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Financial Risks Management within the Construction Projects

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Abstract

Construction risk can be described as the possibility of an incident that will harm the project's feasibility. Different threats that impact businesses may be found in the construction industry as elsewhere. Moreover, construction projects face significant risks, which put building projects at the risk of cost, over time, and poor standard of execution. However, in the last two years, Lebanon has been suffering from a severe economic crisis, which has affected various numbers of businesses and industries, specifically the construction industry. Therefore, this article is carried out to identify, classify and analyse the most significant risks inherent in the Lebanese construction industry with special emphasis on the financial and economic risk category and eventually establish a conclusion in this regard. To achieve the aims of this research, the data was collected by conducting a questionnaire survey among experts in the Lebanese construction industry. The results showed that the construction industry in Lebanon is exposed to many risk sources, internal and external and the most important are the financial risk such as fluctuation of the currency, inflation, lack of solvency, etc. Finally, the importance and benefits of implementing risk management are discussed in this research as well as the barriers to its effective implementation.

Keywords: Risks Management (RM), risk in construction, significant risks, construction projects, Lebanon.

1. Introduction

Interpretation of various law codes and regulations is essential within construction processes; however, it also requires the collection of significant resources such as human resources, equipment, and materials. Moreover, good communication between the parties is important in every construction project. Additionally, diverse factors may be unknown at the beginning of the project, but the risk is an anticipated element of this business. In construction projects, risks are defined as the probability of an event that may negatively affect the life cycle or the schedule of the project and will expose the project to a viable loss. Various damaging consequences may take place on the project because of risks and uncertainty (Flanagan *et al.* 2006). The project success is correlated with three major aspects of cost, time, and quality where risks cannot be eliminated but can be effectually managed. Numerous risks that affect the productivity of the work can be recognised in construction projects. However, those risks differ between projects, to assure the wealth of any project the contractor must identify and allocate those risks to be able to manage them at an early stage of the project, where the purpose of effective risk management is to reduce risk exhibition and it's a cost in construction projects.

As stated by (Abrahamson, 1984), to reduce the negative impact and to increase productivity and effectiveness, an appropriate risk allocation and identification are a must. However, there seem to be more serious risks following the participation of numerous parties in the project, all linked to the political, socio-cultural, and economic differences of the location where the construction is taking place. However, this study focuses more on the



construction sector such as a delay of payments from owners to contractors which will decidedly lead to the project delay. Therefore, this study is targeting the Lebanese construction industry due to the numerous challenges facing it, with particular attention to the economic and financial risks encountered during the project life cycle in Lebanon.

2. Literature Review

2.1. Risk management concept

Risk management is the culture, practices, and structures that are aimed at developing new benefits when managing negative consequences (AS/NZS 4360, 2004). In the form of construction project management, Zou et al. (2007) described risk management as a comprehensive method of identifying, assessing, and coping with risk to achieve the project goals and objectives. According to the British standards BS31100 (2011), risk management is the mechanism by which resolutions are taken to consider a recognised or measured risk and to undertake steps to minimise the effects or the occurrence probability.

One of the most significant responsibilities of project managers is risk management, if it's not perceived as an essential duty, various issues and losses will follow. Dynamic risk management requires not only a precise methodology but also it requires information, knowledge, and experience (Serpella, 2014). The fundamental motivation behind risk management in construction projects is to give a safe workplace for the laborers and better accomplishment of goals. Sehat and Alavi (2010) clarified that risk management is a comprehensive process of risk identification and risk evaluation to include the details needed to decide on effective risk mitigation steps. Furthermore, it allows a system to better handle the normal risks in its day-to-day operations and to continue its processes in a more adequate and exhaustively environment which will also help to produce reasonable results with more reduced costs. For the same reason, risk management is actively preparing for future incidents to occur. However, undermining risk management in construction has contributed to adverse outcomes and low quality of work. For example, the inefficiency of management and incorrect analysis of two significant project variables, cost and time, which cannot be reliably measured, can lead to project delays and impose additional costs (Rezvani, 2015).

Fig. 1. Integrating risk with other project management functions (Rezakhani, 2012)

Project risk management interacts alongside other project components and a successful risk management strategy greatly increases the probability of obtaining the project scope. Fig. 1 demonstrates that the influence of the other project components is combined with project risk management (Rezakhani, 2012). According to Abujnah and Eaton (2010), when it comes to coping with risk, the probability is an important term, however, its estimation has a long history. Therefore, definitions differ from the conventional deterministic principle that probability is the proportion of the event to the total variety of factors that are similarly probable to a singular or judgmental interpretation. The subsequent results are normally anticipated, while it may be more nebulously defined in terms of estimating the cost of construction (Abujnah and Eaton, 2010).

economic and financial risks in construction which are one of the most important risks (Antonio J 2011), moreover, the integrated economy of the world creates many risks for the industries where financial risk is the most complex one. The Lebanese economy had not had the option to flourish as Lebanon has been going through restoration since the fifteen-year war (1975-1990) that destabilised the economy. However, Lebanon demonstrated a major construction explosion in the last few years, as stated by Frans bank the GDP growth in Lebanon was estimated to increase by 7 to 8 percent in 2018, the study indicates the increase in the private and public investments in Lebanon. However, because of the CEDRE donor of 11.8 billion USD as economic support of which 11 billion USD are loans, the Lebanese construction industry was required to see a critical lift. Even though Lebanon has been suffering from a serious economic crisis, which has been increasing dramatically for the past two years, causing various challenges in the

2.2. Risk classification

2.2.1. Internal risks

Normally in large construction projects, internal risks are connected to the team management's control. Referring to Aleshin (2001) internal risks originally come within the project, unlike the external risks which occur from the macro-level. They can be classified as follows: owner's responsibility, architects, suppliers, designers, contractors, and sub-contractors. They must be explicitly defined as performing for their results, to minimise the risk to the owner's responsibility.

