

The Factors Affecting Project Success Criteria – Aviation projects

العوامل المؤثرة في معايير نجاح المشروع - مشاريع الطيران

by

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Abstract

Over few last years, there have been an enormous issues related to the construction projects especially when the cost and time overrun the estimated values. These issues are impacting all parties and projects stakeholder's .As UAE and all developing countries are affected by such issues , the necessity of studying the factors affecting the project's success criteria considered vital and the requirement to overcome these risks become important to all parties.

In order to achieve this objective, a literature review has been conducted to provide a comprehensive understanding of the cost and time overrun risks and the factors affecting the project success criteria . In addition, the literature review shows the characteristic of airport projects and how it can be related to other construction projects. Furthermore , the best practices to mitigate the risks related to the project success criteria were reviewed and the difficulties encountered during the mitigation process were studied.

This study conducted a quantitative analysis where a questionnaire was distributed to 60 professionals working in the aviation industry in UAE. The result of the survey shows the relationship between technical, organization capabilities and environmental factors with the project success criteria where it's found that these factors have a significant impact on the project success criteria.

الخلاصه

في السنين الاخيره , تم ملاحظه العديد من المشاكل في المشاريع الانشائيه خصوصا المتعلقة بالوقت و مده المشروع , هذه المشاكل تؤثر على جميع الاطراف المشتركه في المشروع .الامارات العربيه المتحده و جميع دول العالم المتطوره عانت من هذه المشكله , و لذلك فأن الحاجه لمعالجه هذه المشاكل و ضروره وضع حلول اصبحت عمليه مهمه جدا .

- لاتمام هذه المهمه , في هذه الدراسه تم مراجعه الدراسات السابقه لتسهيل عمليه فهم الاسباب المؤديه الى تاخير و زياده وقت المشاريع , كما انه تم مراجعه الدراسات التي توضح التشابه بين المشاريع الانشائيه خارج و داخل المطارات و الحلول اللازمه للتغلب على هذه المشاكل و اي مصاعب قد تواجه اصحاب القرارات .

تم اجراء تحليلا كيميا من خلال توزيع اسئله على 60 محترف في مجال انشاء المطارات داخل الامارات العربيه المتحده و الدراسه اوضحت العلاقه بين العوامل التقنيه و امكانيات الشركات و الظروف المناخيه و تأثيره على نجاح المشاريع.

كما انه تم اجراء نقاش و تلخيص لهذه الدراسه لتوضيح نتائج الدراسه الكمييه و وضع عدد من الاقتراحات و النصائح لاصحاب القرارات و الباحثين في هذا المجال.

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Introduction

Topic background

Construction is an extremely complicated process, involving interconnections between various parties such as the contractor, the consultant, and the client. Moreover, construction projects are affected by a set of factors that may affect the project criteria in a positive or a negative way (Bertelsen, 2003).

Construction projects are usually not similar and risks increase depending upon several different bases (Oyegoke, 2006). Construction projects are fundamentally complex and dynamic and comprise multiple feedback procedures (Steerman, 1992). Different stakeholders with varied capabilities and skills usually have diverse prospects and interests (Dey and Ogulana, 2004). Naturally, this gives rise to issues and confusion for even the most experienced project managers and contractors.

Extensive research has been conducted in the field of risk management with relation to construction projects. A substantial result of this is the identification of many risks that may influence the construction project delivery. For example, (Al-Bahar, and Crandall, 1990) observed that construction risks are defined as the exposure of the project to any possible loss that may affect the project cost, time, and quality.

Additionally, Banaitiene and Banaitis (2012) studied the risk involved in the construction industry in Lithuania and discovered the way in which managing the risks can effectively and efficiently affect the project success. The same was discussed by Zou, Zhang, and Wang (2007), who studied all the risks that may influence the project goals, such as price, period, quality, environment, and security measures, and they also concluded that all project parties should collaborate with each other in order to mitigate these risks.

The UAE is one of the most evolving countries in the Middle East area, which has been undergoing enormous progress in terms of economy since the last decades. The construction business is one of the major industries that have gained a significant role in this evolution, contributing to 10–15% of national gross domestic product (Dubai Chamber).

Therefore, the study will focus on the success criteria of construction projects and the way in which these risks can be managed and mitigated. A case study of airport projects will be examined to determine the connection between the factors and the project criteria (cost and time).

Statement of the problem

Several types of research studies were carried out to determine the importance of the projects success criteria management in the case of construction industry, the different variables affecting and informing these risks, and the best practices to adopt in order mitigate these risks, an example of such studies are Kerzner (2013) and (Zaneldin, 2006).

However, it was noted that there are few papers that discussed the project's success criteria in the construction industry in the UAE and almost no paper highlighted the factors that generate these risks in the UAE aviation industry.

Due to the continuous evolution of the construction industry in general and the aviation industry in particular, new factors affecting the industry, which lead to new risks, need more focus and further investigation.

According to a report by Oxford Economics (2014), “The UAE's aviation sector is expected to contribute \$53 billion (Dh194.5 billion) to the country's economy by 2020, providing up to 750,000 jobs.

Considering the fact that \$53 billion will be invested in the aviation sector in the UAE and that it is important due to the fact that the country is striving to be one of the top countries in this

industry, a research study that will minimize the risks of the cost and time overrun will undoubtedly have a valuable implication for the UAE.

Therefore, this research work will collect the various kinds of studies forwarded by previous researchers pertaining to the construction risks in different industries such as infrastructure, buildings, in addition to others. Additionally, it will focus on a case study from the UAE aviation industry.

Research aim and objectives

The aim of this research is to identify the key factors leading to the cost and time overrun in construction projects within the aviation industry.

The following objectives were formalized to achieve the aim of this study:

- Investigate the leading factors causing cost and time risks in the construction industry;
- Investigate the leading factors causing cost and time risks in the constructions of the aviation industry in the UAE;
- Analyze the different practices used for minimizing these factors and mitigating the cost and time overrun risks in the construction industry;
- Develop a framework that links the identified factors with the risks, and indicates the relationship between them;

The final outcome of this research work can be used in the context of the UAE aviation companies and help decision makers to direct the aviation projects towards delivering the product according to the planned cost, time, quality, and safety measures.

Scope of the study

There are numerous factors in the global construction industry that affect and lead to the risks in the projects. Therefore, in this research paper, I will analyze and investigate the most important factors agreed upon by previous researchers and then I will try to apply it to the context of the

UAE aviation projects in order to attempt to determine the best practices that may influence the project criteria.

A set of professionals, who have a strong background in the construction in the aviation industry, will be chosen to answer the questionnaire. Accordingly, I may have a limited number of participants for the questionnaire.

The final outcome of this research will thus be indicative due to the limited number of participants in the questionnaire and the limited factors that have been taken into consideration.

Research questions

The succeeding study questions were formulated to build conceptual framework that connects and relates the factors in the construction industry and the risks posed by these factors and the way in which they are interconnected with each other. It also described the most appropriate practices utilized to mitigate these risks.

- What are the common factors affecting the construction industry in the UAE?
- What are the relative risks associated with these factors?
- What is the relationship between the factors and the risks in the construction industry?
- What are the best practices utilized to identify the factors and mitigate the risks?

Research structure

This paper will be divided into two main sections. The first section will include a qualitative analysis of the construction risks in general from literature. The second section will cover a quantitative analysis where a case study from the UAE construction industry will be tested in order to apply the factors and risks reviewed by previous literature in the context of airport projects in the UAE.

Chapter Two: Literature review

This chapter covers the literature assessment and the collected professional view information. Principally, this chapter covers the details of the existing literature and the suggested practices have been reviewed, list and detailing the various assessments and views of scholars pertaining to the topic of the selection of the furthestmost suitable practices utilized for mitigating the risks in the construction industry. The chapter also comprises tables and figures that summarize all the recognized factors and risks along with their relationships.

Chapter Three: Conceptual framework

In this chapter, a conceptual framework and hypotheses will be developed to show the association between the identified aspects in the construction industry and the associated risks. The assumptions in the hypotheses will be analyzed later in the quantitative analysis to either support or reject it.

Chapter Four: Methodology

The quantitative analysis will be started in this chapter where the method of testing the reviewed factors and risks will be examined through the formulation of a questionnaire and its distribution to sampled professionals working in the aviation industry in the UAE.

Chapter Five: Data analysis, findings, and discussions

In this chapter, the data collected over the questionnaire will be analyzed and tested using a set of data analysis methods such as Validity Test (Factor Analysis), Reliability test, 5 Correlation Test, and Regression test. The substantiation for the use of these analytical tools will also be offered in this chapter.

Chapter six: Conclusion and recommendation

This chapter presents the achievement of the objectives, implications to research and practice, limitations, recommendations, and boundaries of this research study. It contains a summary of the study work and its main results, along with endorsements for further research regarding this subject

Literature Review

In this section, the study will highlight previous research works conducted by scholars on the way in which the cost and time risks of the construction industry were identified and the way in which the impact was mitigated.

This section will begin with a description of construction projects and their complexity and then proceed to highlight an in-depth study pertaining to the project success criteria. Accordingly, the factors affecting these success criteria will be tested. The best practices to manage these factors and mitigate the risks impact, risk management techniques, the benefits and difficulties in managing the risks in construction projects and finally a summary of the literature review will be added.

Construction project complexity

Wood and Gidado (2008) defined through their research the project complexity in construction as the interdependencies and interrelationships between the project parties, and they investigated the causes of the project deemed to be complex and found that the organizational aspect is the most important factor that causes a project to be complex. They also emphasized the importance of identifying project complexity at early stages in order to manage it properly.

Brockmann and Girmscheid (2008) studied the construction project complexity and the way in which it can be evaluated. They concluded that the answer to identifying the project complexity is complex in itself. They also concluded that the degree of or the identified nature of the complexity can be an important criterion for a project typology, capable of classifying the anticipated managerial challenges too.

Ochieng and Hughes (2013) observed in their article that the construction projects are not initiated to be complex, but the implementation constraints that are encountered during the project lifecycle make it complex. They also advised that continuous communication and

coordination during the delivery of a complex construction project enables effective management of project complexity.

Bertelsen (2003) showed how the subject of construction project complexity needs further investigation in order to develop new approaches for managing the construction projects in a more effective way.

It was also shown in this research study how the complex project can be managed through gaining a deeper understating of previous theories and the use of the modern business management tools in order to overcome all the difficulties encountered by project managers.

In order to understand the construction project nature in an effective way, it is vital to understand the ways in which the construction projects can be recognized as a success or a failure.

Project success criteria

The project management institute the tested triple criteria that could define the success or failure of each project, which are time, cost, and scope of work.

Accomplishment of any development is frequently measured by achieving the project within its constraints, including keeping up the practical and quality values, upholding its deliberate duration, and continuing within the assumed cost (Kerzner, 2013).

Anastasios (2007) described in his research how vital it is to identify the project success criteria while generating the business case of any project where the project objectives are clarified for the relevant stakeholders. He also showed that the time, cost, and the quality are the most significant success criteria that should be measured in order to deliver a successful project.

Nelson (2005) emphasized the importance of the tradeoff triangle and how every project manager should understand it and analyze it with respect to each stakeholder perspective. He also demonstrated in his research how important it is to document each stakeholder perspective for the project in order to generate the success criteria and measure it as the project progresses.

Beleiu, Crisan, and Nistor (2013) studied the success criteria and factors affecting the project success, and they found that measuring and managing the factors related to success criteria can lead to the achievement of project objectives and, in turn, the attainment of the wanted effects.

