG issues. Local community engagement and environmental compliance under both Egyptian regulations and standards expected under British governing law are key.

This ranking reflects the complexity of managing an international project in Egypt, emphasizing the need for a multifaceted approach to risk management. Engaging local legal and regulatory experts, thorough contract review and negotiation, strategic planning for logistics and security, and a proactive approach to community relations and ESG considerations are essential for navigating the project's risk landscape successfully.

Group1:

when changing from local law to british law, why the rank of "Legal System and Dispute Resolution" stayed the same?

ChatGPT:

Adjusting the governing law from local (Egyptian) to British can indeed impact the prioritization of risk factors, including "Legal System and Dispute Resolution". The decision to keep the "Legal System and Dispute Resolution" risk factor at the same rank in both scenarios might not fully reflect the nuanced changes in risk profile introduced by switching the governing law. Let's delve into a revised analysis and rationale for its ranking considering the switch to British law:

1. **Political Stability:** This remains the top risk due to Egypt's historical political fluctuations, which can impact the regulatory environment and project continuity regardless of the governing law.
2. **Regulatory and Legal Framework Compatibility:** With British law as the governing law, this becomes even more crucial. The need to ensure that project operations are compliant with Egyptian regulations while adhering to the terms of a contract governed by British law introduces complex legal challenges. However, the change in governing law may indeed warrant

placing greater emphasis on understanding and navigating this compatibility, suggesting this risk might be more pronounced than initially ranked.

3. **Security Risks:** The security environment remains a critical concern due to regional instability and domestic threats, unaffected by the change in governing law.
4. **International Relations and Sanctions:** Egypt's geopolitical dynamics and relationships with the international community, including sanctions risk, remain significant and are somewhat independent of the governing law but critical due to the involvement of entities from different countries.
5. **Legal System and Dispute Resolution:** Upon reconsideration, shifting the governing law to British should indeed affect the ranking of this risk. The alignment with British law can introduce complexities in how disputes are resolved, especially in terms of enforceability and recognition of judgments in Egypt. This shift can either mitigate risks by introducing a more predictable legal framework (for those familiar with British law) or increase them by introducing a layer of complexity in enforcement within Egypt. The initial ranking may have underestimated the impact of this shift on the overall risk profile.
6. **Economic Stability and Market Fluctuations:** Egypt's economic volatility affects project costs and financial planning, a risk that's somewhat independent of the governing law but crucial for budgeting and financial management.
7. **Currency and Financial Transfer Risks:** The project's financial operations, particularly currency exchange and repatriation of funds, are complex under Egypt's financial regulations, with risks accentuated by the project's denomination in US dollars.
8. **Corruption and Bureaucracy:** Navigating Egypt's bureaucratic landscape and mitigating corruption risks are essential for project timeline and cost management, a challenge that persists regardless of the governing law.
9. **Infrastructure and Logistics:** Infrastructure and logistical challenges in Egypt can affect material delivery and project timelines, a risk not directly related to the governing law.
10. **Environmental and Social Governance (ESG) Risks:** Managing environmental and social impacts is critical under both local and international expectations, with the specifics of British law potentially introducing additional compliance considerations.

Reflecting on this, "Legal System and Dispute Resolution" might indeed be more pivotal and could be ranked higher or its implications more thoroughly examined in the context of British law governing the contract. This highlights the importance of specialized legal advice and detailed risk analysis tailored to the project's specific contractual and regulatory context.

Group1:

are these risks interrelated?

ChatGPT:

Yes, these risks are interrelated, and their impacts on a construction project, especially in an international context like an oil and gas project in Cairo, Egypt, governed by British law, are often interconnected in complex ways. Understanding the interrelations can help in developing more effective risk management and mitigation strategies. Here's how these risks can be interrelated:

1. **Political Stability and Regulatory and Legal Framework Compatibility:** Political changes can lead to alterations in the legal and regulatory framework. A stable political environment tends to result in a more predictable regulatory landscape, whereas political instability can lead to rapid regulatory changes, impacting compliance with both local and British laws.
2. **Legal System and Dispute Resolution with International Relations and Sanctions:** The legal system's capacity to enforce contracts and resolve disputes is crucial for maintaining project timelines and budgets. International relations can affect the legal and regulatory environment, especially if sanctions or diplomatic issues influence the legal frameworks within which international companies operate.
3. **Security Risks and Political Stability:** Security risks are often directly influenced by the political stability of a region. Political unrest can lead to increased security risks, affecting project safety and operational continuity.
4. **Economic Stability and Market Fluctuations with Currency and Financial Transfer Risks:** Economic stability impacts market conditions and can lead to fluctuations in currency value, affecting project costs and financial transfers. A stable economy generally offers more predictable financial planning conditions, whereas economic volatility can heighten currency and transfer risks.
5. **Corruption and Bureaucracy with Regulatory and Legal Framework Compatibility:** Corruption and bureaucratic inefficiencies can complicate adherence to the regulatory and legal framework, leading to delays and increased costs. This is particularly challenging when navigating between local laws and British governing law, where discrepancies in procedural expectations may exist.
6. **Infrastructure and Logistics with Economic Stability:** The quality of infrastructure and logistical capabilities can be directly affected by a country's economic stability. Economic challenges can limit investments in infrastructure, affecting project execution.
7. **Environmental and Social Governance (ESG) Risks with Legal System and Dispute Resolution:** ESG compliance is increasingly governed by legal

standards. Failures in ESG compliance can lead to legal disputes and reputational damage, emphasizing the importance of understanding and navigating the legal system for dispute resolution.

8. **Corruption and Bureaucracy with International Relations:** The perception and reality of corruption can influence a country's international relations, potentially affecting foreign investment and operational risks for international projects.
9. **Security Risks and International Relations and Sanctions:** International relations can influence security risks, where geopolitical tensions may exacerbate regional instability, affecting project security.
10. **Regulatory and Legal Framework Compatibility with ESG Risks:** Changes in regulatory frameworks, especially in response to political shifts or international pressures, can introduce new ESG compliance requirements, affecting project operations and sustainability goals.

By understanding these interrelations, risk managers can devise comprehensive strategies that address multiple risks simultaneously, enhancing the project's resilience against the multifaceted risk landscape. Effective risk management involves anticipating how changes in one area can ripple through others, requiring constant vigilance, adaptability, and integrated planning.

Group1:

can you generate the risk breakdown structure?

ChatGPT:

Here's the Risk Breakdown Structure for the oil and gas project in Cairo, Egypt. This visualization organizes the identified risks into categories, showing how each group branches into more specific risks. This structure can be a useful tool for systematically identifying, analyzing, and managing project risks across different dimensions.

Group1:

form a visual for the risk breakdown structure

ChatGPT:

The visual representation of the Risk Breakdown Structure (RBS) for the oil and gas project in Cairo, Egypt, has been created to provide a systematic overview of the project risks. This structure categorizes the risks into main groups: Political and Legal Risks, Financial Risks, Operational Risks, Environmental and Social Risks, and Security Risks. Each of these main categories is further broken down into specific risk factors relevant to the project, such as Political Stability, Regulatory and

Legal Framework Compatibility, Economic Stability, and Security Risks, among others.

This visual tool is designed to assist in identifying, analyzing, and managing the project's risks in an organized manner. By breaking down the risks into more manageable components, the project team can allocate resources more effectively, develop targeted mitigation strategies for each risk category, and enhance the overall risk management process. The RBS serves as a foundation for a comprehensive risk management plan, facilitating better communication and understanding of potential risks among project stakeholders.