2.2.2. External risks

External risks are not particularly applicable to the process of construction, but they are of critical significance in terms of project efficiency. They can be categorised into political, socio-cultural, economic, natural, and other categories (El-sayegh, 2008). However, the political risks are classified as follows: risks of wars, modifications in law, corruption, bribery, and delays in approvals. Such risks are linked to the country's risk which often involves situations where the home country is unable to pay the debt due to its economic problems. Some authors have become more specific in terms of political risk, specifically in multinational construction projects, with specific attention to variables such as labor expenses, supplies, and raw materials, as well as overhead costs and foreign currency and exchange rates (Baloia and Priceb, 2003). In Lebanon, corruption has always occurred in all forms (nepotism, patronage, bribery, embezzlement, etc.), and its repercussions have escalated since the end of the 1990 civil war. However, political corruption has been described as the most massive corruption facing Lebanon, which is supported by the Lebanese people's views on corruption.

One of the most dangerous external risks that may affect the country and construction industry specifically is the risk of war. Lebanon has suffered from wars for the last two decades, where a war occurred in 1975-1990 that destroyed the economy and contaminated the environment and another war struck in 2006 (Srouf et al. 2010). The risk of war is still treating Lebanon nowadays due to various economic and political reasons.

2.2.3. Pandemics risk

One of the major unexpected risks that will affect the productivity and the lifecycle of the construction projects is the "pandemics risk". Pandemics are described as large-scale infectious disease outbreaks that can significantly increase death rates over a broad geographic region and trigger substantial economic, social and political disturbance. Data shows that the risk of pandemics has risen during the past century due to increased world travel, integration, urbanization, land-use shifts, and increased natural environment exploitation (Jones et al. 2008). On 9th January in the Wuhan province of China, the novel coronavirus was discovered. Companies around the globe have begun to contract their growth, irrespective of their size-dependent guidance from abroad. Travel and transport between countries have been limited and even constrained which has affected the global economic growth between the countries (McKibbin and Fernando 2020, Shibani et al, 2020; Shibani et al, 2021). Therefore, COVID-19 hurt the delivery of construction materials across the globe. By the World Health Organisation (WHO) guidelines, construction containment procedures are being enforced to ensure optimal protection for staff in construction, introduce effective prevention measures, and control the virus spread. Furthermore, construction would suffer significantly from the crisis as an immediate consequence of a global demand shock and supply shock as a result of social distancing measures, with an estimated projection of 1.76 million workers endangered if the crisis lasts for 6 months (JCC.COVID-19; Shibani, 2020; Shibani, 2021).

2.2.4. Economic risks

Considering the economic and financial risk, EL Sayegh (2008) states that in countries such as UAE, inflation and abrupt price increases are the most significant economic risks. However, for countries such as Kuwait (Kartam, 2001), and China (Fang et al. 2004) the same view is articulated. Therefore, in terms of inflation, (Nevitt and Fabozzi, 2000) argue that it is important to use the right forecasts to properly update future costs and that the lender with more experience is even better than the promoters of the project to carry out these accurate forecasts. Meanwhile, builders also see a large risk of inflation (Kartam, 2001). When planning a large construction project, a main economic risk to be considered is the fluctuation of the currency, especially in the case of foreign projects. The development of privately funded infrastructure has recently focused on foreign capital in many countries, thereby running the risk of local currency devaluation. However, currency risk has been recognized by public corporations or governments in the past, but now, with increasing demand for private funding, the risk of currency depreciation always rests with the project promoter and, eventually, with customers, because the investor is not prepared to assume it (El Sayegh, 2008). Lebanon's central bank has fixed the Lebanese lira to USD at 1507 to 1 USD back in 1997. Since that, the stabilisation of the economy relied on a constant rate against the USD for the last 20 years. Furthermore, Lebanon imports 80 percent of the goods and materials because the government has not established self-sustaining internal enterprises on account of bureaucracy and corruption (Koffman, 2020). According to (Koffman, 2020), because of corruption and the economic crisis that hit Lebanon hardly at the beginning of 2020, the Lebanese lira started to lose its value as it almost reached 10,000 Lebanese lire per dollar.

In addition, as the demand for USD continued to increase, banks started restricting USD withdrawals first at 300 USD and then to nothing at all. This led to financial challenges in the construction industry, where the owners delayed their payments to contractors and suppliers: this also led to delays in project completion.