In his book, Ron Basu (2014) investigated the project success criteria and its measurement and the key factors that lead to project success. He defined project success criteria as the predefined terms that are acceptable to the client, stakeholders, and end-user when measured. He tested a set of success criteria and the factors influencing them, including commercial success, user requirements, budget, timescale, safety, and more, in his book. The conclusion of his research is presented as follows: “The organization quality in projects spans critical success factors and softer issues in project management lead to the sustainability of outcomes.”

Knowing the importance of cost and time in the construction industry and how they are the number one success criteria with respect to project delivery in the UAE construction industry is important. This research study will focus on the cost and time overrun risks and the associated factors.

As discussed in the above section, cost is considered to be one of the major criteria for considering any project successful. Therefore, it is vital to examine the importance of cost in the construction industry and the way in which it contributes to the success of any project.

Parrett (2015) wrote an article pertaining to the importance of cost control in the construction industry. She demonstrated that profit is the most important factor in the construction process from contractor perspective, and that contractors always aim to minimize their cost and expenses in the projects in order to maximize the profit. In order to achieve that, the contractor must have an effective cost control method, along with a realistic forecasting.

UK essays published an article about the cost of construction projects, which showed that the most important objective of the contractors is to stay within the budget of the project throughout the project lifecycle.

In their study, Khosravi and Afshari (2011) developed a model to measure the success of the construction projects. They concluded that cost and time performance were at the top of the

standards that can be used to measure the achievement of any project by meeting project key milestones & project cost objectives.

Songer, Molenaar, and Robinson (1996) studied the selection of success criteria in the design and build projects in the UK and the US. They found six criteria for measuring the project success. However, the most important criteria were the project being within the budget and on schedule.

The same topic was studied by Silva, Warnakulasuriya, and Arachchige (2016). They considered project success as the key foundation in managing any project, and without measuring the project, it cannot be improved. They studied around 10 criteria of project success. However, cost/budget and time/schedule were at the top of the list.

Cost and time overrun risks

Attaining project's objective is normally controlled by the achievement of the goal within its restrictions, such as : operational and quality, supporting the forecasted timescale and perseverance the budgeted cost (Kerzner, 2013).

The major business in UAE and similar countries is the construction. Therefore, excessive exertions have been made with respect to the project's success criteria such as cost and time (Zaneldin, 2006).

Additionally, revisions were steered in order to observe factors affecting the success of any project such as cost and time overrun risks. This is owing to the fact that construction is an enormously active energetic sector and plays a main role in the country's growth and plans. Additionally, it has a massive stake in the economic development of any country (Mulla, 2015).

Cost overrun can be distinct as alteration between the real cost and the planned cost. It happens when the project's actual expenditure surpasses the expenditures that were deliberate for the whole duration of the project to its end (Doloi , 2012).

Furthermore, according to Gonzalez et al. (2014), time risks can be definite as postponement of the project completion in evaluation with contractor's strategic period. It happens after the progress of activities cascades behind the time that was forecasted.

Both Dalmini (2012) and Kerzner (2013) engrossed on project success problems, and they have concentrated on the implication of talking this matter. However, Frame, cited in Memon, Rahman, and Azis (2012), found virtually 16,00% of 8,000 projects were effectively completed within the forecasted time and cost.

Faridi and El-Sayegh, cited in Mahamid (2013), studied the reasons behind the late delivery of construction projects in UAE, where a shocking number was found, 50% of the projects don't follow the planned programs.

Al-Zarooni and Abdou, cited in Mahamid, cited in Al-Ghonamy and Aichouni (2015) made a study to check the change in the UAE community projects evaluations, they have found that the positive or negative differences amongst viable and contract values in the governmental projects range from -28.5% to 36%. Additionally, they stated that the feasibility evaluations in the government entities are usually the estimation of the budgets on the basis of a sole element assessing system irrespective of the project nature, difficulty, scope, or the risks associated with each project, which certainly clarifies the large nonconformity from the assessment.

Shehu et al. (2014) conducted a paper in Malaysian industry in order to find construction routine and the relatives between governmental and private divisions on the basis of the procurement methods, tendering schemes, and project size, nature, and complexity. Therefore, it was conducted a questionnaire survey of Malaysian quantity surveying advisors. The survey results exposed that 55% of Malaysian projects had cost overruns. Also, the governmental projects have better results than the private projects. Moreover, they found that using the design- build delivery technique as the commercial approach has been related with shortened overruns, followed by the old-style method and then by construction management.

Most of the times, the projects success criteria factors lead to entitlements that can be defined as application for reimbursement for compensations produced by contract stakeholders (Semple, Hartman, & Jergeas, cited in Jaffar, Tharim, & Shuib, 2011).

Zaneldin (2006) conducted a survey regarding the change requests categories, reasons, and incidences for UAE construction projects concentrating on Dubai and Abu Dhabi. Therefore, he provided recommendations that might abate the factors affecting projects success criteria such as cost and time overrun factors.

Factors affecting project success criteria and generating risks (cost and time)

Technical factors

In the following section, the research paper will highlight the technical factors leading to the cost and time overrun risks, such as engineering and design changes, scope changes, construction factors, and so on.

Castell (2007) studied the effects of engineering and design changes on the construction industry in Europe and defined the changes in engineering and design as an event that occurs due to additional, omitted, varied, modified, or substituted work. He cited the reason for this issue as the lack of effective management of the engineering and design during the tendering process.

Yap, Rahaman, and Chen (2006) studied the impact of design changes on construction projects, and in their conference, they defined design change as any deviation in the project design after the award of the project to the contractor. They concluded that all the projects will face changes in terms of design and the impact will vary from one project to another depending on several factors. However, cost overrun and delays in schedule will occur eventually.

Charles, Wanigarathna, and Sherratt (2015) studied construction project changes and the effects on cost, and they found that most of the projects are subjected to changes in design and construction, which leads to an impact in a negative or a positive way. In their research work, they concluded that a substantial impact on the construction cost overrun is related to proactive changes. However, these also have the possibility to cause cutbacks in the lifecycle cost and improvements in the entire life value of the consequentially built environments.

Yana, Rusdhi, and Wibowo (2002) studied the factors affecting design changes in construction projects and discovered that projects are naturally exposed to changes in design. They concluded that the owner is the main agent responsible for design changes during the construction projects and the main factor that can minimize the impacts by understanding the causes.

Additionally, according to Kerzner (2013), the failure to have a reasonable thoughtful of the owner demands, unreasonable evaluations of the competences, misjudging period requirements, omission, imprecision of the activities breakdown, misunderstanding of statistics, incorrect estimation approaches, inability to categorize and focus on cost and time fundamentals are the most mutual issues that can disturb alterations in the two restrictions in projects.

Moreover, Isaac and Navon (2008) studied the impact flows of the changes in the context of construction projects and they found that it is difficult to predict and manage the changes. In their research and case study, they concluded that the factors leading to engineering changes, which were identified by the project managers in the tendering process, are manageable. However, they discovered more causes that could have a severe impact on the construction project success criteria.

George (2012) studied the impact of the construction contract types on the project time and cost in Kenya and the difference between the traditional contracts and the integrated contract in terms of the cost and time overrun risks. He concluded that traditional contracts are exposed to higher rates of cost and time risks and respond poorly. Moreover, he recommends the use of an integrated contract in order to respond effectively to the cost and time overrun risks in construction projects.

Richards, Bowen, Root, and Akintoye (2005) studied the impact of the contract choice on the delivery of the construction projects in terms of cost and time, and they concluded that when the contractual procedures and agreements are not compatible with the client's strategic objectives, a high probability of cost and time overrun risk occurs.

Pekuri, Pekuri, and Haapasalo (2014) analyzed the impact of the procurement procedures on construction project success criteria. They discovered that the lack of the procurement understanding at the early stages of the project can affect the timely delivery of the construction projects and thus cause a cost overrun.

Squires, Michael, and Murphy (1983) studied the impact of fast-track construction and construction management on subcontractors, and they found that fast-track contracts and the use of construction management contract may reduce time from the owner standpoint. However, it may cause a severe impact on the subcontractor in terms of cost.

Kerzner (2013), in his study pertaining to construction projects success criteria such as cost and time, found that the difference between the declaration of activities from the owner and the request for offer can lead to inconsistencies in the contractual procedure and thus will eventually lead to cost and time overrun, especially when the members of the project are not involved in the early stages of the project.

Buys (2015) studied the procurement systems and the way in which they impact construction project success criteria, and he found that imprecise contract clauses and poor choice of contract management system can affect the overall project cost and time.

Old-style construction practices are no longer the symbol for the accomplishment of project goals. Expenditure more time on the implementation step and disregarding the need to pay additional care to project commencement and planning stages have caused key effects on the commercially approved restriction, including cost, and give increase to nonstop variation in project scope.

Warhoe and Giammalvo (2013) studied the impact of scope change and rework on the performance of construction projects. In their research work, they found that scope changes during the progress of the project will impact the cost and time of the construction project negatively. This impact will vary on the basis of the categories they have presented in their research.

In her research study, Maja-Marija Nahod (2015) defined scope management and the way in which it can affect project success criteria. The study demonstrated the importance of scope management in the context of a successful project. Having a scope management plan that is not adjusted to the readiness of construction standards will result in scope changes, which, in turn, will impact the construction project cost and time risks eventually.

Alghonamy (2015), KSA construction projects have grievd scope overruns because of frequent nonconformities in construction design and insufficient forecasting along with long gap in the time between design and implementation.

Baloyi and Bekker (2010) emphasized that in the South Africa 2010 FIFA World Cup arenas, the alterations in design and changes on the drawings at the advanced phases have shaped scope variations in the original scope report and caused in redoing the works and postponements in the approved plan and finally led to a cost effect.

Deprived preparation, insufficient investigation, unexpected conditions, inadequate pre-construction study, and imprecise estimates were considered as the top-ranked influences for the Asian transport infrastructure projects (Papadopoulou, 2012).

Shanmugapriya & Subramanian (2013) measured the contruction site as one of the construction features that may cause an overrun in the project cost and time.

In addition, Mahamid and Dmaidi (2013) highlighted some of the factors associated to construction activities like : fake actions, relation between supervisors and employees at the site, extra activities, lack of financial measures throughout project duration, and recurrent absence of suitable workforce.

Olawale and Sun (2010) specified in their study main risks that disturb the cost and time measures in relative to construction, like difficulty in the work, lack of trained labors.

To summarize, the following technical factors can have a key role in the cost , time overrun in context of the construction industry: the lack of engineering management, owner requirement, delay in the identification of the changes, traditional contracts, inconsistency in the contract, the lack of procurement understanding, changes in the design, inadequate site condition, approved project location, site management, complexity of the work.

Capabilities of organizations/stakeholders

In this section, the research work will study the factors related to the capabilities of stakeholders, such as financial ability, client plan changes, strength of the organizations, capacities of contractors and consultants, and governmental policies.

Accurate financial forecasting is one of the key causes responsible for fruitful projects. Failure to do the similar gives rise to risks associated to all stages of construction, including time and cost overruns, and threatens the steadiness of project stakeholders, counting owners, contractors, and dealers.

Abdul-Rahman, Takim, and Min (2009) wrote an article pertaining to the financial causes of construction project time overrun. They concluded in their article that poor cash flow management and late payment would cause a severe delay in the construction projects. Moreover, they associated the delay of the construction projects to the instability of the financial market.