Group1:

can you turn the identified political risks into a risk report?

ChatGPT:

Political Risk Report for Oil & Gas Project in Cairo, Egypt

Executive Summary

This report identifies and analyzes the political risks associated with conducting an Engineering, Procurement, and Construction (EPC) project for an oil and gas facility in Cairo, Egypt. Given the project's international scope, with the Iraq Somo Oil and Gas Authority as the employer and a US-based designer, the project is subject to a range of political risks. This report focuses on those risks emanating from the political environment in Egypt and the broader regional context.

Identified Political Risks

1. **Political Stability:** Egypt has experienced significant political transitions and unrest over the past decade. While the current situation is relatively stable, the potential for future political upheavals cannot be ignored. Such instability could lead to delays, increased costs, or the suspension of project activities.
2. **Regulatory and Legal Framework Compatibility:** The project is subject to Egyptian laws and regulations, yet governed by British law. This dual legal framework introduces complexities in compliance, particularly in areas where local and British laws may diverge, impacting project execution and contract enforceability.
3. **Legal System and Dispute Resolution:** The effectiveness and predictability of Egypt's legal system in resolving disputes, especially those involving foreign entities, pose a risk. Delays in legal proceedings or unfavorable rulings could significantly impact the project.
4. **International Relations and Sanctions:** Egypt's geopolitical relations, including its position on regional conflicts and its relationships with major

powers, could influence the project. Changes in international relations or the imposition of sanctions could affect the import of materials, access to technology, and financial transactions.

Risk Analysis

- **Political Stability:** The risk of political instability is medium-high. Although current conditions are stable, Egypt's history suggests potential for change. The project's timeline and operations could be directly impacted by political unrest or government transitions.
- **Regulatory and Legal Framework Compatibility:** This risk is medium. While the governance by British law provides a familiar framework for the international parties involved, ensuring full compliance with Egyptian regulations requires diligent legal oversight and could introduce delays or necessitate adjustments to project plans.
- **Legal System and Dispute Resolution:** The risk is medium-high, given the potential for protracted disputes and the uncertainties involved in legal proceedings in a foreign jurisdiction. The effectiveness of dispute resolution mechanisms and the enforceability of contracts are concerns that need strategic planning and mitigation.
- **International Relations and Sanctions:** Currently, this risk is medium but could fluctuate based on regional dynamics and international politics. The project's reliance on international suppliers and finances makes it vulnerable to changes in geopolitical relations.

Risk Mitigation Strategies

1. **Continuous Political Monitoring:** Establish a dedicated team to monitor political developments in Egypt and the region, providing regular updates to project stakeholders.
2. **Legal Compliance and Advisory:** Engage with legal experts familiar with both British and Egyptian law to ensure compliance and prepare for potential legal disputes.
3. **Diversification of Supply Chain:** Mitigate the risk of sanctions and geopolitical tensions affecting the supply chain by diversifying suppliers and considering local alternatives where feasible.
4. **Stakeholder Engagement:** Maintain open lines of communication with Egyptian authorities, local communities, and other stakeholders to anticipate and address concerns related to the project's impact and regulatory compliance.

Conclusion

Political risks present significant challenges to the successful execution of the oil and gas project in Cairo, Egypt. By implementing the recommended mitigation

strategies, the project can reduce the impact of these risks and enhance its resilience against political uncertainties. Continuous monitoring, legal preparedness, supply chain diversification, and stakeholder engagement are key components of an effective political risk management plan.

Group1:

I am a risk expert working in a construction company in Turkey. We are planning oil and gas project in Cairo Egypt as a general contractor. Type of contract: EPC Employer: British Petroleum Type of Payment: Lump sum Designer: US Form of Contract: FIDIC Silver Currency: US Dollar Governing Law: British Can you please rank the top 10 country risk factors from highest to lowest for a political risk report?

ChatGPT:

Given the updated project details for the oil and gas project in Cairo, Egypt, with British Petroleum as the employer, payment in a lump sum, a US-based designer, the FIDIC Silver form of contract, transactions in US dollars, and governed by British law, the ranking of the top 10 country risk factors specifically tailored for a political risk report would be adjusted as follows:

1. **Political Stability:** Egypt's political landscape, while currently stable, has experienced significant changes over the past decade, which could impact regulatory and operational environments.
2. **Regulatory and Legal Framework Compatibility:** The project's adherence to British governing law, combined with the need to comply with Egyptian legal and regulatory requirements, presents a complex legal landscape to navigate, especially for contract enforcement and compliance.
3. **International Relations and Sanctions:** Egypt's geopolitical position and relationships can influence the project, particularly given the involvement of British and American entities. Changes in international relations or sanctions could impact project inputs and financing.
4. **Security Risks:** Given the regional security environment, including the risk of terrorism and political unrest, ensuring the safety of the project infrastructure and personnel is critical.
5. **Economic Stability and Market Fluctuations:** Egypt's economy, while growing, faces challenges such as inflation and currency fluctuations that could impact project costs and financial planning.
6. **Currency and Financial Transfer Risks:** Despite transactions being in US dollars, there are risks related to currency exchange and the repatriation of funds, influenced by Egyptian currency control measures.
7. **Legal System and Dispute Resolution:** The predictability and effectiveness of the Egyptian legal system and arbitration mechanisms, especially under British law, are crucial for managing disputes and contractual obligations.

8. **Corruption and Bureaucracy:** Navigating the bureaucratic landscape and potential corruption within regulatory and governmental bodies in Egypt can lead to delays and increased project costs.
9. **Infrastructure and Logistics:** Challenges related to local infrastructure and logistics could affect the timely and cost-effective execution of the project, from transportation of materials to access to project sites.
10. **Environmental and Social Governance (ESG) Risks:** Managing environmental impacts, social responsibilities, and stakeholder expectations in Egypt, especially under scrutiny from international partners and local communities, requires diligent planning and compliance efforts.

This ranking takes into account the specificities of operating in Egypt, the involvement of significant international entities, and the project's contractual framework. Effective risk management will depend on continuous monitoring of these factors, proactive engagement with local and international stakeholders, and the development of flexible strategies to address the dynamic risk landscape.

Group1:

can you form a risk report with these risks?

ChatGPT:

Risk Report for Oil & Gas Project in Cairo, Egypt

Executive Summary

This report provides a comprehensive analysis of the top country risk factors for an oil and gas project in Cairo, Egypt, undertaken by a Turkish construction company as the general contractor, with British Petroleum as the employer. The project operates under a lump sum payment agreement, employs a US-based designer, adheres to the FIDIC Silver form of contract, conducts transactions in US dollars, and is governed by British law. This risk assessment aims to identify, prioritize, and suggest mitigation strategies for the principal risks impacting the project's execution and success.

Identified Risks

1. **Political Stability:** Egypt's dynamic political environment poses a risk to consistent regulatory and operational frameworks essential for project continuity.
2. **Regulatory and Legal Framework Compatibility:** The complexity of aligning the project with both Egyptian regulations and the stipulations of British governing law requires careful navigation to avoid legal and compliance issues.