2.3. *Benefits of implementing Risk Management*

The successful completion of construction projects is enhanced by a well-applied risk management plan and thereby making the project more profit Table. As stated by (Poh, 2005) and (Toader *et al.* 2010), the main benefits of the risk management process are as follows:

- Efficiency: the project managers will be aware of any risk, which may affect the project operation so that they do not take place. In the tendering process, the implementation of a risk management plan makes for rational project pricing.
- Considering the challenges that occur in the project lifecycle, implementing effective risk management increases the possibility of project completion and success with the minimum amount of loss.
- More systematic and detailed risk assessments can be produced in the presence of risk knowledge and information. The failures and mistakes made in previous construction projects can be prevented with the availability of risk expertise.
- Construction companies' impressive track record and demonstrated risk management systems will increase their chances of winning potential contracts from the same project owner, due to the good reputation the company has acquired.
- The communication between project parties may be enhanced by an effective risk management process.

Finally, from previous several construction ventures in developed countries like Lebanon are suffering from delays in terms of project execution at defined times, overruns of costs, and quality issues, sometimes these losses are responsible for converting profitable enterprises into losing ones. Therefore, an accurate and productive construction risk management function would improve the successful execution of construction projects and render the project more viable.

3. Research Methodology

Depending on the research onion, the philosophy, approach to theory development, research methods, research strategy, time horizon, techniques, and procedures for this study are shown in Fig. 2 below. Research philosophy defines the theory of a study in a specific field, it describes the principles underlying research methods (Maylor and Blackmon, 2005). Moreover, according to Da Veiga (2016), the type and form of data gathered in the research study are identified in the research philosophy. Moreover, the philosophy adopted in this study is the positivist philosophy, as the method used to collect the primary data needed in this study is the "quantitative method", by sending a questionnaire to specialists and experts in the Lebanese construction industry to gather the appropriate data for this research and analyses the outcomes in the context of statistical data. Therefore, according to Chetty (2020), the quantitative method is the one that needs to be implemented and adopted in the activism philosophy as it is based on statistical tools. In conclusion, activism is the most suitable for achieving the aim and covering the objectives of the research. In the literature review, all the data is secondary taken from recent studies in terms of conventions between authors about the most significant risks affecting the construction industry and the importance of risk management.

This data has been collected from articles, journals, and books concerning the financial risks in the construction industry and risk management. Moreover, primary data are essential in this study to come up with more exact and accurate data but not limited to the financial risks affecting the Lebanese construction project and identifying the benefits and potential barriers of implementing an effective risk management plan in Lebanon an acceptable percentage of responses is above 60%.

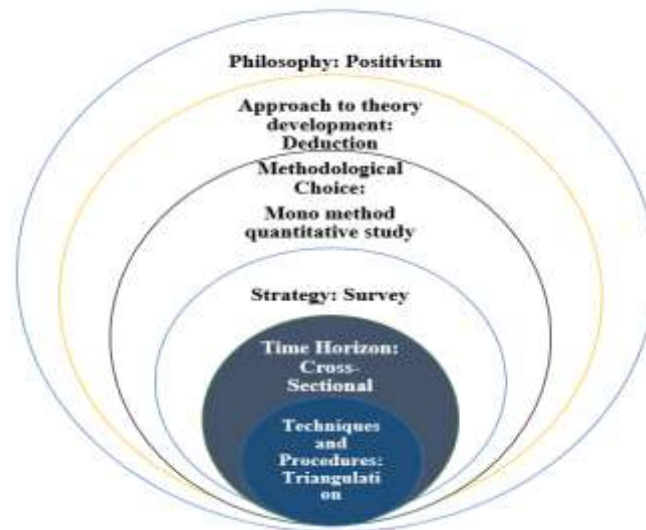


Fig. 2. Research Onion for current student

Table 1

The sources of the risk factors and barriers to implementing RM

Risk Factors	Sources
Risk of war	(Srouf et al. 2010)
Pandemic risk	(Jones et al. 2008)
Corruption in the Lebanese construction sector	(Mezher and Tawil, 1998) & (Kenny, 2009)
Political Corruption	El Sayegh (2008)
Delayed Payments to contractors	(Onengiyeofori 2016)
Design change	Hassanein and Afify (2007), (Baloia and Priceb, 2003) & (Kartam and Kartam, 2001)
Inflation of construction materials price	EL Sayegh (2008)
Fluctuation of the currency	EL Sayegh (2008)
Lack of solvency	Hassim et al (2009) & Mills (2001)
Interest rates fluctuation	(The Increasing Interest Rate and the Construction Industry BPE Solicitors 2020)
Lack of clarification in taxes liabilities	Hassanein and Afify (2007)
Unavailability of foreign currency exchange	(Zayed et al. 2008)
Unmanaged cash flow	(Onengiyeofori 2016)
Incomplete or inaccurate cost estimation	(Turner 2014)
Lack of knowledge of RM	(Goh and Abdul-Rahman 2013)
Absence of a structured risk management program	Choudhry and Iqbal (2013)
The time and cost needed for a risk management plan	Silva et al. (2013)
Lack of qualified expertise	Silva et al. (2013)
various identification strategies for risk management	of Tang et al. (2007)
No incentive for better risk management	Tang et al. (2007)