Additionally, Olukyode, Mathew, and Taiwo conducted an assessment of the causes impacting the construction in Nigeria. They arrived at the conclusion that the main reason for unsuccessful projects in term of cost and time in is the cost of the material and the insufficient care displayed by quantity surveyors with respect to this subject, as their estimate of the material cost is usually inaccurate.

Cunningham (2013) studied the issue of cost overrun for building projects in the Irish context. They concluded that the contractors' financial situation, which leads them to choose temporary laborers at a lower cost, tends to delay the projects and causes cost overrun and destroys the reputation of the organization in the market.

Buerte, Abeere-Inga, and Kumi (2012) analyzed the financial impacts on construction project cost contingency. They found that economic factors such as micro- and macroeconomic indicators and delayed payment problems can have a direct impact on the construction project cost and time performance.

Saisi, Ngahu, and Kalio (2015) studied the financial factors affecting the successful delivery of construction projects in public universities in Kenya. They concluded that when the construction projects are not exposed to vast capital outlays, successful delivery of the construction projects may be achieved, which leads to a severe impact on the project cost and time.

Vu, Wang, Min, and Nguyen (2015) analyzed the impacts of financial factors on delay risk in the schedule for international contracting projects. They discovered that slow payment flow, change in the market finance, and mismanagement of the finance may impact the cost and time of construction projects in a negative manner.

Mahamid and Dmaidi (2013) expended supplementary energies in studying the factors affecting project success criteria, and they detected fiscal instability of owners and suppliers to be one of the major aspects. Conversely, Akintoye (2014) carried out a research about the Malaysian construction industry, he considered the money stream matters as client and contractor factors. Client factor problems contain late payments and guarantees, while contractor-related problems include project funding. The mentioned factors have a key effect on projects success criteria especially cost and time in this business.

The same factors were studied, including difficulties in outflows in the public projects, in projects in developing countries, such as the Iranian pipeline projects (Fallahnejad, 2013).

Alghonamy (2015) pointed out a problem that is frequently found in KSA construction industry where owners incline to delay or grasp payments against contractors as a means to exercise more power on them in order to haste their productivity, which lastly demands extra expenses and time.

In planned projects such as the 2010 FIFA World Cup stadia in South Africa, it is revealed that payments delays played a major role in affecting the delivery of the programs which were establish at the early stages (Baloyi & Bekker, 2011).

In summary, the following factors are considered to be the financial factors that affect project cost and time: poor cash flow management and late payment, the instability of the financial market, material cost, the insufficient care displayed by quantity surveyors, choosing temporary laborers, and vast capital outlays.

Alaryan, Emadelbeltagi, Elshahat, and Dawood (2012) conducted a research in relation to the impact of change orders and their impact on the construction projects in Kuwait. They concluded that the change in the clients' plans, which leads to issuing new change orders, will eventually have severe impacts on the construction project cost and time and it will be difficult to be mitigate it if it was issued at a late stage in the construction lifecycle.

Considered as the key compartment cost in the construction industry and affected by and influencing the projects restraints (i.e. quality, time, scope, and so on), materials and equipment managing has reaped a significant amount of courtesy from owners and suppliers who have shaped a protected scheme to monitor and measure the factors affecting these success criteria, especially time and cost overrun (Cunningham, 2013).

A summary has been made by Mulla (2015) to the factors of success criteria risks such as lack of material supply by clients, which is related to the client's commercial arrangements with the contractor and lack of equipment and properties productivity. Conversely, Shanmugapriya and Subramanian (2013)) concluded that variations in the material market rates, such as growth of material cost, have a core impact on the Indian construction industry success criteria

Nagaraju and Reddy (2012) conducted a research on the effect of resource management on the construction projects from a client perspective. It was noted that the lack of state-of-the-art resource management will have a huge impact on the construction schedule. Moreover, it was found that the allocation of the resources in a proper manner will enhance the project cost performance.

Abdulrahman, Memon, Abd karim (2013) tried, in their research, to determine a relationship between resources factors and the cost overrun in the context of construction projects. They found that the most significant factor that affects the cost in construction projects is the shortage of the material from the contractor's side. They also associated the shortage of contractor workers in the site to the financial factors that will eventually cause a cost and time overrun. It was also discovered that laborers' overtime, attitude, errors counted as resource factors that lead to delays in the project.

(Assaf and Al-Hejji 2006) conducted a research that showed how the project success criteria such as cost and time can be affected by several factors. One of the major factors to be found was

the laborer factor. It was discovered that there are a lot of factors associated with project resources but the most important ones are labor supply and productivity and the presence of unskilled laborers.

Indhu and Ajai (2008) observed that delays in the construction projects are a global phenomenon and the need for a study to show and analyze the factors affecting the construction project performance in terms of success criteria is extremely essential. They found that the frequent change in the site team and the lack of construction material and laborer supply are the main factors affecting the construction projects success criteria.

Also , it was highlighted by Mahamid & Dmaid (2013) who have showed their paper on the middle east district from a designer viewpoint. The same was noted that the 2010 FIFA World Cup stadia in South Africa have grieved cost and time overrun due to the same factors including material costs and tariffs uncertainty (Baloyi & Bekker, 2010), which causes to the assumption that these factors are worldwide problems affecting success of project rather than provincial or district issues.

Additionally, Darvik and Larsson (2010) stated that projects investors will improve the process of material and equipment procurement and management by retaining a set of procedures, start with the procurement of dealers to the distribution at the site, counting

- Supplier's assessments and procuring procedure (supplier procurement, relationships, and complete assessments)
- transport contracts
- transport procedure instruction (material ordering, supplier confirmation, notifications from the logistic firm, material and equipment reception and inspection)

To avoid any delivery and supplying postponements, which are extremely public matters affecting project conclusion.

Additionally, Sharma and Goyal (2014) highlighted the fact where projects postponements are caused because of deficiency of construction material in native markets and the accessibility of

these materials and equipment, including standby fragments, capable workforce, and steady facility management, throughout construction events.

Trafford, Dannenhauer, and Boggis (2017) considered the delivery of any project on time and schedule as a challenging opportunity for any organization. Therefore, they presented a paper associating organization capabilities to project success. They concluded that when projects come up against the organization capabilities and are not in line with the organization objective, a huge challenge will be encountered in delivering the project on time.

Isik , Arditi , Dikmen , Birgonul (2009) investigated the effects of organization weakness/strength on project management in any firm. Since the projects are greatly based on the projects, organizations should emphasize their strength and their relationship with other firms in order to help the projects achieve the objectives and success criteria (cost and time).

Abdullahi, Ibrahim , Ibrahim, and Ahmadu (2017) conducted a research that showed the effects of organization characteristics on contractors' performance in terms of the project's cash flow forecasting. They found that firm size, firms' level of experience, nature of works executed and most adopted procurement method, and firms' organizational finance structure are strongly related to the ability of construction firms to effectively and successfully forecast and plan project cash flows.

According to Mulla (2015), one of the foremost issues linked to the act of the contractors that distresses the projects success criteria is stumpy efficiency of resources.

Subramani and Kavitha (2014) found from their research relating to the Indian construction industry that the deprived design agreed by the consultant and the non-performance of the subcontractor are the main factors that lead to these matters.

Furthermore, Danso and Antwi (2012) discovered that insufficient site supervision and the lack of technical capabilities , which lead to affecting the projects success criteria in the Ghana construction industry.

Sweis (2013) deliberated on this problem in the construction industry in Jordan. He surveyed the insights of 30 engineers employed at the ministry of public works and housing and the

association of construction contractors, where they emphasized that lack of experiences of designers, engineers, and project members allocated to the project led unsuccessful projects

Mukuka, Aigbavboa & Thwala (2014) completed an examination for investigative past papers relating to development extend cost and calendar invades, with the particular point of distinguishing the circumstances and end results of the overwhelms. They perceived that poor development administration tremendously affects venture time and cost deviation.

Sweis (2013) recognized the deferment in government endorsements as one of the main considerations that cause time and cost risks in the Jordanian development businesses.

Akintoye (2014) found from his examination that deferrals in getting the permits from the administration causes cost and time overrun in the Malaysian development industry.

Sonuga, referred to in Olawale and Sun (2010), has likewise seen in his investigation that insecure government arrangements much of the time prompt similar issues.

Moreover, Koushki et al., referred to in Olawale and Sun (2010), directed an examination where he found that powerless project direction and control may cause a postponement in the project plan.

To summarize, the following factors can play a major role in the cost and time overrun in the context of the construction industry: incompatibility with client objective, poor cash flow and late payment, instability of market finance and material cost, insufficient care displayed by quantity surveyors, choice of temporary laborers and vast capital outlays, changes in client plan, failure and delays in material supply by the client, poor equipment and resources productivity, fluctuations in the material market rate, lack of resource management, contractor performance, government regulations and approvals, project objectives against organization objectives, and organization relationship strength.

Environmental factors

The environmental circumstances at the site have a marvelous effects on the construction project success criteria such as the cost , time and quality. For instance, risky warm , cold and stormy weather affect laborer efficiency and site hours, particularly for outdoor works. Furthermore, depraved weather also affects the machineries and equipment efficiency and in dangerous conditions, causes failures and indemnities (PMI, 2013).

Akannia, Okeb, and Akpomiemieb (2015) studied the impacts of the environment on the building projects. They found that these factors can vary from one country to another. They also observed that the major environmental factors affecting the projects are pollution, use of resources, and habitat destruction.

Calnan (1952) wrote an article regarding the weather condition and its effects on construction project time overrun. He linked the cold weather to the concrete mixtures and examined the way in which this can delay the construction activities. Moreover, he indicated that rainy weather can affect project performance in terms of quality, which will eventually affect the cost and time of the projects.

McFadden and Bennett (1991) selected the snow joke and its effects on the contractors in the construction industry. He advised the contractors to revise their contractual entitlement due to the heavy snow. He concluded that the weather condition, if not forecasted, will affect the cost and time overrun from the contractor prespective.

Chamberland (2006) studied the cold weather, the hot weather, and the storms and their impact on construction equipment. She concluded that these factors can truly impact the cost and time of the projects due to the fact that the equipment may be severely affected.

According to Kerzner (2013), due to the effects of the weather circumstances on construction, which leads to nonconformities from the baseline, it is vital to study the site location of the construction site throughout the design stage. This implies extra discussion with respect to the assessment of cost and planning.

Furthermore, the effect of weather has to be reflected in the construction procedures, installation methods, materials used and equipment. Different temperature, heat transfer, humidity rates, wind speed, and other such factors will necessitate changes to the baseline during the design stage (Alinaitwe, Apollos, & Tindiwensi, 2014).

In summary, the following factors can have a key influence in the cost / time overrun in the context of the construction industry: weather conditions, pollution, construction procedure, and installation method.

The characteristic of airport projects

In this section, the study will highlight the different characteristics of airport projects and the factors affecting the success of these projects and indicate the similarities of these projects with projects in other construction industries.

The aviation industry is a very large industry, which contributes to the overall economy of any country. The airport operators encounter several difficulties in managing airfield projects (Alnasseri, Osborne, & Steel, 2013). The researchers also concluded that airport construction projects are the same as normal construction projects and are affected by the critical time frame, the involvement of many stakeholders, and environmental factors.

Pichot and Scott (2010) studied the key factors affecting the success of airport projects. They found that proper planning for the project, scope changes, and the capabilities of the stakeholders considered most vital factors that affect the success of any airport project.