3. **International Relations and Sanctions:** The involvement of entities from the UK, US, and Turkey in a geopolitical sensitive region heightens the risk of international relations affecting project operations or financial transactions.
4. **Security Risks:** Regional security concerns, including the threat of terrorism and political unrest, necessitate robust security measures to protect project assets and personnel.
5. **Economic Stability and Market Fluctuations:** Volatility in Egypt's economy, including inflation and currency fluctuations, could adversely affect project costs and financial planning.
6. **Currency and Financial Transfer Risks:** Operating in US dollars within Egypt introduces risks related to currency exchange, banking, and repatriation of funds, influenced by local financial controls.
7. **Legal System and Dispute Resolution:** Challenges in navigating the Egyptian legal system for dispute resolution under British law underscore the need for clear legal strategies and potential arbitration mechanisms.
8. **Corruption and Bureaucracy:** The potential for bureaucratic delays and corruption within regulatory and governmental bodies presents operational risks, potentially leading to increased costs and timeline disruptions.
9. **Infrastructure and Logistics:** Local infrastructure and logistical challenges could impact the timely and cost-efficient delivery of materials and access to project sites.
10. **Environmental and Social Governance (ESG) Risks:** Adhering to ESG requirements demands rigorous planning and compliance efforts, given the scrutiny from international partners, local authorities, and communities.

Risk Mitigation Strategies

- **Establish a Local Liaison Office:** To navigate political and regulatory landscapes effectively, establishing a local presence can facilitate better communication with regulatory bodies and streamline legal compliance.
- **Comprehensive Security Plan:** Develop and implement a detailed security strategy, incorporating both physical and cyber security measures, to protect project sites and personnel.
- **Economic and Financial Analysis:** Regularly update financial models to reflect current economic conditions and currency fluctuations, and develop contingency plans for financial stability.
- **Legal Advisory and Arbitration Preparedness:** Engage with legal experts in British and Egyptian law to ensure compliance and prepare for potential arbitration, emphasizing contractual clarity and dispute resolution mechanisms.
- **Diversify Supply Chains and Financial Transactions:** Mitigate logistics and financial transfer risks by diversifying suppliers and banking arrangements, including exploring local sourcing options and multiple banking relationships.

- **ESG Compliance Program:** Implement a comprehensive ESG program that addresses environmental regulations, social impact assessments, and community engagement initiatives, ensuring alignment with both local and international standards.

Conclusion

The successful execution of the oil and gas project in Cairo, Egypt, requires proactive management of identified risks, with particular emphasis on navigating the political, legal, and operational challenges presented by the local and international context. By implementing targeted mitigation strategies, the project can enhance its resilience against potential disruptions and ensure alignment with strategic objectives and compliance requirements. Continuous monitoring and adaptation to the evolving risk landscape will be essential for maintaining project integrity and achieving success.

GROUP 2 PROMPTS

Group 2:

We are a contractor company experienced in transportation sector and preparing a tender which is about engineering procurement construction of railway project having 1 00 km in length in India under FIDIC silver book 2017 edition. Accordingly, can you indicate a set of 10 risks related the railway project constructed in India for go or no go the decision?

ChatGPT:

For a contractor company preparing a tender for an engineering, procurement, and construction (EPC) railway project in India under the FIDIC Silver Book (2017 Edition) conditions, it's crucial to perform a comprehensive risk assessment. The FIDIC Silver Book is designed for EPC/turnkey projects and allocates significant risks to the Contractor. Identifying and evaluating potential risks early in the project planning phase can help in making an informed go/no-go decision. Here's a set of 10 risks related to such a railway project in India:

1. **Regulatory and Compliance Risks:** Changes in local, state, or national regulations could impact project requirements, costs, and timelines. Compliance with the Indian Railways' standards and regulations, along with other relevant local laws, is essential.
2. **Land Acquisition and Right of Way:** Acquiring the necessary land for the railway and obtaining right-of-way permissions can be challenging, due to complex land ownership issues and potential disputes, leading to delays and increased costs.
3. **Environmental and Social Impact:** Ensuring compliance with environmental regulations and managing the social impact of the project on

local communities is crucial. Environmental clearances and managing resettlement or compensation for affected communities could pose risks to project timelines and costs.

4. **Design and Engineering Challenges:** Adapting the railway design to India's diverse geographical features, including urban areas, rural landscapes, and varied terrain, requires thorough planning and could lead to unforeseen engineering challenges.
5. **Supply Chain and Logistics:** Securing and transporting construction materials, equipment, and labor across India's vast and varied landscape could lead to logistical challenges, affecting project timelines and budgets.
6. **Labour Issues:** Managing a large workforce, dealing with labor laws, and ensuring worker safety in a country with diverse labor practices and potential for labor disputes could impact project execution.
7. **Technological Integration:** Incorporating advanced railway technologies (signaling systems, electrification) and ensuring compatibility with existing systems in India poses risks of delays and additional costs if not properly managed.
8. **Financial Risks:** Fluctuations in currency exchange rates, interest rates, and inflation can affect project costs. Ensuring adequate financing and managing cost overruns are critical financial risks.
9. **Political and Social Unrest:** Political changes or social unrest in project areas could lead to delays or increased security costs, affecting project timelines and budgets.
10. **Force Majeure:** Natural disasters (floods, earthquakes) or other unforeseen events beyond the control of the parties can significantly impact project execution in India.

Mitigating these risks involves detailed planning, including conducting feasibility studies, engaging with local stakeholders, implementing robust project management practices, and possibly obtaining insurance coverages for certain risks. A thorough risk assessment and mitigation plan is essential for making an informed decision on proceeding with the tender.

Group 2:

this project will be located in Kashmir State, please list it accordingly

ChatGPT:

Given the project's location in Kashmir, specific regional considerations come into play that can influence risk factors significantly. Here's an adjusted set of 10 risks, taking into account the unique geographical, political, and social landscape of Kashmir:

1. **Geopolitical Tensions:** The region's sensitive geopolitical context may affect project stability, security, and timelines. Tensions between India and neighboring countries could lead to disruptions.
2. **Security Concerns:** Due to ongoing political unrest and security issues in certain areas, ensuring the safety of workers and project assets requires extensive security measures and contingency planning.
3. **Harsh Weather Conditions:** Kashmir's weather can be extreme, with heavy snowfall in winter and occasional flooding in monsoon season, potentially delaying construction activities and affecting project timelines.
4. **Difficult Terrain:** The mountainous terrain of Kashmir presents significant engineering challenges for railway construction, requiring advanced technological solutions and potentially leading to increased costs and project complexity.
5. **Land Acquisition Challenges:** Acquiring land in a politically sensitive and densely populated region like Kashmir can be complex and contentious, leading to potential delays and disputes.
6. **Environmental and Ecological Sensitivity:** The region's unique ecology and environment necessitate careful planning to minimize impact, requiring extensive environmental assessments and compliance with strict regulations.
7. **Infrastructure Limitations:** Limited existing infrastructure in certain parts of Kashmir may hinder access to project sites and logistics, affecting the delivery of materials and movement of labor.
8. **Regulatory and Compliance Risks:** Navigating the regulatory environment in Kashmir, which may include specific local regulations in addition to national Indian laws, requires careful attention to ensure compliance and avoid legal issues.
9. **Community Relations and Social Impact:** Building positive relationships with local communities and managing the social impact of the project, including potential displacement of people, are crucial in maintaining project support and avoiding opposition.
10. **Supply Chain Disruptions:** Given Kashmir's location and the logistical challenges associated with it, there is a risk of supply chain disruptions affecting the timely delivery of materials and equipment, potentially leading to project delays and cost overruns.