At the outset of the study, the questionnaire is used as a tool for data collection it attempts to identify and explain the major risks affecting the construction projects in Lebanon. Therefore, the main aim of this questionnaire is to answer the research questions. The first stage of the questionnaire is based on the respondent's personal

information; this section includes the participant's details such as ethnicity, age, current job, and personal experiences to maintain a diversity of viewpoints and experiences in the Lebanese construction industry. The second stage contains questions and responses about risk factors inverted from literature reviews. Participants were asked to evaluate these factors on a Likert 5-point scale. This stage shows the level of awareness of the major risks affecting construction projects in Lebanon, which will help the companies and construction organizations to take the most important step in the risk management plan, which is “risk identification” and identify the most significant risks to set appropriate risk management specific to the Lebanese construction sector. The third stage is based on ranking the benefits of implementing risk management in the Lebanese construction industry. It shows a variety of benefits taken from the literature review and based on past studies made in various developed countries and large construction companies that showed significant progress after implementing effective risk management plans in their projects. The fourth stage of the questionnaire is the last one. In this stage, participants were asked to rank the potential barriers to implementing risk management, which will illustrate the awareness and understanding of the barriers to risk management implementation in the Lebanese construction industry. To ensure whether the data collected is accurate, this data will be analysed using SPSS software to assess the reliability of answers, especially for the questions of the Likert scale. Therefore, Cronbach’s alpha and correlation values will be calculated. However, this will reveal that the factors listed in the questionnaire survey can be categorized as risk factors and benefits and barriers in the Lebanese construction industry.

4. Data Analysis and Result

The statistical data obtained from the questionnaire and check whether an RM implementation in Lebanon is necessary by the responses of highly experienced academics and experts in the Lebanese construction industry to the questionnaire and identifying their understanding of the factors that influence building projects. In addition, after analysing the results of the questionnaire, the objectives of the study will be addressed and discussed. Therefore, new results will be discussed about the value of RM's ongoing implementation in Lebanese companies, and the participants’ perceptions of its barriers will be discussed as well. Information about respondents.

4.1. Workers

According to Fig. 3. The result of the questionnaire in this part shows that 70% of respondents work in the private sector and 30% work in the public sector. The respondent’s work categories were divided into five sections. However, the results show that most respondents are engineers (45%); 19% are consultants; 17% are academics; 17% are contractors as well and 2% work in operations, as shown in Fig. 4. On the other hand, in Fig. 5. The questionnaire shows that 56% of respondents have less than 5 years of experience in the industry, while 20% have between 5 to 10 years. 14% have an experience between 11 and 20 whereas 10% have more than 20 years of experience in the Lebanese construction sector.

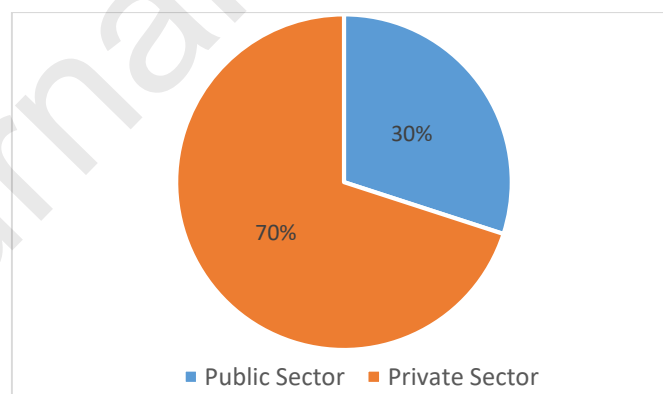


Fig. 3. Participants work nature

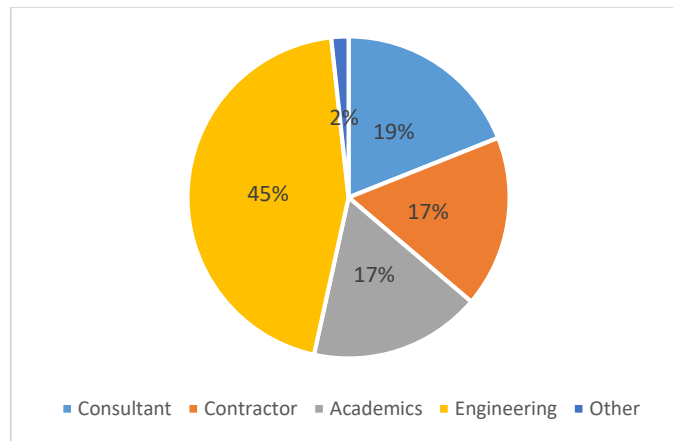


Fig. 4. Distribution of the experts' professions in the construction industry

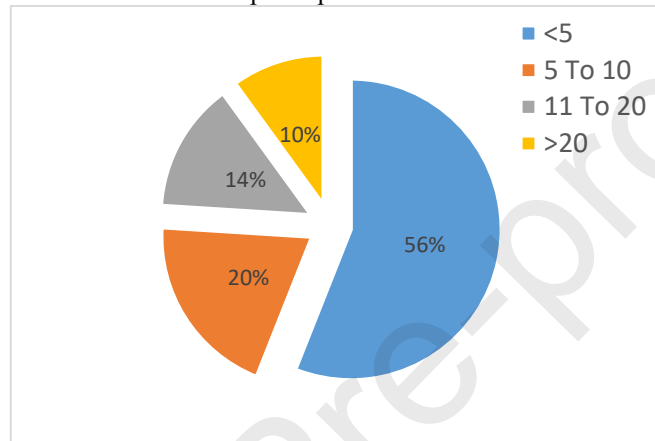


Fig. 5. Participant's years of experience

Table 2
Findings on Risk factors

Risk Factors	Unlikely	Somehow Likely	Moderate	Likely	Very Likely
Risk of war	0	8	8	12	22
Pandemic risk	1	10	6	16	17
Corruption in the LCS	3	0	6	19	22
Political Corruption	0	5	5	15	25
Delayed Payments to contractors	1	3	15	19	12
Design change	2	11	25	8	3
Inflation of construction materials price	1	7	7	21	14
Fluctuation of the currency	2	1	6	13	28
Lack of solvency	2	13	23	7	4
Interest rates fluctuation	2	8	21	16	3
Lack of clarification in taxes liabilities	9	10	17	9	5