Kimball (2010) examined the success of airport projects management. He concluded that a proper planning, maximization of project funds, performance of stakeholders and organizations, and the adequate understanding of project design can play a major role in airport project success.

The best practices to mitigate the cost and time risks involved in construction

In this section of the literature review, the study will highlight the best practices that can be applied by the project teams in order to mitigate and manage cost and time overrun risks elaborated in construction projects.

The construction business is a wide and complex industry, which has a tendency to have numerous components that influence the cost and time of the projects. Since all associations attempt to extend their certainty and oversee projects appropriately, practices to relieve these risks will be useful.

Addressing the above factors that construction projects success criteria and showing its main effects that risk the continuity , evolution of the private and the public sectors in a lot of organizations around the globe where the consequences are assessed in billions, which affect the essential of the construction business, caused in increasing care toward realizing lasting solutions in order to ease the impact of the factors and to certify that programmes are managed and measured.

Mulla (2015), in order to remove the project delivery problems relating clients' inability to provide material as commercially approved upon or postponements in certifying progress payments along with the period required to gain NOC letters from the authorities, it is vital to put on improved methods in terms of project administration, this will ultimately lead to commercial improvement.

Contrariwise, suppliers are directed to procure the construction resources at the start construction in order to avoid price variation over the project timeframe and to have planned programs for material delivery and usage in order to avoid deficiencies or suspensions. Additionally, it is essential to employ crucial staff members with good experiences in order to be able to practice the best forecasting, supervisory, technical, and excellence monitoring, and controlling aspects over the projects. Moreover, owners should be delegated to ensure all project aims, deliverables, and documents prepared in a inclusive and comprehensive manner. In addition, clients are endorsed to assess contractors' fiscal capability to accomplish the project. Therefore, the

lowest bid is no longer the crucial condition for choosing the suppliers (Shanmugapriya & Subramanian, 2013).

Akintoye (2014) focused on the fiscal performance of the project as the key risk that affects the project success criteria in Malaysia. He highlights the key strategies to govern these risks, including cash readiness, efficiency rates, the capability to procure equipment and resources, and employment locating.

To overcome the issues with the project success criteria in the construction of groundwater projects in evolving nations, Frimpong, Oluwoye, and Crawford (2003) have put forward some endorsements as follows:

- Developers have to study the appropriate subsidy level at the primary phases of development to ensure that steady expenses are acknowledged on time.
- Adequate training needs to be supplied for the contractor staffs to improve their supervisory assistances and methods.
- The procedure of procurement and management has to be enhanced to avoid any material suspensions.

Further investigators offered a different method to concede the consequence of cost overrun factors, addressing the significance of implementing the relationship between them. For instance, Sharma and Goyal (2014) have developed the cost overrun assessment model in a fuzzy environment as a valuable means for suppliers and owners to measure and rank overrun risks.

According to Sweis (2013), showed that regardless the similarity of the problems encountered with regards to the cost and time overruns in evolving countries, the understating of the issues is different, he proposed the following to mitigate these factors in Jordan :

- More systematic steps to accelerate governmental approvals
- Extra care to the early design phase to reduce change requests
- Training to the public sector employees to enhance their capabilities.

In KSA, owners must devote extra energies to monitor and correctly forecast projects to avoid the major factors affecting the projects success criteria, including bid award for lowest price, frequent changes in design, improper planning, long gap between time of design and time of implementation, and payments delay (Alghonamy, 2015).

Kymmell (2007) conducted a study that observed the cost and time risk mitigation in construction projects. They discovered that effective coordination, using integrated teams, proper understanding of claims and dispute can be used to reduce the impacts of cost and time overrun risks in the construction industry.

The benefits of risk allocation in construction projects

After studying the factors affecting the project success criteria in construction industry and categorizing them into multiple types, and also showing the best practices utilized in order to manage and mitigate these risks, a research study pertaining to the benefits of risk allocation in the construction industry would be advantageous.

Zhang Shuibo, Zhang Le, Gao Yuan (2006) studied the risk allocation in Fidic contracts in the context of the Chinese construction industry. They demonstrated how important risk allocation is in reducing the impacts on the cost and time of a project, if it is performed in a proper way. They concluded that a proper risk allocation will lead to efficiency in terms of project management and will reduce cost transaction in the construction industry.

A research study relating to the best practices utilized to allocate the risks in construction projects and their impact on the project parties was conducted by Patrick Mead (2007). He indicated the importance of risk allocation and management in the organization commercial (cost and time). Moreover, he concluded that by establishing the context, identifying the risks, categorizing the risks, and determining the key area of risk, the projects team can reduce the cost and time risks in the projects.

Additionally, Babchuck (1992) wrote a paper related to risk allocation in construction contracting. He showed the way in which risk sharing can be helpful in achieving the project

objective in term of their success criteria (cost and time). Moreover, he concluded that the objective of proper risk allocation is neither to absolutely relocate nor to totally preserve all risks but to endorse the overall effectiveness of construction projects with respect to the comprehensive usage of assets.

Lamarre (2009) conducted a research study related to the risk allocation in the nuclear industry. He advised that risk allocation is crucial to the project success criteria and showed that when the contractor has undertaken excessive risks, a high level of contingency and cost risks will arise. Conversely, when this excessive risk is related to the owner, the projects may be financeable. Therefore, the need for keeping the sequence of the activities unchanged, proper planning, and alignment of interest will be helpful to risk allocation for the projects.

In his research, (Shapiro,2010) demonstrated the way in which the risks can be transferred between the project parties in the construction contracts. He indicated that it is usually a point of conflict as to whether the risks should be equally allocated between the projects parties or whether it depends on the strength of the stakeholder. He reached the conclusion that a proper risk identification and equal distribution of the risks between the stakeholders can benefit the projects in term of the timely delivery of the projects.

Moreover, (Corcuera,2010) wrote an article about the risk allocation in the construction industry. She indicated that risks are not avoidable and must be treated in order to benefit the project success criteria. She recommended the management of the risks in four stages: identification, assessment, mitigation, and monitoring. This will lead to the proper management of the risks and thus minimize cost overrun in the construction industry.

(Peckiene, Komarovska, and Ustinovicius ,2013) presented an overview of risk allocation between stakeholders in the construction business. They showed the importance of equitable risks transfer between the projects parties and its effect on the cost and time overrun in the construction industry.

Wong Ming Yien (2011) conducted a research study pertaining to the importance of risk allocation in the construction industry in Malaysia. He showed that the risks involved in the construction projects cannot be eliminated and must be transferred between the projects parties.

He recommended the project parties to take action against the risks in order to protect their interest in the event of risk occurrence.

The difficulties and challenges in managing risks in construction projects

The managing of project success criteria in construction industry is vital nowadays. However, a considerable number of challenges are encountered by project managers while managing and mitigating these risks. In this section, I will try to explain the most important challenges faced in the construction industry while managing cost and time overrun risks.

Junying, Bingguang, Binshan, Vanthuan (2007) conducted a research project in order to investigate the major challenges experienced while managing the risks in the Chinese construction industry. The findings of their research work were that the cultural consideration and the contractors' attitude toward the risks are the major challenges that inhibit the proper management of cost and time overrun risks.

(Muir,2011) carried out a research study, which highlighted the key issues encountered by the construction managers while mitigating the cost and time risks. He found multiple factors affecting the issue. However, the major ones are the governmental constraints and the legal factors.

(Thamhain,2013) showed in his research that organizations' perspectives toward project management could affect their ability to manage cost and time overrun risks. Accordingly, their ability to deliver a project on time and within the planned budget may be affected.

(Danesh and Mand ,2017)wrote an article related to the issues and challenges caused by the cost and time overrun risks in the construction industry. They summarized it as the following factors: team culture, inefficient communication, and over-optimistic contractors.

Cumming and Hirtle (2001) studied the challenges faced in managing the risks pertaining to the projects, and they discovered that changes in regulation posed a great challenge to organizations while managing risks.

Literature review summary

This section of the study described the previous examinations conducted by researchers on the issue of risk management in general and cost and time overrun risks in particular.

It began with a brief definition of the complexity of construction projects and the reasons that render a project complex while managing it.

Subsequently, a description of the project success criteria was presented, where cost and time were the furthestmost significant success measures for any project in the construction business. Moreover, the way in which it can vary from one stakeholder to another was highlighted.

In the next part of the review, a definition of the cost and time overrun risks in the construction industry was presented by through an analysis of the existing literature, and the effects of these risks on the projects and organizations were indicated.

In order to gain an extensive understanding of the risks in the construction industry, it is vital to know the most important factors. Engineering and design- related factors, contractual procedure, financial factors, scope changes, resources, organizational capabilities, environmental factors, construction-related factors, consultant and contractor capabilities, and regulation factors were analyzed in this review.

These risks are important in relation to any project for achieving the objectives. Consequently, the best practices and methods for mitigating the cost and time overrun risks were presented.

Following this, a review related to the risk allocation terminology was presented. Most of the researchers supported this method and suggested that the risks must be allocated equally between the construction project parties.

At the end of this section, the challenges encountered by projects managers and their organization while managing the risks were elaborated upon.

Factors \ Author	Cas	Yap & man & Chen	Cha & Wan & She	Yan & Rus & Wib	Ker	Isa & Nav	Geo	Ric & Bow & Roo & Aki	Pek & Haa	Squ & Mic & Mur	Buy	Abd & tak & Min
Technical factors	✓											
The lack of engineering management	✓	✓	✓	✓	✓							
Delay in identification of the changes					✓	✓						
Traditional contracts							✓			✓		
Incompatability with client objective								✓				
Inconsistency in the contract					✓						✓	
The lack of procurment understanding									✓			
Changes in the design												
Inadequate site condition												
Approved project location												
Site management												
Complexity of works												
Enviromental factors												
Weather conditions					✓							
Pollution												
The construction procedure and installation method												
Organizations/Stakeholders capabilities												
Projects objectives against organization objectives												
Organizations relationship strength												
Owner requirement					✓							
Poor cash flow and late payment								✓				✓
Instability of market finanace and material cost												
the insufficient care by the quantity surveyors												
choosing a temporary labor and vast capital outlays												
Changes in client plan												
Failure and delays of material supply by client												
Poor equipment and resources productivity												✓
Fluctuations in the material market rate												
The lack of resource managemnt												
Contractor performance												
Consultant performance												
Government regulations and approvals								✓				

Factors \ Author	Olu & mat	Cun	Bue & Nga & Kal	Vu & Wan & Min & NGU	Mh & Dma	Fall	Algh	Bal & bek	War & Gia	Ala & Ema & Els & Daw	Maj	Pap
Technical factors												
The lack of engineering management												
Delay in identification of the changes												
Traditional contracts												
Incompatability with client objective												
Inconsistency in the contract												
The lack of procurment understanding												
Changes in the design							✓	✓			✓	
Inadequate site condition												✓
Approved project location												
Site management					✓							
Complexity of works												
Enviromental factors												
Weather conditions												
Pollution												
The construction procedure and installation method												
Organizations/Stakeholders capabilities												
Projects objectives against organization objectives												
Organizations relationship strength												
Owner requirement												
Poor cash flow and late payment			✓	✓		✓	✓	✓				
Instability of market finanace and material cost	✓	✓		✓	✓							
the insufficient care by the quantity surveyors	✓	✓										
choosing a temporary labor and vast capital outlays												
Changes in client plan									✓	✓		
Failure and delays of material supply by client												
Poor equipment and resources productivity												
Fluctuations in the material market rate					✓							
The lack of resource managemnt		✓										
Contractor performance												
Consultant performance												