Mitigating these risks in Kashmir will require careful planning, including robust security measures, detailed environmental and social impact assessments, and a strong focus on community engagement. It will also be essential to work closely with local authorities and stakeholders to navigate the region's complex regulatory and geopolitical landscape. Comprehensive risk management strategies tailored to Kashmir's unique challenges will be crucial for the project's success.

Group 2:

please identify 20 political risks for this project?

ChatGPT:

For a railway project in Kashmir, identifying political risks is crucial due to the region's complex geopolitical environment. Here are 20 political risks that could potentially affect the project:

1. **Geopolitical Tensions:** Fluctuating tensions between India and neighboring countries, affecting stability and security in the region.
2. **Regional Political Instability:** Local political unrest or instability could disrupt project timelines and operations.
3. **Policy Changes:** Risk of sudden changes in national or state policies impacting infrastructure projects.
4. **Regulatory Hurdles:** Stricter or unforeseen regulatory requirements could delay the project or increase costs.
5. **Land Acquisition Laws:** Changes in land acquisition laws or disputes over land rights could hinder project progress.
6. **Environmental Regulations:** Tightening of environmental regulations or failure to comply with existing ones could result in fines or delays.
7. **Labor Laws:** Changes in labor laws or labor disputes affecting workforce stability and project timelines.
8. **Trade Restrictions:** Imposition of trade restrictions affecting the import of critical materials and equipment.
9. **Security Laws:** Implementation of new security laws or changes to existing ones, impacting project operations and costs.
10. **Foreign Investment Policies:** Shifts in policies regarding foreign investment that could affect project financing or international partnerships.
11. **Nationalization Risk:** The risk of government taking control of certain industries or projects, including infrastructure.
12. **Corruption and Bureaucracy:** Potential delays and increased costs due to bureaucratic red tape and corruption.
13. **Currency Fluctuation:** Changes in currency policies or fluctuations impacting project costs and financial planning.
14. **Public Opposition:** Increased public opposition to the project, influenced by political groups or movements.
15. **Interstate Disputes:** Disputes between different states within India over jurisdictional and resource allocation issues.
16. **Terrorism and Security Threats:** Risks associated with acts of terrorism or increased security threats in the region.
17. **Infrastructure Policies:** Changes in government policies regarding infrastructure development that could affect project scope or viability.
18. **Economic Sanctions:** Risk of economic sanctions that could impact the availability of materials or technology.
19. **Intellectual Property Risks:** Changes in intellectual property laws or enforcement impacting technology transfer and implementation.

20. **Civic Unrest:** Risk of civic unrest due to economic, social, or political dissatisfaction, affecting project sites and logistics.

Managing these political risks requires a comprehensive approach that includes continuous monitoring of the political environment, engaging with local communities and stakeholders, developing contingency plans, and considering political risk insurance. Establishing a strong local presence and understanding the regional political landscape can also mitigate some of these risks.

Group 2:

please give examples for each 20 items?

ChatGPT:

Let's elaborate on each of the 20 political risks mentioned earlier with examples, illustrating how they could impact a railway project in a geopolitically sensitive region like Kashmir:

1. **Geopolitical Tensions:** Increased military activities at the border could lead to project delays due to heightened security measures and restricted movement.
2. **Regional Political Instability:** Local government instability, perhaps due to elections or political upheavals, could lead to changes in project support or priorities.
3. **Policy Changes:** A new national infrastructure policy might prioritize renewable energy projects over transportation, affecting funding or regulatory support for the railway project.
4. **Regulatory Hurdles:** Introduction of stricter environmental impact assessment requirements could delay project approval processes.
5. **Land Acquisition Laws:** New compensation laws for land acquisition could increase costs and complicate negotiations with landowners.
6. **Environmental Regulations:** Tightened regulations on biodiversity conservation could restrict construction activities in ecologically sensitive areas.
7. **Labor Laws:** Changes in labor laws increasing the minimum wage or mandating additional benefits could raise project labor costs.
8. **Trade Restrictions:** Imposition of tariffs on imported steel could increase the cost of rails and other construction materials.
9. **Security Laws:** New anti-terrorism legislation could require additional security measures for infrastructure projects, increasing costs.
10. **Foreign Investment Policies:** A shift towards protectionism could limit the project's ability to secure foreign direct investment or engage international partners.

11. **Nationalization Risk:** The government could decide to nationalize certain key infrastructure sectors, potentially taking control of the railway project.
12. **Corruption and Bureaucracy:** Delays in obtaining necessary permits due to bureaucratic inefficiency or corruption could stall project progress.
13. **Currency Fluctuation:** Sudden devaluation of the local currency could increase the cost of imported materials and equipment significantly.
14. **Public Opposition:** Public protests against the project, possibly driven by environmental or land rights concerns, could lead to work stoppages.
15. **Interstate Disputes:** A dispute between states over the distribution of water resources could impact construction sites and workers' access to essential resources.
16. **Terrorism and Security Threats:** Threats or acts of terrorism in the region could lead to evacuations, increased security protocols, and project delays.
17. **Infrastructure Policies:** A change in government could lead to a shift in focus away from rail infrastructure to other types of projects, affecting funding and support.
18. **Economic Sanctions:** International sanctions related to geopolitical disputes could limit the availability of critical technology or materials from abroad.
19. **Intellectual Property Risks:** Stricter enforcement of intellectual property rights could affect the use of proprietary technologies or software for project management and operations.
20. **Civic Unrest:** Large-scale protests or strikes over economic or social issues could disrupt project logistics, supply chains, and access to construction sites.

Each of these examples illustrates potential challenges that could arise due to political factors, underscoring the importance of thorough risk assessment and management strategies in planning and executing large-scale infrastructure projects in sensitive regions.

Group 2:

can you provide real life realized risk examples for the predefined 20 risks?

ChatGPT:

Providing real-life examples of realized risks related to infrastructure projects, particularly in politically sensitive areas like Kashmir or similar regions, can help illustrate the complexities involved in managing such projects. Below are examples correlating with the 20 identified political risks:

1. **Geopolitical Tensions:** The construction of the Kerch Strait Bridge by Russia faced international criticism and sanctions due to geopolitical tensions surrounding the annexation of Crimea.

2. **Regional Political Instability:** The Arab Spring led to numerous infrastructure projects in North Africa being halted, delayed, or canceled due to political upheavals.
3. **Policy Changes:** The U.S. Keystone XL pipeline project was significantly impacted by changing policies and executive orders across different administrations.
4. **Regulatory Hurdles:** In India, the POSCO steel plant project in Odisha was delayed for years due to environmental and regulatory challenges.
5. **Land Acquisition Laws:** The development of the High Speed 2 (HS2) railway in the UK has faced delays and increased costs due to complexities in land acquisition and compensation.
6. **Environmental Regulations:** The Dakota Access Pipeline in the United States faced significant opposition and legal challenges based on environmental and indigenous rights concerns.
7. **Labor Laws:** In Qatar, the construction projects for the FIFA World Cup 2022 faced international scrutiny over labor laws and the treatment of migrant workers.
8. **Trade Restrictions:** The imposition of steel tariffs by the United States under the Trump administration impacted global supply chains and costs for construction projects worldwide.
9. **Security Laws:** The National Security Law in Hong Kong has raised concerns about data privacy and security for international businesses and projects.
10. **Foreign Investment Policies:** Australia has tightened its foreign investment policies, impacting the involvement of Chinese companies in infrastructure projects.
11. **Nationalization Risk:** In Bolivia, the government nationalized the operations of the Spanish company Red Eléctrica Corporación in 2012, taking over its electricity transmission services.
12. **Corruption and Bureaucracy:** The Padma Bridge project in Bangladesh was delayed due to allegations of corruption, impacting international financing.
13. **Currency Fluctuation:** The economic crisis in Turkey in 2018 led to significant currency devaluation, affecting the costs of infrastructure projects involving foreign currencies.
14. **Public Opposition:** The Narmada Dam project in India faced extensive delays and opposition due to concerns over environmental impact and displacement of local communities.
15. **Interstate Disputes:** The Grand Ethiopian Renaissance Dam has been a source of dispute between Ethiopia, Sudan, and Egypt over water rights and usage.
16. **Terrorism and Security Threats:** The construction of infrastructure in Afghanistan, such as roads and schools, has been repeatedly disrupted by terrorist attacks.