Unavailability of foreign currency exchange	1	13	5	19	12
Unmanaged cash flow	2	12	26	7	3
Incomplete or inaccurate cost estimation	3	16	20	8	3

4.2. Risk Factors

The first risk factor mentioned in the questionnaire is the Risk of war, which is an external risk. However, twenty-two participants were very likely to agree on this risk factor, while twelve of them answered likely agree. Eight experts moderately agree as well as eight others answered somehow likely agree, whereas none

of the participants unlikely agreed on the risk of war. Seventeen of the participants answered very likely agree with the pandemic risk, while sixteen answered likely agree that the pandemic risk affects the productivity of construction projects. Six respondents answered moderately agree on this factor, however, ten participants somehow likely agree whereas just one of the respondents answered unlikely to agree on the pandemic risk factor. Twenty of the participants responded very likely agree that the corruption in the Lebanese construction industry affects the project lifecycle and nineteen agreed with them and answered likely agree, whereas six answered moderately agree and only three unlikely agreed. However, none of the participants answered somehow likely agree with this risk factor.

Most of the participants responded very likely agree on the risk of political corruption (25 respondents), and fifteen respondents answered likely agree. However, five moderately agreed, as well as five others answered somehow likely agree, but no one was against this factor and answered unlikely agree. Out of fifty participants, nineteen likely agreed that the delayed payment to contractors is one of the significant risks in the construction projects in Lebanon, while fifteen answered moderately agree and twelve answered very likely agree. Finally, three experts answered somehow likely agree and only one answered unlikely to agree on this risk factor. Half of the expert participants moderately agreed that the design change is one of the significant risks in the Lebanese construction projects and eleven of them answered somehow likely. In addition, eight answered likely agree whereas only three respondents very likely agreed. Finally, two respondents had an opposite opinion as they answered unlikely to agree on the design change risk factor. Twenty-one participants likely agreed that the inflation of the construction materials price is one of the major risks that impact the construction projects, moreover, fourteen others answered very likely agree. Seven respondents moderately agree as well as seven others answered somehow likely agree. However, only one had a negative response on this factor and answered unlikely as shown in Table 2.

The results in the Table show that more than half of the participants very likely agreed that the fluctuation of the currency is classified as one of the most significant risks affecting the construction projects in Lebanon, in addition, thirteen answered likely agree. Six participants moderately agree whereas two answered unlikely to agree and one answered somehow likely agree. Twenty-three participants moderately agree on the lack of solvency risk and thirteen answered somehow likely agree. Moreover, seven respondents likely agree and four very likely agreed, while only two disagreed with this risk factor and answered unlikely to agree.

For the interest rate fluctuation risk, twenty-one of the participants moderately agreed on this factor, whereas sixteen of them likely agreed that the interest rate fluctuation affects the construction projects in Lebanon, while eight specialists answered somehow likely agree. Only three experts in the Lebanese construction sector very likely agreed on this risk factor, as well as two disagreed with it and answered unlikely to agree. Seventeen participants moderately agreed on the risk of lack of clarification in tax liabilities, in addition, ten of the respondents answered somehow likely. Nine of the participants answered likely to agree and five of them answered very likely agree. However, ten participants responded by somehow likely agree, whereas nine gave negative responses and answered unlikely agree. Nineteen participants likely agreed that the unavailability of foreign currency exchange risk affects the productivity and efficiency of the Lebanese construction projects and twelve answered very likely agree. Thirteen people responded somehow likely agree whereas five moderately agreed while only one had a negative response and answered unlikely agree.

Table 2 illustrated that twenty-six participants moderately agreed that the unmanaged cash flow affects the construction projects in Lebanon, and twelve answered somehow likely agree. Seven respondents likely agree with this risk factor, while three answered very likely agree. However, only two answered unlikely to agree. On the other hand, twenty respondents moderately agreed on the incomplete or inaccurate cost estimation risk factor, whereas sixteen participants somehow likely agreed on this factor. Eight experts likely agreed on this factor. However, only three respondents answered very likely agree as well as three others unlikely to agree on the inaccurate cost estimation risk factor.

4.3. Benefits of implementing Risk Management

Table 3

Findings on Risk Management Benefits

Risk Management Benefits	Somehow			Very	
	Unlikely	Likely	Moderate	Likely	Likely
Improve efficiency	1	2	9	21	16
More accurate project pricing in the tendering	0	3	5	24	17
Increase the Possibility of project success	0	1	10	27	12
Minimize losses	0	3	8	13	26
Better reputation for the company	2	5	12	22	8
Improve communication between project parties	2	5	11	14	17