Government regulations and approvals												
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Factors Author	Mul	Nag & red	Ind & Aja	Dar & Lar	Shar & Goy	Shan & sub	Ola & Sun	Sub & Kav	Dan & Ant	Swe	Muk & Aig & thw	Aka & Oke & Akp
Technical factors												
The lack of engineering management												
Delay in identification of the changes												
Traditional contracts												
Incompatability with client objective												
Inconsistency in the contract												
The lack of procurment understanding												
Changes in the design												
Inadequate site condition												
Approved project location					✓							
Site management						✓						
Complexity of works						✓						
Enviromental factors												
Weather conditions												
Pollution												✓
The construction procedure and installation method												
Organizations/Stakeholders capabilities												
Projects objectives against organization objectives												
Organizations relationship strength												
Owner requirement												
Poor cash flow and late payment												
Instability of market finanace and material cost												
the insufficient care by the quantity surveyors												
choosing a temporary labor and vast capital outlays												
Changes in client plan												
Failure and delays of material supply by client	✓											
Poor equipment and resources productivity					✓							
Fluctuations in the material market rate			✓									
The lack of resource managemnt		✓		✓	✓							
Contractor performance	✓							✓	✓		✓	✓

Consultant performance								✓		✓		
Government regulations and approvals							✓			✓		

Factors	Author	Jac	Jon	Sar	Ali & Apo & Tin	Dav & Fra & Pet	Zey & Dav & yah & Tal	Moh & Yah & Ahm & Has
Technical factors								
The lack of engineering management								
Delay in identification of the changes								
Traditional contracts								
Incompatability with client objective								
Inconsistency in the contract								
The lack of procurment understanding								
Changes in the design								
Inadequate site condition								
Approved project location								
Site management								
Complexity of works								
Enviromental factors								
Weather conditions	✓	✓	✓					
Pollution								
The construction procedure and installation method				✓				
Organizations/Stakeholders capabilities								
Projects objectives against organization objectives					✓			
Organizations relationship strength						✓	✓	
Owner requirement								
Poor cash flow and late payment								
Instability of market finance and material cost								
the insufficient care by the quantity surveyors								
choosing a temporary labor and vast capital outlays								
Changes in client plan								
Failure and delays of material supply by client								
Poor equipment and resources productivity								
Fluctuations in the material market rate								

The lack of resource managemnt							
Contractor performance	✓	✓	✓	✓	✓	✓	✓
Consultant performance							
Government regulations and approvals							

Table 1: Factors affecting projects success criteria with Citation

Conceptual Framework

In this section, a conceptual model will be built to show the relationship between the various factors identified by previous researches as shown in the literature review section and the cost and time overrun risks.

It will systemize the various factors into a model, so the reader of this research will understand the relationship between the factors and the cost and time overrun risks.

Moreover, this section will be a guidance to build the research questionnaire which will be distributed later on, to identify the opinion of the aviation experts on the cost and time overrun risks in the construction of the airports.

Based on the conceptual framework, a null hypothesis will be developed to show the relationship between these factors and project success criteria. The null hypothesis will be tested after analyzing the regression and correlation test of the data collected.

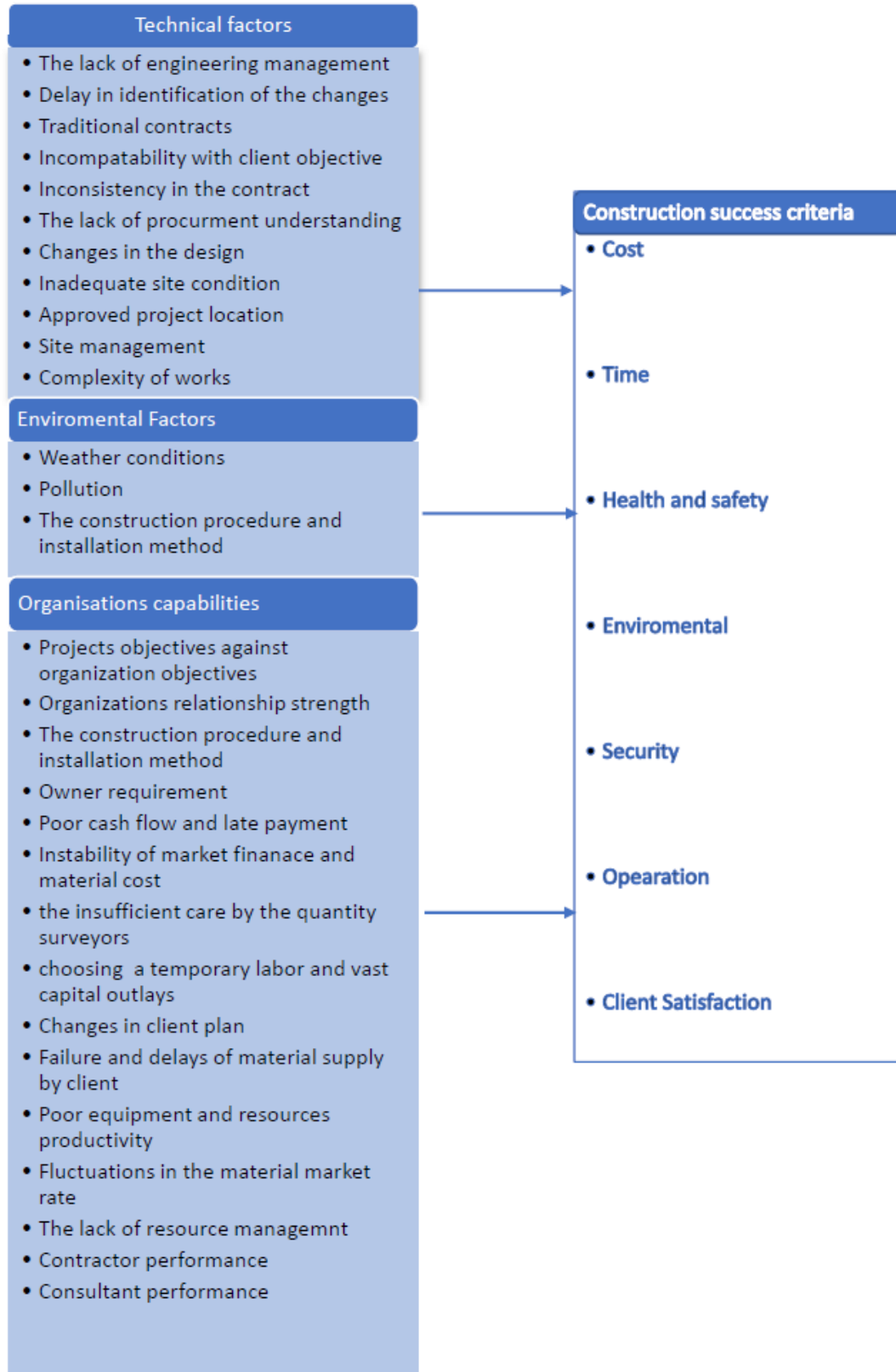


Figure 1: Factors affecting project success criteria

Hypothesis Development

In this section of the research a null hypothesis will be developed between the factors studied previously in the literature review and its effects on project success criteria in the aviation industry.

The hypothesis of the research represents a relationship prediction of the independent factors (cited factors) and the dependent factors (project success criteria) , it will show what to expect from this research and it will be used to test the assumption based on a questionnaire will be distributed in later stage .

It will also help the research on answering its questions which were developed at the introduction section and test them.

The variables used in the hypothesis were categorized into :

Independent variables:

➤ **Technical factors**

- The lack of engineering management
- Delay in identification of the changes
- Traditional contracts
- Incompatibility with client objective
- Inconsistency in the contract
- The lack of procurement understanding
- Changes in the design
- Inadequate site condition
- Approved project location
- Site management
- Complexity of works

➤ **Environmental factors**

- Weather conditions
- Pollution
- The construction procedure and installation method

➤ **Organizations/Stakeholders capabilities**

- Projects objectives against organization objectives
- Organizations relationship strength
- Owner requirement
- Poor cash flow and late payment
- Instability of market finance and material cost
- the insufficient care by the quantity surveyors
- choosing a temporary labor and vast capital outlays
- Changes in client plan
- Failure and delays of material supply by client
- Poor equipment and resources productivity
- Fluctuations in the material market rate
- The lack of resource management
- Contractor performance
- Consultant performance
- Government regulations and approvals

Dependent variables:

- **Projects success criteria in construction projects – Aviation**

The hypothesis that will be tested later on as follow:

- **Ho 1:** Technical factors have no influence on Projects success criteria in construction projects – Aviation
- **Ho 2:** Organisations/Stakeholders capabilities factors have no influence on Projects success criteria in construction projects – Aviation
- **Ho3:** Environmental factors have no influence on Projects success criteria in construction projects – Aviation
- **Ho4 :** all risks factors have no influence on Projects success criteria in construction projects – Aviation

Research Methodology

In previous sections , a qualitative analysis were done and a set of factors causing the cost and time overrun in the construction industry which were deliberated by previous researchers were studied .The necessity to examine these factors statistically on a local industry in UAE is vital.

Starting from this section, the research will practice a quantitative analysis technique to examine the statistical relationship between the projects success criteria and the identified factors in the literature review , the research will use a projects constructed in an airfield environment along the airports in UAE .

Moreover, this section of the research will answer the research questions showed in the introduction of the research , achieve the objective and also shows the reliability and validity of the proposed hypothesis .

In summary , this section contains a theoretical background section showing the studied independent and dependent variables and the relationship between them , also it contains the chosen samples and procedures and how the questionnaire questions will be distributed to the aimed professionals , additionally a set of hypothesis will be established to be analyzed and tested at the end of this research.

Theoretical Background

Based on the previous assessments collected in the review segment in the study, and to elaborate the objectives of this study, success criteria in construction. Conceptual model was done which displays the factors affectingto this abnormality in the success criteria in construction industry (The independent Variables) with the project success criteria (Dependant variables).

This paper is established to implement additional elaboration on the relationship these factors and project success criteria and to what degree of criticality and severity it do influence and impact project success criteria, the research is aiming to test these factors on the UAE aviation

market due to the fact that the construction industry in this country is developing in a rapid rates that need an up to date valuations for these risks.

Numerous previous researches confirmed the effects of such factors on the success criteria in the construction industry; however the application of these factors on the aviation industry in UAE were limited.

Sample and procedures

Figures for study was composed by issuing an online questionnaire on employees in two organization including Dubai Airports, Jacobs International (A representative of Abu Dhabi Airports Company) , 110 staffs were chosen who are conquering different positions in their associations, and performing a airports related jobs to get exact and consistent outcomes for the purpose applying these factors on the aviation industry in UAE, the questionnaires were circulated as an online questionnaire sent through an email.

The survey was circulated to 110 persons, high percentage of contribution was notified as 70 were sent back where 40 didn't, yet, after assessing the returned forms it came to know that 10 are ineligible due to Invalid info, therefore 60 were recognized and verified .

Variables and measures

The questionnaire comprises three key segments; segment one was general information about respondents such as the designation category, How many expert risk management employee their organization has, the sufficient interaction between expert risk management team and non-expert Employees, the satisfaction with the prevailing risk management strategy of your company , How often do they carry out risk assessment relating to projects success criteria and their personal experience in the management of construction projects , part two indicated ratings for the impact of studied factors on the airfield projects success criteria, this part comprises of three main risks categories : Technical , capabilities and environmental factors, based on these high level categories and referring to the literature review conducted, several factors that might

impact the success criteria in the UAE construction projects were stated, and participants were requested to rate the likelihood of occurrence of these factors.