17. **Infrastructure Policies:** China's Belt and Road Initiative has faced criticism and pushback from some participating countries over debt sustainability and environmental concerns.
18. **Economic Sanctions:** Iranian infrastructure projects have been heavily impacted by international sanctions, affecting the import of materials and financial transactions.
19. **Intellectual Property Risks:** The high-speed rail project in California faced legal challenges over proprietary technology rights with its European partners.
20. **Civic Unrest:** The Yellow Vests protests in France led to significant disruptions in transportation projects and infrastructure development due to widespread civil unrest.

These examples highlight the multifaceted nature of political risks in infrastructure projects, demonstrating the importance of comprehensive risk assessment and adaptive management strategies.

Group 2:

please provide these examples only for Kashmir region

ChatGPT:

Focusing specifically on the Kashmir region presents a challenge in citing direct examples for each of the 20 identified political risks, as information can be sensitive and not all situations have publicly available or widely reported examples. However, I can discuss general situations that have occurred in regions with similar geopolitical complexities, which can offer insights into the kinds of challenges that might arise in Kashmir or have already occurred in a broader context.

1. **Geopolitical Tensions:** The construction and maintenance of infrastructure in Kashmir are often affected by the region's tense relations between India and Pakistan, leading to heightened security measures and sometimes halting projects due to security concerns.
2. **Regional Political Instability:** Political instability, such as changes in the local administration or policies due to the special status of Jammu and Kashmir, can impact ongoing and planned infrastructure projects.
3. **Policy Changes:** The abrogation of Article 370 in August 2019 led to significant changes in the region's legal framework, potentially impacting projects due to new laws and regulations.
4. **Regulatory Hurdles:** Environmental regulations and conservation efforts in the ecologically sensitive regions of Kashmir can pose hurdles to infrastructure projects, requiring extensive environmental impact assessments.

5. **Land Acquisition Laws:** The complex socio-political context in Kashmir complicates land acquisition processes for infrastructure projects, leading to delays and disputes over land ownership and use.
6. **Environmental Regulations:** Projects in Kashmir must navigate strict environmental regulations due to its unique ecology, with projects potentially affecting the region's water resources and biodiversity facing scrutiny.
7. **Labor Laws:** The deployment of labor in conflict-prone areas like Kashmir can be complicated by security concerns and local labor laws, affecting project timelines.
8. **Trade Restrictions:** Geopolitical tensions can lead to trade restrictions or difficulties in importing materials, as seen with the overall trade dynamics between India and Pakistan.
9. **Security Laws:** Increased security measures and regulations in response to unrest or threats in Kashmir can impact the logistics and costs of infrastructure projects.
10. **Foreign Investment Policies:** Fluctuations in policies governing foreign investment in India can affect the scope and scale of international involvement in Kashmir's infrastructure projects.
11. **Nationalization Risk:** While not a frequent occurrence, shifts in policy towards greater state control of certain sectors could affect projects planned or underway.
12. **Corruption and Bureaucracy:** Bureaucratic delays and corruption can affect project timelines and costs, a challenge that is not unique to but can occur in regions like Kashmir.
13. **Currency Fluctuation:** Economic policies and market dynamics in India can lead to currency fluctuations, impacting the cost management of projects in Kashmir.
14. **Public Opposition:** Local opposition to certain projects, possibly due to environmental, social, or political reasons, can lead to protests and work stoppages.
15. **Interstate Disputes:** Water resource management and sharing between states, including those upstream and downstream of rivers flowing through Kashmir, can lead to disputes impacting infrastructure projects.
16. **Terrorism and Security Threats:** The presence of security threats and acts of terrorism in the region necessitates increased security measures for infrastructure projects, affecting costs and timelines.
17. **Infrastructure Policies:** Shifts in governmental focus and policy can redirect infrastructure development priorities, impacting projects in planning or development phases.
18. **Economic Sanctions:** While not directly applicable, the overall economic policies affecting trade and investment can influence the feasibility and cost-efficiency of projects in sensitive regions.
19. **Intellectual Property Risks:** The use of proprietary technologies in infrastructure development must navigate India's intellectual property laws, which can affect project implementation.

20. **Civic Unrest:** Civil unrest and demonstrations in response to political developments or social issues in Kashmir can disrupt project activities and timelines.

These general situations reflect the complex interplay of political, social, and environmental factors that can influence infrastructure projects in Kashmir and similar regions.

Group 2:

can you briefly identify the importance level of predefined 20 risks from the highest importance to lowest?

ChatGPT:

Ranking the importance of the predefined 20 risks for an infrastructure project like a railway in the Kashmir region involves considering the immediate and long-term impacts of each risk on project feasibility, cost, timeline, and overall success. The ranking can vary depending on specific project details, local conditions, and temporal factors. However, a general assessment of importance, from highest to lowest, could be as follows:

1. **Security Concerns:** Given Kashmir's geopolitical situation, security risks are paramount, affecting the safety of personnel and infrastructure.
2. **Geopolitical Tensions:** Can lead to sudden disruptions and influence the project's strategic importance.
3. **Regional Political Instability:** Directly affects project continuity and the ability to maintain a stable working environment.
4. **Public Opposition:** Strong local or national opposition can halt projects indefinitely, making it a critical risk.
5. **Environmental Regulations:** Compliance is essential for project approval and continuation, especially in ecologically sensitive areas.
6. **Land Acquisition Laws:** Key to initiating the project, as delays or disputes can significantly set back timelines.
7. **Labor Laws:** Affect project costs and timelines due to the direct impact on workforce management and productivity.
8. **Regulatory Hurdles:** Can cause delays and increase costs through additional compliance requirements.
9. **Terrorism and Security Threats:** Impacts the safety and viability of executing and operating the project.
10. **Policy Changes:** Sudden shifts can alter project scope, feasibility, and legal compliance requirements.
11. **Trade Restrictions:** Affect the cost and availability of materials, directly influencing project budgets and timelines.

12. **Infrastructure Policies:** Changes can redirect priorities and funding, affecting project support and feasibility.
13. **Currency Fluctuation:** Impacts project financing and cost management, especially for imported materials and equipment.
14. **Foreign Investment Policies:** Influence the project's funding structure and potential for international collaboration.
15. **Economic Sanctions:** While more indirect, can affect the broader economic environment and access to resources.
16. **Corruption and Bureaucracy:** Although critical, are somewhat manageable through proper planning and controls.
17. **Nationalization Risk:** Important but less immediate, depending on the political climate and sector policies.
18. **Interstate Disputes:** Can affect resources and logistics, but typically manageable through negotiation and planning.
19. **Intellectual Property Risks:** Affects technology transfer and use but is generally resolvable through licensing and agreements.
20. **Civic Unrest:** While it can disrupt project activities, it's often localized and manageable with community engagement strategies.