Twenty-one of the participants likely agree that the implementation of Risk Management improves the efficiency in the Lebanese construction projects, in addition, sixteen more participants very likely agreed on this benefit. However, nine participants moderately agree with it, two somehow likely agreed and just one disagreed on these benefits of implementing RM and answered unlikely agree. Concerning the table above, it shows that twenty-four of the participants likely agreed that the implementation of Risk Management would provide more accurate project pricing within the tendering phase. Moreover, seventeen experts responded very likely agree with this benefit. Furthermore, only five respondents moderately agreed and three of them somehow likely agreed, whereas none of the participants were against this benefit since no one voted unlikely to agree. The data in Table 3 illustrated that twenty-seven of the participants likely agreed that Risk Management will increase the possibility of the project's success and twelve very likely agreed on this RM implementation benefit. However, ten of the specialists answered moderately agree, while, only one answered somehow likely. Finally, no one had a negative response since no one answered unlikely to agree on this RM implementation benefit. The above Table illustrates that more than half of the participants (twenty-six) very likely agreed that Risk Management implementation will lead to a minimisation in losses within the Lebanese construction projects, in addition, thirteen participants also agreed with them as they answered likely agree. However, eight of the specialists moderately agreed on these benefits, of which three answered somehow likely agree, but no one answered unlikely to agree. Table 3 shows that twenty-two of the participants agreed that implementation of an appropriate Risk Management plan will provide the company with a better reputation, however, twelve others moderately agreed with this. Furthermore, eight of the experts very likely agreed on this RM implementation benefit. However, five participants somehow likely agreed, whereas two answered against this benefit.

4.4. Barriers to implementing Risk Management

Table 4
Findings on Risk Management Barriers

Risk Management implementation barriers	Unlikely	Somehow Likely	Moderate	Likely	Very Likely
Lack of knowledge of RM	5	3	7	24	11
Absence of a structured RM program	2	3	7	20	18
The time and cost needed for an RM plan	2	3	6	16	23
Lack of qualified expertise	2	9	4	21	13
various identification of strategies for RM	0	8	18	15	7
No incentive for better RM	1	4	11	10	21

Table 4 shows that twenty-four participants likely agreed that the lack of knowledge is a barrier that prevents Risk Management implementation in Lebanese construction companies, and eleven others very likely agreed.

Moreover, seven respondents answered moderately agree on this barrier, while three somehow likely agree. Finally, five participants unlikely agreed that a lack of knowledge is considered a potential barrier to RM implementation. Twenty participants likely agreed that the absence of a structured risk management program is a barrier preventing the companies from implementing Risk Management in their projects, in addition, eighteen others very likely agreed on this. However, seven respondents moderately agreed on this barrier, and three of them somehow likely agreed. Finally, two of the participants had a negative response since they answered unlikely to agree. Almost half of the participants (23 respondents) very likely agreed that the time and cost needed for a risk management plan is considered a significant barrier to Risk Management implementation in Lebanon, in addition, sixteen others very likely agreed on this barrier. However, the Table shows that six participants moderately agreed on this barrier. Furthermore, three answered somehow likely agree and two participants unlikely agreed. Eighteen respondents moderately agreed that various identifications of strategies for risk management are a barrier to RM implementation, whereas fifteen likely agreed on the effect of this barrier. Furthermore, eight respondents answered somehow likely agree, while seven very likely agreed on this barrier. The above table shows that the majority of participants very likely agreed that “no incentive for better Risk Management” is considered a significant barrier to RM implementation in the Lebanese construction companies, whereas eleven others answered moderately agree with this barrier. However, ten participants likely agreed on this barrier, while four somehow likely agreed and only one unlikely agreed that this is considered a barrier preventing the RM implementation in the Lebanese construction industry.

4.5. Reliability analysis

As mentioned earlier, the questionnaire’s main questions are based on a Likert scale. Therefore, these types of questions are best analysed using SPSS software, the data obtained will be analysed and validated using a reliability test to calculate the Alpha Cronbach. Lee Cronbach developed Alpha for measuring the internal consistency of a measure or scale in 1951; it was described as a number from 0 to 1. Internal consistency defines the degree to which all the elements of the test evaluate the same definition or form and that the interrelation between the elements is related in the test (Tavakol and Dennick, 2011). The reliability test is conducted to ensure that the method used as a data collection method is accurate, the alpha coefficient range from 0 to 1, therefore, to attain reliable instruments, the alpha should be greater than 0.6 (Mubarak et al., 2017). Since the risk factors analysed in this research were integrated into the five modules, the internal consistency between the assessments of these factors by the respondents was crucially significant. Therefore, it was agreed to use the Cronbach alpha instrument to accomplish this purpose. In this research, the result of the reliability test was 0.721 which is greater than 0.5, which indicates that the Likert scale measurement is reliable at the 5% significance level (Norusis, 2005).

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.721	.725	26

Fig. 6. Cronbach's Alpha for the current research

4.5.1. Ranking of risk factors affecting the construction projects in Lebanon

Table 5

Classification of the risk factors based on the questionnaire results

Risk Factors	Mean
Political corruption	4.38
Fluctuation of the currency	4.26
Corruption in the Lebanese construction sector	4.14
Risk of war	3.96
Inflation of construction materials price	3.82
Delayed Payments to contractors	3.72
Pandemic risk	3.7
Unavailability of foreign currency exchange	3.48

Interest rates fluctuation	3.24
Design change	3.02
Lack of solvency	2.94
Unmanaged cash flow	2.92
Incomplete or Inaccurate Cost estimation	2.86
Lack of clarification in taxes liabilities	2.76

The questionnaire survey of this research contains fourteen Likert scale questions at the first stage about the major risks inherent to the construction industry with consideration of the financial risks. The ranking of risk factors was done using the concept of mean values for each risk. However, the statistical ranking of the 14 risk factors gives an ability to evaluate the results of respondents based on the mean values provided for each risk factor. Therefore, this segment demonstrates the risk factors classification and ranking. It was found that the risks that most affect and negatively impact the efficiency and productivity of the construction projects in Lebanon are considered by the respondent as follows; the political corruption (4.38), fluctuation of the currency (4.26), corruption in the Lebanese construction industry (4.14), risk of war (3.94), inflation of construction material cost (3.82). Furthermore, delayed payments to contractors (3.72) and pandemics risk (3.7) are also considered one of the most significant risks. However, the Mean values of all the risk factors are represented in Table 5 above.