Part three has examined the various types of criteria where the project can be described as a successful or not , these criteria are : Cost , time , environmental , health and safety , operations, client satisfaction and security.

The variables in the second part will be used to determine the relationship between the main factors and the project success criteria and the variables in the third section will be used to determine which criteria is the most important

Data Analysis, Findings and Discussion

After collecting the acceptable number of responses from the selected organizations , statistical package for social sciences (SPSS) program will be utilized to examine the information and hence guide us to the findings and discussion of the analysis.

Descriptive Statistics

This section described the analysis of the first part of the questionnaire, which shows the the respondent general information such as : Designation , professional experience , Organization frequent use of risk management , respondent satisfaction , the number of risk management users in the organisation .

Designation

The analysis of the collected data showed that the highest percentage was (68.3 %) representing the senior positions , Head – Manager positions were in the second rank with (26.7 %) , all other positions such as : senior management , front/junior employee and others have the same percentage (1.7 %) .

Risk Management Experts in the Organisations

In this section , the respondents were asked to answer the number of experts in risks management in their organisations , it was found from the analysis that (58.3 %) answered 5-10 employees , (23.3 %) answered More than 20 , (15 %) answered 10-15 and only (3.3 %) answered 0-5 .

This shows that the selected organisations have the capabilities to manage the risks in the construction projects.

Interaction Between Experts & Non-Experts In Risk Management

In this section, the respondents were asked to rate the sufficient interaction between experts and non-experts in their organisations . (22 %) answered moderate interaction , (16%) answered strong interaction , (15 %) answered weak interaction and (7%) answered no interaction at all .

Risks Management Strategy Satisfaction

They were requested to give a rate to the satisfaction with the used risk management strategy in their organisations. (35 %) answered moderate satisfaction , (17%) answered strong satisfaction , (1 %) answered low satisfaction and (7%) were not satisfied at all.

The Frequency In Using Risk Management In The Construction Projects

(39%) of the respondent were using the risk management in the projects often , (14 %) were using it moderately and the rest were not using it at all .

Personal Experience

The respondent experience in the construction projects was collected. 36.7% of the respondents have 5-10 years , 23.3% have 10-15 , 21.7% have 15-20 , 13.3 % have 0-5, 5% have more than 20 years

The following table summarizes the data collected from general information part :

Frequency Table		
Designation		
Category	Frequency	Percent
Senior Management	1	1.7
Manager – Head	16	26.7
Senior	41	68.3
Front Employee	1	1.7
Other	1	1.7
Total	60	100.0
Risk Management Experts In The Organizations		
Category	Frequency	Percent
0-5	2	3.3

5-10	35	58.3
10-15	9	15.0
More than 20	14	23.3
Total	60	100.0
Interaction Between Experts & Non-Experts In Risk Management		
Category	Frequency	Percent
No interaction at all	7	11.7
Weak interaction	15	25.0
Moderate Interaction	22	36.7
Strong interaction	16	26.7
Total	60	100.0
Risks Management Strategy Satisfaction		
Category	Frequency	Percent
Not Satisfied at all	7	11.7
Low	1	1.7
Moderate	35	58.3
Satisfied	17	28.3
Total	60	100.0
The Frequency In Using Risk Management In The Construction Projects		
Category	Frequency	Percent
Not at all	7	11.7
Moderate	14	23.3
Often	39	65.0
Total	60	100.0
Personal Experience		
Category	Frequency	Percent
0-5	8	13.3
5-10	22	36.7
10-15	14	23.3
15-20	13	21.7
More than 20	3	5.0
Total	60	100.0

Table 2: Frequency Table

Result of the survey

Part of the analysis of the collected data is the outcome of the mean , variance and standard deviation for all measured factors affecting the construction projects success criteria .

The below table shows these values:

Main Factors	Sub Factors	Mean	Std. Deviation	Variance
Technical factors	The lack of engineering management	3.8	1.19036	1.417
	Changes in the design	3.5	0.79191	0.627
	Complexity of works	3.3	1.01347	1.027
	Delay in identification of the changes	3.3	0.97945	0.959
	The lack of procurement understanding	3.25	1.12935	1.275
	Incompatibility with client objective	3.0833	0.99646	0.993
	Site management	3	0.90198	0.814
	Approved project location	2.9833	1.12734	1.271
	Inadequate site condition (Soil condition , existing utilities , etc .)	2.9667	1.13446	1.287
	Traditional contracts (Design - Bid - Build)	2.95	0.3873	0.15
	Inconsistency in the contract	2.7333	0.77824	0.606
Environmental Factors	Weather conditions	3.2000	.98806	.976
	The construction procedure and installation method	2.9833	.89237	.796
	Pollution	2.5333	1.24147	1.541
Organizations capabilities	Contractor performance	4.2333	0.46456	0.216
	Government regulations and approvals	4.0333	0.2582	0.067

	Poor equipment and resources productivity	3.9	0.7524	0.566
	Consultant performance	3.9	0.81719	0.668
	The lack of resource management	3.8167	0.50394	0.254
	Poor cash flow and late payment	3.8	0.48011	0.231
	Instability of market finance and material cost	3.75	0.60014	0.36
	Changes in client plan	3.65	0.81978	0.672
	Organizations relationship strength	3.4667	0.5031	0.253
	Owner requirement	3.35	0.73242	0.536
	Projects objectives against organization objectives	3.3167	0.4691	0.22
	the insufficient care by the quantity surveyors	3.3167	1.38383	1.915
	choosing a temporary labor and vast capital outlays	3.2167	0.58488	0.342
	Failure and delays of material supply by client	2.7667	1.31956	1.741
Projects Success Criteria	Time	4.05	0.34074	0.116
	Cost	3.8	0.5142	0.264
	Client Satisfaction	3.7667	0.46456	0.216
	Operations	3.6833	0.65073	0.423
	Security	3.6667	0.95077	0.904
	Health and Safety	3.6	0.96023	0.922
	Environment	3.4667	0.8919	0.795

Table 3: Means , Variance and Standard deviation

Reliability Test

(Hammerer et al ,2013) Reliability is a sign to which an valuation means produces steady and dependable results. In this assessment cronbach alpha – inter consistency mode will be used where alpha shall fall above 0.7 which considered very reliable.

In this analysis , a measurement for each factor was performed separately and then an overall reliability test was done for all the factors as shown in the table below .

While testing the reliability of the data , it was found that the overall Cronbach Alpha value is 0.751 for a set of 35 items , which indicates that the data collected is very reliable.

The test for the environmental factors was 0.595 which indicates that it's not reliable , therefore one item was deleted where a new value was generated equals 0.927 .

The same applies for the organizations capabilities factors , where six items were deleted to achieve the required value which is 0.72 .

Factor	No of Items	Cronbach Alpha value	No of items after delete	Cronbach Alpha value if item deleted
Technical Factors	11	0.778	N/A	N/A
Environmental Factors	3	0.595	2	0.927
Organizations capabilities	14	0.156	8	0.72
Success Criteria	7	0.711	N/A	N/A

Table 4: Cronbach Alpha Values

Correlation Test

Pearson correlation test is used to have understanding of the nature (significance, strength and direction) of connection among the factors to admit or discard the hypothesis.

significance must be between less than .05 so the relationship between the variables considered available otherwise there is no relationship of numerical indication.

The belw table displays the outcome of the correlation between the factors and projects success criteria in the aviation construction business

It's noted below there is a significant relationship between technical, environmental and organizations capabilities factors and project success criteria which is supporting the hypothesis.

Correlations		
		Project Success
Global Technical Factors	Pearson Correlation	.939**
	Sig. (2-tailed)	.000
	N	60
Global Environmental Factors	Pearson Correlation	.809**
	Sig. (2-tailed)	.000
	N	60
Global organizations capabilities factor	Pearson Correlation	.475**
	Sig. (2-tailed)	.000
	N	60
**. Correlation is significant at the 0.01 level (2-tailed).		

Table 5: Correlation test results

Regression Test

Regression analysis predicting the value of cost and time overrun risks in UAE construction industry from the perception of Technical, Environmental and Organizations Capabilities Factors, as we indicated previously in using the correlation coefficient test that these factors had a significant relationship with the project success criteria.

In this test, enter method will be used which is the default method in the regression test where all the independent variables are entered into the equation in one step.

By using SPSS data analysis and as shown in the following tables , we can notice that all the null hypothesis developed were rejected and there are a positive relationship between all the factors and project success criteria due to the high value of F ratio . it was found that the technical factors are the highest significance and the organizational capabilities with the least significance

Technical Factors:

The R Square and the adjusted R Square values were 0.883 and 0.881 which show that there is a high degree of goodness of fit of the regression model, in addition R Square and adjusted R Square value shows that 88% of variance in the project success criteria data could be explained by the technical factors.

The R value represents the simple correlation (the "R" Column), which indicates a high degree of correlation. The R² value (the "R Square" column) indicates how much of the total variation in the dependent variable

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.939 ^a	.883	.881	2.06368
a. Predictors: (Constant), All factors				

Table 6: R square and Adjusted R square values - Technical Factors

F ratio for this factor was 435. which is significant at $P \leq 0.001$ which show that the regression model is predicting the project success criteria well, however, the B value of 0.939 which is not supporting the null hypothesis developed earlier which indicates the positive relationship between the technical factors and the project success criteria.

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1855.925	1	1855.925	435.	.000 ^b
	Residual	247.009	58	4.259		
	Total	2102.933	59			
a. Dependent Variable: Project success Criteria						
b. Predictors: (Constant), Global Technical Factors						

Table 7: F ratio Values - Technical Factors

Coefficients ^a					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		

1	(Constant)	27.107	2.370		11.435	.000
	Global Technical Factors	-.031	.067	435	-.459	.648
a. Dependent Variable: Projects success criteria						

Table 8: Beta values - Technical factors

Environmental Factors

The R Square and the adjusted R Square values were 0.809 and 0.654 which show that there is an acceptable degree of goodness of fit of the regression model, in addition R Square and adjusted R Square value show that 65% of variance in the project success criteria data could be explained by the environmental factors .

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.809 ^a	.654	.648	1.38990
a. Predictors: (Constant), Environmental factors				

Table 9: R square and Adjusted R square values - Environmental Factors

F ratio for this factor was 109.813 which is significant at $P \leq 0.001$ which show that the regression model is predicting the project success criteria well, however, the B value of 0.809 which isn't supporting the null hypothesis developed earlier which indicates a positive relationship between the environmental factors and the project success criteria but it's not as strong as the technical factors relationship.

ANOVA ^a						
	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	212.138	1	212.138	109.813	.000 ^b
	Residual	112.045	58	1.932		
	Total	324.183	59			
a. Dependent Variable: Project Success Criteria						

b. Predictors: (Constant), Environmental factors

Table 10: F Ratio Values - Environmental Factors

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-11.192	1.908		-5.865	.000
	All factors	.212	.020	.809	10.479	.000
a. Dependent Variable: Project Success Criteria						

Table 11: Beta Value - Environmental Factors

Organizations Capabilities

The R Square and the adjusted R Square values were 0.47 and 0.226 which show that there is a low degree of goodness of fit of the regression model, in addition R Square and adjusted R Square value show only 22% of variance in the project success criteria could be explained by the organizations capabilities factors.