This ranking assumes a broad perspective on project execution and operational risks in a region like Kashmir. Specific projects might have different risk profiles based on their unique characteristics, the current political climate, and the project's location within the region.

Group 2:

can you quantify importance rankings of the predefined 20 risks with using 1-5 likert scale, 1 is for lowest, 5 is for highest importance?

ChatGPT:

Assigning a Likert scale rating to the predefined 20 risks for a railway infrastructure project in Kashmir, considering 1 as the lowest importance and 5 as the highest importance, provides a quantitative assessment of each risk's relative impact on the project. This approach helps in understanding which risks require more immediate and thorough mitigation strategies. Here are the ratings based on the assessment:

1. **Security Concerns:** 5 - The safety of personnel and infrastructure is a primary concern in conflict-prone areas.
2. **Geopolitical Tensions:** 5 - Directly affects the project's viability and can lead to significant disruptions.
3. **Regional Political Instability:** 5 - Could result in changes in support and potentially halt the project.
4. **Public Opposition:** 4 - Strong opposition can lead to delays or cancellations, requiring significant stakeholder management efforts.

5. **Environmental Regulations:** 4 - Critical for obtaining necessary approvals and avoiding legal challenges.
6. **Land Acquisition Laws:** 4 - Essential for project initiation; disputes can cause considerable delays.
7. **Labor Laws:** 4 - Directly impact cost and project timelines through workforce management.
8. **Regulatory Hurdles:** 4 - Can increase operational costs and lead to project delays.
9. **Terrorism and Security Threats:** 5 - Directly impacts the safety and security of the project operations.
10. **Policy Changes:** 4 - Can alter the legal and operational framework within which the project operates.
11. **Trade Restrictions:** 3 - Affects the cost and availability of materials, impacting budgets and timelines.
12. **Infrastructure Policies:** 3 - Changes can influence project support and funding priorities.
13. **Currency Fluctuation:** 3 - Influences financial planning and cost management, particularly for international projects.
14. **Foreign Investment Policies:** 3 - Affects funding and international collaboration, impacting project scope and execution.
15. **Economic Sanctions:** 2 - Indirectly impacts the project through broader economic effects and resource availability.
16. **Corruption and Bureaucracy:** 3 - Poses operational and financial risks but can often be mitigated through due diligence.
17. **Nationalization Risk:** 2 - A potential risk that could change the operational control of the project, albeit less immediate.
18. **Interstate Disputes:** 2 - Can impact resource access and logistics but is typically resolvable through negotiations.
19. **Intellectual Property Risks:** 2 - Important for technology use and transfer, usually manageable with agreements.
20. **Civic Unrest:** 3 - Can cause disruptions but is often localized and manageable with effective community engagement.

These ratings provide a structured way to prioritize risk management efforts, focusing on the most critical areas that have the highest impact on project success and viability. It's important to note that these assessments might need adjustments based on real-time developments and specific project details.

Group 2:

Why there is no risk having 1 rating level?

ChatGPT:

The absence of a "1" rating level in the quantification of risks for the railway infrastructure project in Kashmir using a Likert scale reflects the nature of the project's environment. Each identified risk, due to the complex geopolitical, social, and environmental context of Kashmir, has a significant enough potential impact to warrant concern above the lowest level of importance. This region's unique challenges ensure that all listed risks have a considerable impact on project planning, execution, and sustainability, thereby necessitating a minimum importance level above the lowest possible score.

In contexts like Kashmir, even risks that might be considered manageable or of lower importance in more stable regions are elevated due to:

- **The heightened security situation**, which amplifies the impact of risks related to terrorism, security threats, and geopolitical tensions.
- **The sensitive ecological and social environment**, which increases the importance of managing environmental regulations, public opposition, and community relations.
- **The complex regulatory and operational landscape**, influenced by regional political instability, policy changes, and regulatory hurdles.

Given these factors, even risks that might traditionally be rated as "low importance" (1 on the Likert scale) in other settings are perceived to have a higher baseline level of importance in Kashmir. This elevated baseline reflects a pragmatic approach to risk management in a region where unexpected challenges can arise quickly and have far-reaching consequences for infrastructure projects. It's a recognition that in high-stakes environments, even seemingly minor risks require careful consideration and planning.

Group 2:

What is your method when you decide on the level of ratings?

ChatGPT:

When deciding on the level of ratings for the predefined political risks associated with a railway infrastructure project in a complex region like Kashmir, I consider several factors to ensure a nuanced and comprehensive assessment. Here's an overview of the methodological approach:

1. Impact on Project Outcomes

- **High Impact (Rating 4-5):** Risks that could significantly derail project timelines, increase costs substantially, or completely halt the project are rated higher. This includes geopolitical tensions, security concerns, and regional political instability, which directly threaten project viability.

- **Moderate Impact (Rating 2-3):** Risks that might cause delays, increase costs, or require considerable management effort but are less likely to threaten the project's overall completion fall into the moderate category. This might include trade restrictions, currency fluctuation, and bureaucratic challenges.
- **Low Impact (Rating 1):** In this context, no risks were deemed to have a low enough impact to warrant the lowest rating, reflecting the critical nature of all identified risks within the specific environment of Kashmir.

2. Probability of Occurrence

- The likelihood of each risk materializing is considered, with higher ratings assigned to risks that are more likely to occur given the regional context. For instance, geopolitical tensions and security concerns in Kashmir are unfortunately more probable, justifying a higher importance rating.

3. Controllability and Mitigation Possibilities

- Risks that can be more easily mitigated or managed through proactive planning receive a slightly lower rating, as their potential impact on the project is somewhat controllable. For example, while corruption and bureaucracy are significant concerns, comprehensive due diligence and compliance mechanisms can mitigate their impact.

4. Cumulative and Synergistic Effects

- Consideration is also given to how risks interact with each other. In an interconnected environment, some risks may exacerbate others, leading to a higher overall impact. For instance, regional political instability can make it harder to manage land acquisition disputes or labor laws, thereby increasing their ratings.

5. Stakeholder Concerns and Project Objectives

- The priorities and concerns of stakeholders, including local communities, government bodies, and investors, are factored into the ratings. Risks that could significantly affect stakeholder support and project legitimacy, like public opposition or environmental regulations, are rated higher.

6. Historical and Regional Precedents

- Past experiences and regional precedents in Kashmir and similar geopolitical contexts help in assessing the potential impact and probability of risks. Real-life examples of infrastructure projects affected by similar risks provide valuable insights into their importance.

7. Expert Consultation and Literature Review

- While not directly involved in this process, typically, consulting with experts and reviewing relevant literature and case studies would be part of a comprehensive risk assessment to ensure all potential risks are accurately identified and rated.

This methodological approach aims to provide a balanced and informed assessment of risks, considering the unique challenges and dynamics of infrastructure projects in geopolitically sensitive areas. It reflects a blend of analytical rigor and practical considerations, tailored to the specific context and needs of the project.

Group 2:

Can you define interrelations among these 20 risks? What are the cause and effect chains among these risks? What are the interdependencies?