4.5.2. Ranking of the Benefits of implementing Risk Management in the Lebanese construction

The mean value comparison is used as well to compare the benefits of implementing RM and to classify and rank these benefits. In the section on RM implementation, 'minimize losses' has received the highest mean value (4.24) as the 'more accurate pricing in the tendering' constitutes an important benefit as well (4.14). Interestingly, the 'increase in the possibility of project successes had also a significant mean value (4.00). However, 'increase efficiency', 'improve communication between the project parties' and 'better reputation for the company had the lowest mean value (3.98), (3.76), and (3.56) respectively. Therefore, Table 6 represents the benefits of implementing RM with the mean value of each one of them.

Table 6

Classification of the benefits of implementing RM based on the questionnaire results

RM Benefits	Mean
Minimize losses	4.24
More accurate project pricing in the tendering	4.14
Increase the Possibility of project success	4
Improve efficiency	3.98
Improve communication between project parties	3.76
Better reputation for the company	3.56

4.5.3. Ranking of barriers to implementing Risk Management in the Lebanese construction

The last section of the questionnaire is to rate the barriers to implementing Risk Management in the Lebanese construction companies using Likert scale questions. Respondents' answers were used in this research to rank and classify the most significant barriers to implementing RM. Therefore, concerning the experts' responses, the most significant barriers that had the highest mean value are 'The time and cost needed for an RM plan' (4.1), 'Absence of a structured Risk Management program' (3.98), 'No incentive for better risk management (3.94) and 'Lack qualified expertise' (3.72). In addition, 'Lack of knowledge of RM' and 'various identifications of strategies for RM had the lowest mean value based on respondents' answers with a value of (3.66) and (3.46) respectively. In this regard, all the mean values of barriers are represented in Table 7.

Table 7

Classification of the barriers to implementing RM based on the questionnaire results

Barriers	Mean
The time and cost needed for a Risk Management plan	4.1
Absence of a structured Risk Management program	3.98
No incentive for better Risk Management	3.94
Lack of qualified expertise	3.72

Lack of knowledge of RM	3.66
Various identification of strategies for Risk Management	3.46

5. Conclusion and Key Findings

This research revealed the existing condition of the Lebanese construction industry and the benefits and barriers of implementing Risk Management. However, this research aimed to identify major risks inherent in the Lebanese construction projects, where there was particular attention to the financial and economic risks due to the current situation of the country. To achieve this aim, an investigation was required to clarify the principles and core problems of RM. Therefore, the quantitative process methodology applied through a survey explained the attitude and understanding of construction industry experts in Lebanon regarding the significant risks and the concept of RM in construction, who underlined the value of implementing RM.

To fulfill the research objectives, the questionnaire was carefully designed and structured to achieve the participant's perceptions about the risk factors in construction projects, as well as the benefits and barriers of RM implementation. Therefore, the participants have approved most of the advantages of RM stated in the Likert scale questions, as well as most of the barriers. However, the results were concluded and analysed using the SPSS.

The questionnaire contained fourteen risk factors (internal, external, and financial). The main reasons for RM factors in the Lebanese construction industry are as follows: risk of war, pandemic risk, corruption in the Lebanese construction sector, political corruption, delayed payments to contractors, design change, inflation of construction materials price, fluctuation of the currency, lack of solvency, interest rate fluctuation, lack of clarification in taxes liabilities, unavailability of foreign currency exchange, unmanaged cash flow and incomplete or inaccurate cost estimation. On the other hand, the RM benefits in Lebanon are improving efficiency, more accurate project pricing in the tendering increasing the possibility of project success, minimise losses, a better reputation for the company, and improved communication between project parties. RM implementation Barriers are Lack of knowledge of RM, the Absence of a structured RM program, The time and cost needed for an RM plan, Lack of qualified expertise, various identifications of strategies for RM, and finally, no incentive for better RM.