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.475 ^a	.226	.213	2.72153
a. Predictors: (Constant), Org Capabilities				

Table 12: R square and adjusted R square values - Org Capabilities

F ratio for this factor was 16.93 which is significant at $P \leq 0.001$ which show that the regression model is predicting the project success criteria well, however, the B value of 0.475 which isn't supporting the null hypothesis developed earlier which indicates a positive relationship between the organizational capabilities factors and the project success criteria however it's the weakest amongst the other relationship.

ANOVA ^a						
	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	125.393	1	125.393	16.930	.000 ^b
	Residual	429.590	58	7.407		
	Total	554.983	59			
a. Dependent Variable: Project Success Criteria						
b. Predictors: (Constant), Org Capabilities factors						

Table 13: F ratio value - Org Capabilities

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	35.211	3.737		9.423	.000
	All factors	.163	.040	.475	4.115	.000
a. Dependent Variable: Project Success Criteria						

Table 14: Beta value - organizations capabilities

Discussion

The collected data comprised of three categories, the first category focusing on the demographical data including the position, years of experience and some questions on the risk management in their organizational.

The second category is focusing on the importance of each sub-variables for the technical, environmental and organizational capabilities factors.

The third category is concerned about the various criteria describing the success of the projects in the aviation industry.

In the previous section, the relationship between the factors affecting any project and the success criteria were tested and analyzed using a various type of test and analysis.

Three major factors were tested (Technical, Environmental and organizational capabilities) against the project's success criteria. Both variables (dependent and independent) has its own sub-variables, however the test was done on the global variables only.

The data collected tested a respondent from Abu Dhabi International Airport – Airside development programme, the data shows that most of the tested employee were in senior roles with more than 5 years' experience in the construction management. this is due to the fact that the aviation programmes require a high number of years to manage such projects.

In Addition to that, the sample collected has a good experience in the risk management with a fair interaction between the risk management experts in the organization.

When testing the data, it was found that the organizational capabilities is the least reliable factor where in this study it was necessary to delete six sub-variables to achieve the required reliability factor. this is due to the excessive number of variables tested under this category. In the other hand, the technical factors were the most reliable due to the knowledge of the respondent of the technical factors in the construction projects.

When performing the correlation test, it was found that all the tested factors have a momentous and solid relationship with the project success criteria. It was found that the technical factors are the most significant factor and the organizational capabilities are the least significant.

With regards to the regression, null hypothesis was excluded where it was shown that all three factors have a positive relationship with the project success criteria. This means that by having more technical, environmental or organizational capabilities factors the project success criteria can be affected more.

Further to the results of the analysis, the discussion of the analysis can be summarized into three categories:

Technical Factors influence on the project's success criteria

The first objective of the data analysis is to discover the kind of association between the technical factors and project success criteria that was achieved by performing the regression and correlation tests.

The paper developed a null hypothesis indicating that the technical factors have no influence on the project success in airfield construction projects in UAE.

As per the result of the regression and correlation tests, it was clear that the technical factors are the strongest factors affecting the project success criteria where the null hypothesis developed was rejected and a positive relationship was obtained.

This result is aligned with the previous researches that emphasize the positive relationship between the technical factors and project success criteria.

(Kerzner, 2013) found that there are several technical factors affecting the project success criteria and leading to the cost and time overrun in the projects. In addition, (Buys, 2015) concluded in his research that there are some technical factors related to the procurement affecting the project success criteria in a positive way.

Moreover, Baloyi & Bekker (2010) result is aligned with this research result where they have found that technical factors related to the design were affecting the project success criteria in the FIFA world cup stadia 2010. Also, Alghonamy (2015) results are aligned with what the research findings; he found that the technical deviation In Saudi projects are affecting the project success criteria.

Changes in the design is the furthestmost significant technical factors affecting project success criteria as per (Yana , Rusdhi &Wibowo , 2002) & (Charles, Wanigarathna and Sherratt,2015) & (Yap & Abdul rahaman & Chen , 2006). In Addition , (Kerzner , 2013) found in his research that the complexity of works in any project , which is one the studied factors , causing a massive impact on the project success criteria especially the cost and time overrun. Similarly , (Isaac and Navon,2008) found in their research that the continuous lack of engineering management would have a severe impact on the construction project success criteria.

(GEORGE , 2012) & (richards, bowen, root and akintoye, 2005) studied the effect of contracts on the success criteria , have concluded the wrong choice of the contract could affect the performance of the project and leads to cost and time overrun.In addition (Pekuri , Pekuri and Haapasalo , 2014) & (SQUIRES, and MICHAEL. MURPHY, 1983) & (Buys , 2015) studied the relationship between the procurements methods and the performance of construction projects and they found it'll impact the contractors performance and thus impacting the project success criteria.

On the other hand , (Warhoe with Giammalvo,2013) & (Maja-Marija Nahod , 2015) &(Alghonamy 2015) studied the relationship between scope management and project performance , they have concluded that the scope changes and lack of scope management could impact the construction project success criteria.

Additionally , (Baloyi & Bekker 2010) & (Shanmugapriya & Subramanian , 2013) studied the technical factors related to the site activities and their impact on the cost and time of the projects and they concluded that the project location and poor site management could impact the construction projects success criteria.

As shown above , all previous researchers and their studies showed how the construction project success criteria by the various technical factors which aligned with the outcome of the data analysis of this study.

As shown above , all previous researchers and their studies showed how the construction project success criteria by the various technical factors which aligned with the outcome of the data analysis of this study.

Environmental Factors influence on the project's success criteria

The first objective of the data analysis is to show the kind of connection between the environmental aspects and the project success criteria which was achieved by performing the regression and correlation tests .

The paper developed a null hypothesis indicating that the environmental factors have no influence on the project success in airfield construction projects in UAE

The result of the regression and correlation tests shows clearly the effect of the environmental factors on the mentioned project success criteria where the null hypothesis developed were rejected and a positive relationship was concluded however it wasn't as strong as the technical factors relationship with the project success criteria due to the difference in environmental conditions between the studied countries and projects.

This result is aligned with the previously studied researches that found a relationship between the environmental factors and project success criteria.

(PMI,2013) showed how the weather condition which considered as one of the environmental factors studied earlier can affect the project expenditures and working hours which has severe impact on the project success criteria . Also, (Jack Calnan) found in his research how the weather condition can affect the construction schedule and also the quality of the construction activities which at the end lead to a massive impact on the project success criteria.

Additionally, (Alinaitwe, Apollos, & Tindiwensi, 2013) found in their research that the humidity rates, which is one of the major environmental factors in UAE, can change the baseline of the project and thus leading to affect the project success criteria. Moreover, (Sarah Chamberland)

found in her research that the hot weather condition, which also applied for UAE, can impact severely the construction equipment and delay the construction activities and affect the project success criteria. Similarly, (Akannia, Okeb, Akpomiemieb, 2015) studied the environmental impact on the construction projects especially the buildings, where they concluded that these factors can vary from one country to another and the pollution is the most important factor affecting the environment which is considered one of the project success criteria as shown in the conceptual framework previously.

(McFadden, and Bennett, 1991) studied the snow joke effects on the cost and time of any construction projects and they found that it can impact the construction schedule massively, however this can't be applied to UAE construction industry due to the hot weather condition. Additionally, (Kerzner, 2013) studied the impact of the weather condition on the location of the projects and its effects on the baseline schedule where it will cause a massive cost and time overrun to any construction project. Also (crissinger, 2005) studied the effect of the weather condition on the construction projects where he found a massive impact on the quality of the works done which is considered one of the project success criteria shown previously in the conceptual model.

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As shown above, all previous researchers and their studies showed how the construction project success criteria by the various environmental factors which aligned with the outcome of the data analysis of this study.

Organizational capabilities Factors influence on the project's success criteria

The objective of the data analysis is to find the kind of relationship between the organizations capabilities factors and the project success criteria which was achieved by performing the regression and correlation tests.

The paper developed a null hypothesis indicating that the organizations capabilities factors have no influence on the project success in airfield construction projects in UAE

The result of the regression and correlation tests show clearly the effect of the organizational capabilities factors on the mentioned project success criteria where the null hypothesis developed were rejected and a positive relationship was concluded however it the weakest factor that has a relationship with the project success criteria .

This result is aligned with the previously studied researches that found a relationship between the environmental factors and project success criteria.

(Abdul-Rahman , Takim , Min , 2009) found in their research that the capabilities of any organization in term of the cash flow and financial situation can impact the performance of the project and affect the project success criteria. (Cunningham, 2013) showed also the effect of financial situation of the Irish contractor on the project success criteria and impact the organization reputation in the market. In addition, (Akintoye , 2014) concluded that the late payment certification in the Malaysian construction industry can affect the performance of the contractors and leading to impact on the project success criteria.

Moreover , (Fallahnejad (2013) found that the poor capability of Iranian government had a massive impact on the complication of construction payment and led to a severe impact on the project success criteria for one of the pipeline projects in Iran . (Buerter , Abeere-Inga , and Kumi , 2012) & (saisi & ngahu & kalio , 2015) & (Vu, Wang, Min, Nguyen , 2015) studied the financial capabilities of the clients and its impact on the performance of the construction projects , they have found that it could impact the project success criteria especially the cost and time .

(Baloyi & Bekker , 2011) &(Alghonamy 2015) studied the impact of the late payment from the clients to the contractors in Saudi Arabia and south Africa and found a massive impact caused by this factor on the project success criteria. In Addition , (David Trafford, Frank Dannenhauer and Peter Boggis ,2017) found a relationship in their research between the project success and organizations objectives where they have concluded that the project will fail if the project objectives are not aligned with the organization objective Additionally , Sweis (2013) found that the poor performance by the consultants and contractors in Jordan led to a massive impact on the construction projects and impacted the cost and time .

As shown above , all previous researchers and their studies showed how the construction project success criteria by the various organizations capabilities factors which aligned with the outcome of the data analysis of this study.

In summary , all the factors that were studied in the literature review where the researchers shows the various relationship with the project success criteria and the factors tested using a questionnaire were aligned , therefore , the paper concluded the positive relationship between these factors (Technical , environmental and organizational capabilities) and the project success criteria (Cost , time , health and safety , security , environmental, operation and client satisfaction).

Conclusion

The key aim of this study was to determine the relationship between various factors and its effect on the project success criteria. A study on the leading factors that affecting the project success criteria construction industry in and outside UAE which were studied by previous researchers. Additionally, the different practices used to minimize these factors and mitigate the cost and time overrun in the construction industry was conducted. A link between the factors and the project success criteria was established and questionnaire was distributed to a set of respondent to test these variables on the aviation industry in UAE. The final outcome of this research can be used by the decision makers to help them delivering the aviation projects according to the previously established success criteria.

The main findings of the research are related to the relationship between the technical, environmental and organizational capabilities factors and the project success criteria in the aviation industry. In the following sections, the finding for each factor will be shown in more details. The findings of this research can be utilized later by researchers to test the various practices to manage the technical, environmental and organizational capabilities factors in order to achieve the success criteria of the construction project in the aviation industry in UAE.

Technical factors

The following sub-factors were identified in the literature review as a technical factors have a relationship with the project success criteria : The lack of engineering management, Delay in identification of the changes, Traditional contracts (Design - Bid - Build),Incompatibility with client objective, Inconsistency in the contract, The lack of procurement understanding, Changes in the design, Inadequate site condition (Soil condition , existing utilities , etc. .),Approved project location, Site management, Complexity of works

The same factors were tested using a questionnaire; it was found that the technical factors have a significant effect on the project success criteria. In fact, the technical factors considered the most factors with a positive relationship with the project success. Thus, extra care and further analysis shall be made to find the best practice to manage these factors and mitigate any issues with the project's success criteria.