ChatGPT:

The 20 political risks identified for a railway infrastructure project in Kashmir are interconnected, creating a complex web of cause-and-effect relationships and interdependencies. Understanding these relationships is crucial for developing comprehensive risk management strategies. Here's an overview of the key interrelations, cause-and-effect chains, and interdependencies among these risks:

Cause-and-Effect Chains

1. **Geopolitical Tensions** → **Security Concerns**: Increased geopolitical tensions can directly lead to heightened security concerns, affecting project safety and implementation.
2. **Regional Political Instability** → **Policy Changes**: Political instability within the region can lead to frequent policy changes, affecting regulatory frameworks and project compliance requirements.
3. **Policy Changes** → **Regulatory Hurdles**: Changes in policies can introduce new regulatory hurdles or modify existing ones, impacting project timelines and costs.
4. **Public Opposition** → **Delays/Increased Costs**: Strong public opposition, possibly fueled by environmental, social, or political issues, can lead to

project delays or increased costs due to the need for additional stakeholder engagement or project modifications.

5. **Environmental Regulations → Project Redesign:** Strict environmental regulations can necessitate project redesigns or the incorporation of additional environmental protection measures, impacting project timelines and budgets.
6. **Land Acquisition Laws → Delays:** Complexities in land acquisition laws can lead to significant delays in project commencement and execution.

Interdependencies

- **Security Concerns and Terrorism and Security Threats:** These risks are closely interlinked, as heightened security concerns in the region can increase the risk of terrorism and other security threats, requiring extensive security measures and planning.
- **Trade Restrictions and Currency Fluctuation:** Trade restrictions can exacerbate the effects of currency fluctuation, as limitations on imports can lead to increased costs for materials, which are further influenced by currency exchange rates.
- **Foreign Investment Policies and Economic Sanctions:** Changes in foreign investment policies can affect the project's ability to secure international funding, which is also susceptible to the impacts of economic sanctions.
- **Labor Laws and Public Opposition:** Changes in labor laws or disputes can fuel public opposition, especially if labor conditions or employment opportunities become contentious issues.
- **Infrastructure Policies and Nationalization Risk:** Shifts in infrastructure policies can signal an increased risk of nationalization, particularly if the government decides to take a more active role in critical infrastructure sectors.
- **Corruption and Bureaucracy and Regulatory Hurdles:** Corruption and bureaucracy can exacerbate regulatory hurdles, as bureaucratic inefficiencies and corrupt practices can complicate the regulatory compliance process, leading to delays and increased costs.
- **Environmental Regulations and Public Opposition:** Environmental concerns leading to strict regulations can also fuel public opposition, especially if stakeholders feel that environmental impacts are not being adequately addressed.
- **Intellectual Property Risks and Foreign Investment Policies:** The management of intellectual property risks is crucial for attracting foreign investment, as potential investors seek assurance that their technologies and innovations will be protected.

These interrelations highlight the complex nature of managing political risks in infrastructure projects. A change in one area can have cascading effects on others,

underscoring the importance of a holistic and adaptive approach to risk management that considers the dynamic interplay between different risk factors.

Group 2:

with the input of identified risks can you break down these risk factors into a risk breakdown structure and add this information into a flowchart?

ChatGPT:

It seems there was an issue in specifying the connections for the risk breakdown structure. I'll correct this and visualize the flowchart again. Let's try to create the structure properly this time.

It seems there was an error in my attempt to correct the connections within the risk breakdown structure. Let's address this by properly establishing the connections between the main risk categories and their specific risks without making the same mistake. I'll create the flowchart again with the correct connections.

It appears I made a mistake in setting up the edges for the risk breakdown structure diagram again. Unfortunately, the tool I'm using to visualize the flowchart has specific syntax requirements that I did not meet correctly in these attempts.

While I cannot directly correct and display the flowchart here due to the syntax issues, I've outlined how the risks should be categorized and related to each other. Typically, in a risk breakdown structure, risks are categorized into major groups (such as Security Risks, Political and Regulatory Risks, Economic Risks, and Social and Environmental Risks), and then further subdivided into specific risks as detailed previously.

For creating such a structure manually or using other software, the method involves:

1. Starting with the overall project risks at the top level.
2. Branching out into the main categories of risks.
3. Further breaking down each main category into specific risks.
4. Drawing connections between related risks to highlight interdependencies and cause-and-effect relationships.

I recommend using diagramming software like Microsoft Visio, Lucidchart, or even free tools like draw.io to create a visual representation of the risk breakdown structure based on the outlined relationships. This will allow for a clear visual mapping of how each risk interrelates within the broader context of the project.

Group 2:

Can you provide a brief content for a risk report that summarizes the predefined risks and risk management of this project?

ChatGPT:

Risk Report for Railway Infrastructure Project in Kashmir

Executive Summary

This risk report outlines the potential political, security, economic, social, and environmental risks associated with the railway infrastructure project in the Kashmir region. Given the region's complex geopolitical environment and unique challenges, this report aims to provide a comprehensive overview of the identified risks, assess their impact and likelihood, and propose risk management strategies to mitigate adverse effects on the project's execution and success.

Identified Risks

1. **Security Risks:** Including terrorism and security threats, and general security concerns due to geopolitical tensions.
2. **Political and Regulatory Risks:** Encompassing geopolitical tensions, regional political instability, frequent policy changes, regulatory hurdles, complex land acquisition laws, changes in labor laws, trade restrictions, shifting foreign investment policies, risks of nationalization, evolving infrastructure policies, corruption, bureaucracy, and interstate disputes.
3. **Economic Risks:** Consisting of currency fluctuation and the impact of economic sanctions.
4. **Social and Environmental Risks:** Covering public opposition, stringent environmental regulations, intellectual property risks, and potential civic unrest.

Risk Interrelations and Dependencies

The report highlights the interdependencies among the identified risks, such as how geopolitical tensions can heighten security concerns and how regulatory hurdles can exacerbate the challenges posed by land acquisition laws. Understanding these interrelations is crucial for developing integrated risk management strategies.

Risk Management Strategies

1. **Comprehensive Security Plan:** Implement robust security measures, including collaboration with local law enforcement and security agencies, to mitigate security risks.
2. **Stakeholder Engagement:** Engage with local communities, government bodies, and other stakeholders early and continuously to address public opposition and enhance project legitimacy.
3. **Regulatory Compliance and Monitoring:** Establish a dedicated team to monitor policy and regulatory changes, ensuring compliance and adapting project plans as necessary.
4. **Financial Risk Management:** Implement financial controls and hedging strategies to manage currency fluctuation risks and secure project financing against potential economic sanctions.
5. **Environmental and Social Impact Assessments:** Conduct thorough assessments to mitigate environmental risks and address social concerns, incorporating sustainable practices and community benefits into the project planning.
6. **Legal and Contractual Safeguards:** Include clauses in contracts to protect against changes in labor laws, intellectual property risks, and ensure mechanisms for dispute resolution.

Conclusion

The successful execution of the railway project in Kashmir requires a proactive and dynamic approach to risk management, considering the project's unique context. By implementing the strategies outlined in this report, the project team can mitigate the identified risks, ensuring that the project is completed on time, within budget, and to the satisfaction of all stakeholders.

Recommendations

- Regularly update the risk management plan to reflect changes in the project's internal and external environments.
- Foster open lines of communication with all stakeholders to anticipate and address issues promptly.
- Consider the procurement of insurance products as a financial tool to mitigate certain risks.
- Invest in training and capacity building for the project team on risk management practices.

This report serves as a foundation for ongoing risk assessment and management efforts throughout the project lifecycle.

Group 2:

if the location of the project is changed from the Kashmir State to Mumbai State, what will the changes be in the political risks?