From the questionnaire survey, 70% of respondents work in the private sector, and 30% work in the public sector. However, most respondents are engineers (45%); 19% are consultants; 17% are academics; 17% are contractors and 2% work in operations. The questionnaire shows that 56% of respondents have less than 5 years of experience in the industry, while 20% have between 5 to 10 years. 14% have an experience between 11 and 20 whereas 10% have more than 20 years of experience in the LCI. The first risk factor mentioned in the questionnaire is the Risk of war which is an external risk. From the results, 34 of the participants strongly agree and agree with this risk factor about (100%) of the sample, on the other hand, 80% answered very likely and likely agree that the pandemic risk affects the productivity of construction projects during the pandemic risk, while 20% unlikely agree. The results show that 39 of the participants very agree and agree that the corruption in the LCI affects the project's lifecycle, whereas six moderately agree and only three unlikely agreed. All participants agree that the risk of political corruption (40 respondents about 100%) affects the LCI. On the other hand, 39 agreed that the delayed payment to contractors is one of the RM in the LCI. Half of the participants moderately agreed that the design change is one of RM in the LCI. The inflation in the price of construction materials is one of the primary threats affecting the LCI, 21 participants most likely agreed. The currency fluctuation is most likely considered one of the most significant hazards impacting the LCI by half of the participants. For the interest rate fluctuation risk, thirty-seven of the participants moderately agreed on this factor, whereas 16 likely agreed. 27 agreed on the risk of the lack of clarification in taxes liabilities. While 10 participants responded by somehow likely agree, whereas nine answered unlikely to agree. In case of unavailability of foreign currency exchange risk affecting the productivity and efficiency of the 16 LCI, thirty-one participants (84%) very likely agreed and likely agree. whereas five moderately agreed while only one unlikely agreed. On the other hand, 26 participants moderately agreed that the unmanaged cash flow affects the LCI. While three very likely agreed. However, only two unlikely agreed. Thirty-six respondents moderately agreed on the incomplete or inaccurate cost estimation risk factor, whereas only three respondents very likely agreed as well as three others unlikely agreed on the inaccurate cost estimation risk factor.

In the case of benefits of implementing RM, 37 of the participants likely agreed and agreed that the implementation of RM improves the efficiency in the LCI and just one disagreed. About forty-one (91%) of the participants likely agreed that the implementation of RM would provide more accurate project pricing within the tendering phase. Furthermore, thirty of the participants agreed that the implementation of appropriate RM, while two were against this benefit. In the case of barriers to implementing RM, about half of the participants likely agreed that the lack of knowledge is a barrier that prevents RM implementation in LCI, and five participants unlikely agreed. Thirty-eight participants likely agreed that the absence of a structured RM program is a barrier preventing the companies from implementing RM in their projects. However, two of the participants had unlikely agreed. Almost half of

the participants (23 respondents) very likely agreed that the time and cost needed for the RM plan is considered a significant barrier to RM implementation in Lebanon, in addition, sixteen very likely agreed, three likely agreed and two unlikely agreed.

Eighteen respondents moderately agreed that various identifications of strategies for RM are a barrier to RM implementations, whereas fifteen likely agreed on the effect of this barrier, eight respondents somehow likely agree and seven very likely agreed on this barrier. The majority of participants very likely agreed that “no incentive for better RM” is considered a barrier to RM implementation in the Lebanese construction companies. However, fourteen participants likely agreed and only one unlikely agreed that this is considered a barrier preventing the RM implementation in the LCI.

The results show that 80% of the participants agreed that the political corruption is ranked as the highest risk affecting the construction projects in Lebanon, which is an external risk factor, which makes it compatible with a study made by El Sayegh (2008) mentioned that political corruption is classified as one of the external risks that affected to the construction industry. Political corruption was described as Lebanon's most serious corruption problem, and it simultaneously hurt the construction industry. Therefore, the respondents' answers made this risk viable.

In addition, most of the risks were validated and proved to be reliable in the Lebanese construction projects based on the experts' responses, which makes these risks viable and compatible with the previous studies in the literature review. Furthermore, this ensured that the study is answering the research question and achieving the research aim which is identifying the most significant risks affecting the construction projects in Lebanon. The participants agreed with most of the benefits stated in the Likert scale questions, which indicates that the experts in the Lebanese construction industry are aware of the importance of Risk Management in the project life cycle. The results show that the implementation of an effective risk management plan in the construction projects in Lebanon will minimise the losses in the process of construction, especially in a country like Lebanon that has a high risk of currency fluctuation as well as the risk of inflation of construction material prices. Therefore, the participants ensure that implementing the appropriate risk management plan that is compatible with the current economic situation of the country is advantageous in avoiding most of the risks that may occur in the project execution. In addition, all the benefits mentioned in the questionnaire had a mean value of 3.5 based on the participants' responses. This demonstrates that the results agree with the research done by Poh (2005) and Toader et al., (2010) about the benefits of RM implementation, which make these benefits viable and applicable in the Lebanese construction industry. Moreover, the experts approved that risk management is important and play a significant role in the project's success. However, this implementation has various barriers in Lebanon, where these barriers were approved by the participants. The time needed to implement the risk management was classified as the first barrier preventing the RM implementation. In Lebanon, time is a major factor in the construction project success, owing to various risks that threaten the country (economic, political, wars), in addition to the corruption that is one of the major factors to project delay in Lebanon as stated earlier by (Mezher and Tawil, 1998).

The main outcome from the survey demonstrates that proper implementation of a risk management strategy in the Lebanese construction industry will reduce losses in the project and increase the possibility of its success. However, construction risk management was not sufficiently implemented in the Lebanese construction sector. The two major reasons for this are the time and cost needed for an RM plan and the absence of an RM program in the companies.

To ensure that the data collected are admissible and viable in the Lebanese construction sector, the data were documented through a questionnaire survey and distributed to experts in this field. Therefore, the outcome of the questionnaire reveals that the sector in Lebanon is subject to several risks affecting its efficiency and productivity and the risk of war was classified in the first class.

6. Conflicts of Interest Statement

"No conflict between authors"

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