By studying the sub-factors, it can be noticed that these factors can have a significant effect on the time and cost of the projects as identified previously in the literature review.

Environmental Factors

With regards to the environmental factors, the following sub-factors were identified in the literature review that has a relationship with the project success criteria: Weather conditions, Pollution, The construction procedure and installation method

These sub-factors were tested in the questionnaire to show their relationship with the project success criteria. There was a relationship but not as strong as the technical factors. The success criteria affected by these factors are the environment. However, affecting the environment can lead to a cost and time overrun or can affect the operation of the airports . Therefore , a further study can be made to show how the environment can lead to a cost and time overrun. In addition , extra study can be made to show the best practices to manage such factors and mitigate and environmental risks arise.

Organizational capabilities

In term of organizational capabilities factors , the following sub-factors were identified In the literature review that have a relationship with the project success criteria : Projects objectives against organization objectives, Organizations relationship strength, Owner requirement, Poor cash flow and late payment , Instability of market finance and material cost, the insufficient care by the quantity surveyors, choosing a temporary labor and vast capital outlays, Changes in client plan, Failure and postponements of material stock by client, lack of equipment and properties efficiency, The lack of resource management, Contractor performance, Consultant performance and Government regulations and approvals

Due to the number of factors identified in the literature review , some of the factors have to be deleted in order to have a reliable data as shown previously . however , the organizational capabilities factors have a strong relationship with the project success criteria but no as significant as the technical and environmental factors.

Cost and time were studied in the literature review as a project success criteria ,the relationship between the factors and cost and time overrun were focused on by previous researchers , however from personal experience , other success criteria were added to the questionnaire . in the distributed questionnaire , around seven success criteria were tested against the factors affecting the projects .

The success criteria as follow : Cost , Time, Health and Safety , Environment , Client Satisfaction, Operations, Security

Most of the respondent emphasizes the importance of all the above mentioned success criteria , therefore one global factors including all success criteria was developed .

In summary , the research demonstrate the importance of the success criteria and how it should be predefined in order to consider any project successful or not . the research studied a wide range of factors affected the cost and time overrun studied by previous researchers and apply it to a wider range of success criteria in the aviation industry .

In addition , the research showed how these factors can be managed in order to establish a control measures to mitigate any deviation in the project success criteria .

The literature review was limited to the cost and time overrun success criteria , if more literatures found related to other success criteria , it can be used to generate more factors that can be managed and influence the success of the project.

In addition , the questionnaire was limited to respondent from one organization for one aviation programme only , it's noted that if the questionnaire distributed to a wider range of respondent , more efficient result can be obtained

Recommendation

Following the conclusion in the previous section , this section will present some recommendations and suggestions to the decision makers in the aviation industry in UAE to ensure a proper usage of the result of the research . the recommendation will be for each section of the factors to show how to mitigate the sub factors and minimize its effect on the projects success criteria.

Technical factors : Appointing a proper engineering consultant , Adequate project scoping, Choosing the type of the project according to the current financial condition, Choosing the projects that serve the client objective, Well defined contract clauses, A proper procurement techniques , Appointing a trustworthy designer, Defining site conditions, Proper site management personnel, Proper breakdown of the project activities

Environmental factors : Considering Weather condition in the project programme, Proper project environmental management, Aligning the construction method with the environmental condition

Organizational capabilities factors: Aligning Projects objectives against organization objectives, Strengthen organizational relationship with stakeholders, Predefined Owner requirement, Securing Project budget, Mitigation plan for market changes, Qualified quantity surveyors, Well defined client plans, Proper supply chain management, Proper resources management, Appointing well performed contractors, Appointing well performed Consultants ,Proper understanding of Government regulations and approvals

The ultimate recommendation to the decision makers is the proper analysis of the factors studied in the literature review , setting up priorities , defining the project success criteria available in the literature review and the ones added in the questionnaire and then trying to manage these factors to mitigate any arising risks that might impact the project success criteria.

Limitation of the study

The study analyzed a case study from the aviation industry in United Arab emirates . therefore the study may be limited to UAE construction industry only and similar type of projects only . In addition to that , the sample for the questionnaire were from a construction management firm only , more reliable data would be collected if a wider range of respondent were tested from contractors and designers firms .

The literature review studied the cost and time overrun success criteria only , more accurate results would be obtained if previous researches were studied related to other success criteria .

Future researchers

The current findings have various suggestions for future researchers who would like to conduct such studies for UAE construction industry such as including a wider range of respondent to the questionnaire from other aviation companies in other cities .

In addition , similar research can be conducted using a wider range of dependent and independent factors where the result will show a better results.

It's important for future researchers to know that there are massive amount of researches conducted on the project success criteria , however , no research was conducted on the aviation industry especially in countries with similar UAE conditions . Therefore , future research could study the practices used to manage the factors affecting the project success criteria in an industry similar to UAE aviation industry .

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Appendices

Appendix A – Questionnaire

Factors affecting projects success criteria - Airfield projects

1. Respondent's General Information

1. Designation

- ☐ Senior management
- ☐ Head - Manager
- ☐ Senior
- ☐ Front employee
- ☐ Others

2. How many expert risk management employee your organization has ?

- ☐ 0 - 5
- ☐ 5- 10
- ☐ 10 -15
- ☐ 15-20
- ☐ More than 20

3. In your organization, is there sufficient interaction between expert risk management team and non-expert employees

- ☐ No interaction at all
- ☐ Weak Interaction
- ☐ Moderate Interaction
- ☐ Strong Interaction
- ☐ Very strong interaction

4. Are you satisfied with the prevailing risk management strategy of your company?

- ☐ Not satisfied at all
- ☐ Low
- ☐ Moderate
- ☐ Satisfied
- ☐ Very satisfied

5. How often do you carry out risk assessment relating to projects time and cost overruns

- ☐ Not at all
- ☐ Low
- ☐ Moderate
- ☐ Often
- ☐ Very often

6. Your personal experience in the management of construction projects (years):

- ☐ 0 - 5
- ☐ 5 -10
- ☐ 10 -15
- ☐ 15 - 20
- ☐ More than 20

Factors affecting projects success criteria - Airfield projects

2. Technical factors

Please rate the following factors impact on the airfield projects success criteria

7. The lack of engineering management

- ☐ Very low
- ☐ Low
- ☐ Medium
- ☐ High
- ☐ Very high

8. Delay in identification of the changes

- ☐ Very low
- ☐ Low
- ☐ Medium
- ☐ High
- ☐ Very high

9. Traditional contracts (Design - Bid - Build)

- ☐ Very low
- ☐ Low
- ☐ Medium
- ☐ High
- ☐ Very high

10. Incompatibility with client objective

- ☐ Very low
- ☐ Low
- ☐ Medium
- ☐ High
- ☐ Very high

11. Inconsistency in the contract

- ☐ Very low
- ☐ Low
- ☐ Medium
- ☐ High very
- ☐ Very high

12. The lack of procurement understanding

- ☐ Very low
- ☐ Low
- ☐ Medium
- ☐ High
- ☐ Very high

13. Changes in the design

- ☐ Very low
- ☐ Low
- ☐ Medium
- ☐ High
- ☐ Very high

14. Inadequate site condition (Soil condition , existing utilities , etc .)

- ☐ Very low
- ☐ Low
- ☐ Medium
- ☐ High
- ☐ Very high

15. Approved project location

- ☐ Very low
- ☐ Low
- ☐ Medium
- ☐ High
- ☐ Very high

16. Site management

- ☐ Very low
- ☐ Low
- ☐ Medium
- ☐ High
- ☐ Very high

17. Complexity of works

- ☐ Very low
- ☐ Low
- ☐ Medium
- ☐ High
- ☐ Very high

Factors affecting projects success criteria - Airfield projects

3. Environmental Factors

Please rate the following factors impact on the airfield projects success criteria

18. Weather conditions

- ☐ Very low
- ☐ Low
- ☐ Medium
- ☐ High
- ☐ Very high

19. Pollution

- ☐ Very low
- ☐ Low
- ☐ Medium
- ☐ High
- ☐ Very high

20. The construction procedure and installation method

- ☐ Very low
- ☐ Low
- ☐ Medium
- ☐ High
- ☐ Very high

Factors affecting projects success criteria - Airfield projects

4. Organisations / Stakeholders capabilities

Please rate the following factors impact on the airfield projects success criteria

21. Projects objectives against organization objectives

- ☐ Very low
- ☐ Low
- ☐ Medium
- ☐ High
- ☐ Very high

22. Organizations relationship strength

- ☐ Very low
- ☐ Low
- ☐ Medium
- ☐ High
- ☐ Very high

23. Owner requirement

- ☐ Very low
- ☐ Low
- ☐ Medium
- ☐ High
- ☐ Very high

24. Poor cash flow and late payment

- ☐ Very low
- ☐ Low
- ☐ Medium
- ☐ High
- ☐ Very high

25. Instability of market finance and material cost

- ☐ Very low
- ☐ Low
- ☐ Medium
- ☐ High
- ☐ Very high

26. the insufficient care by the quantity surveyors

- ☐ Very low
- ☐ Low
- ☐ Medium
- ☐ High
- ☐ Very high

27. choosing a temporary labor and vast capital outlays

- ☐ Very low
- ☐ Low
- ☐ Medium
- ☐ High
- ☐ Very high

28. Changes in client plan

- ☐ Very low
- ☐ Low
- ☐ Medium
- ☐ High
- ☐ Very high

29. Failure and delays of material supply by client

- ☐ Very low
- ☐ Low
- ☐ Medium
- ☐ High
- ☐ Very high

30. Poor equipment and resources productivity

- ☐ Very low
- ☐ Low
- ☐ Medium
- ☐ High
- ☐ Very high

31. The lack of resource management

- ☐ Very low
- ☐ Low
- ☐ Medium
- ☐ High
- ☐ Very high

32. Contractor performance

- ☐ Very low
- ☐ Low
- ☐ Medium
- ☐ High
- ☐ Very high

33. Consultant performance

- ☐ Very low
- ☐ Low
- ☐ Medium
- ☐ High
- ☐ Very high

34. Government regulations and approvals

- ☐ Very low
- ☐ Low
- ☐ Medium
- ☐ High
- ☐ Very high

Factors affecting projects success criteria - Airfield projects

5. Airfield Projects Success criteria

Rate below the importance of the criteria in the project

35. Cost

- ☐ Very Low
☐ Low
☐ Medium
☐ High
☐ Very High

36. Time

- ☐ Very Low
☐ Low
☐ Medium
☐ High
☐ Very High

37. Health and Safety

- ☐ Very Low
- ☐ Low
- ☐ Medium
- ☐ High
- ☐ Very High

38. Environment

- ☐ Very Low
- ☐ Low
- ☐ Medium
- ☐ High
- ☐ Very High

39. Client Satisfaction

- ☐ Very Low
- ☐ Low
- ☐ Medium
- ☐ High
- ☐ Very High

40. Operations

- ☐ Very Low
- ☐ Low
- ☐ Medium
- ☐ High
- ☐ Very High

41. Security

- ☐ Very Low
- ☐ Low
- ☐ Medium
- ☐ High
- ☐ Very High