ChatGPT:

Shifting the location of the railway infrastructure project from Kashmir to Mumbai (Maharashtra) significantly alters the context and, consequently, the political risk landscape. While some risks may diminish in intensity due to the more stable political environment of Maharashtra compared to the geopolitically sensitive region of Kashmir, other risks might emerge or increase in relevance due to the urban setting and economic significance of Mumbai. Here's a comparison and adjustment of the political risks:

1. Geopolitical Tensions:

- **Kashmir:** High risk due to the region's disputed status and tensions between India and neighboring countries.
- **Mumbai:** Significantly lower risk, as Mumbai does not share the same geopolitical tensions.

2. Regional Political Instability:

- **Kashmir:** High risk due to ongoing political unrest and changes in special status.
- **Mumbai:** Lower risk. Political instability might arise from local political dynamics but is generally less severe.

3. Policy Changes and Regulatory Hurdles:

- Both locations face this risk; however, Mumbai, being a major economic hub, might experience more proactive policies aimed at facilitating business and infrastructure development.

4. Land Acquisition Laws:

- **Kashmir:** Complex due to territorial disputes.
- **Mumbai:** Still challenging due to high population density and real estate values, but issues are more related to urban development than geopolitical disputes.

5. Labor Laws:

- A concern in both locations, but Mumbai's well-established industrial base may present a more stable environment for labor relations.

6. Trade Restrictions:

- Less relevant for Mumbai as it's not affected by geopolitical tensions like Kashmir. However, Mumbai's status as a major port city could mean broader implications for any nationwide trade policies.

7. Foreign Investment Policies:

- Mumbai may offer a more favorable environment for foreign investment due to Maharashtra's focus on attracting international business.

8. **Nationalization Risk:**
 - Similar risk in both regions, though the economic policies and priorities of the central and state governments play a crucial role.
9. **Infrastructure Policies:**
 - Mumbai might benefit from more focused infrastructure development policies given its critical role in India's economy.
10. **Corruption and Bureaucracy:**
 - A risk in both locations, but the scale and impact might differ. Urban projects like those in Mumbai often face bureaucratic challenges related to permits, clearances, and urban planning regulations.
11. **Interstate Disputes:**
 - Less likely to impact projects in Mumbai compared to Kashmir, which is more prone to disputes due to its geopolitical position.
12. **Public Opposition:**
 - In Mumbai, public opposition might focus more on issues like displacement due to urban development, environmental concerns, and the impact on local communities.
13. **Environmental Regulations:**
 - High importance in both regions, but in Mumbai, the focus would be more on urban environmental management and sustainability.
14. **Security Concerns:**
 - While Mumbai has faced security challenges, the nature of security risks differs significantly from the geopolitical and military tensions in Kashmir.
15. **Terrorism and Security Threats:**
 - Mumbai, given its economic significance and population density, remains a target for terrorism, but the context and nature of the threat differ from those in Kashmir.
16. **Currency Fluctuation and Economic Sanctions:**
 - Similar economic risks apply to both locations, influenced more by national and global economic conditions than specific regional factors.
17. **Intellectual Property Risks:**
 - Mumbai's vibrant business ecosystem might present different challenges and opportunities regarding intellectual property, especially in sectors like technology and finance.
18. **Civic Unrest:**
 - Risks related to civic unrest in Mumbai would more likely stem from local issues like housing, infrastructure, and economic disparities, rather than the political and sectarian tensions seen in Kashmir.

The shift from Kashmir to Mumbai transforms the risk landscape from one dominated by geopolitical and security concerns to a more conventional set of challenges associated with urban development, economic activity, and environmental sustainability in a major metropolitan area.

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FOREIGN LANGUAGES

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PUBLICATIONS

1. Ozyurt, B., Birgonul, M. T. and Dikmen, I. (2024). “Using ChatGPT for Risk Management in Construction Industry: A Literature Review”, Proceedings of the 8th International Project and Construction Management Conference (IPCMC 2024), 06-08 June, Yıldız Technical University, Istanbul, Turkey, 1029-1037.
2. Ozyurt, B., Tah J. H. M, Dikmen, I. and Birgonul, M.T. (2023). “Using Web Crawling for Automated Country Risk Assessment”, Proceedings of the 33rd European Safety and Reliability Conference (ESREL 2023), 3-7 September, Southampton, UK, 2568-2572.
3. Ozyurt, B., Birgonul, M. T. and Dikmen, I. (2022). “Using Web Crawling for Risk Assessment of International Construction Projects”, Proceedings of the 7th

- International Project and Construction Management Conference (IPCMC2022), 20-22 October, Yıldız Technical University, Istanbul, Turkey, 705-713.
4. Ozyurt, B., Dikmen, I. and Birgonul, M.T. (2019). “Clustering of Host Countries to Facilitate Learning Between Similar International Construction Markets”, *Engineering, Construction and Architectural Management*, Vol. 27, No. 1, 66-82.
 5. Bilgin, G., Eken, G., Ozyurt, B., Dikmen, I., Birgonul, M.T. and Ozorhon, B. (2019). “Validation of Support Tools for Project Management: Case of COPPMAN”, *Proceedings of the Creative Construction Conference 2019 (CCC2019)*, 29 June-2 July, Budapest, Hungary, 513-522.
 6. Ozyurt, B., Bilgin, G., Dikmen, I. and Birgonul, M. T. (2018). “Clustering of Countries to Facilitate Knowledge Transfer between Similar Markets”, *Proceedings of the 5th International Project and Construction Management Conference (IPCMC 2018)*, 16-18 November, Girne, North Cyprus, 967-975.
 7. Bilgin, G., Eken, G., Ozyurt, B., Dikmen, I., Birgonul, M. T. ve Ozorhon, B. (2018). “Construction Project Portfolio Management Tool (COPPMAN)”, *Proceedings of the COBRA 2018 Conference*, 23-24 April, London, UK.
 8. Ozyurt, B., Bilgin, G., Dikmen, I. and Birgonul, M. T. (2017). “Similarity Assessment of Countries to Facilitate Learning from International Construction Projects”, *ISEC-9: Resilient Structures and Sustainable Construction 24-29 July*, ISEC PRESS, Valencia, Spain, C-10. DOI: 10.14455/ISEC.res.2017.12
 9. Bilgin, G., Eken, G., Ozyurt, B., Dikmen, I., Birgonul, M. T., and Ozorhon, B. (2017). “Handling Project Dependencies in Portfolio Management”, *Procedia Computer Science* 121, 356-363.
 10. Özyurt, B., Bilgin, G., Eken, G., Dikmen, İ. and Birgönül, M.T. (2016). “İnşaat Projelerinde Öğrenme: Benzerlik Değerlendirmesi için Kümeleme Analizi”, 4. Proje ve Yapım Yönetimi Kongresi, 3-5 Kasım, Eskişehir, Turkey 246-257.

11. Erol, H., Özyurt, B., Bilgin, G., Atasoy Özcan, G., Birgönül, M.T. and Dikmen, İ. (2016). “Lazer Tarayıcı Uygulamalarında Planlama: Bir Vaka Çalışması”, 4. Proje ve Yapım Yönetimi Kongresi, 3-5 Kasım, Eskişehir, Turkey 742-756.
12. Bilgin, G., Eken, G., Özyurt, B., Dikmen, İ., Birgönül, M.T. and Özorhon, B. (2016). “İnşaat Şirketleri İçin bir Proje Portföy Yönetim Aracı: COPPMAN”, 4. Proje ve Yapım Yönetimi Kongresi, 3-5 Kasım, Eskişehir, Turkey 233-245.