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RESEARCH ARTICLE

## Lessons Learned Framework for Efficient Delivery of Construction Projects in Saudi Arabia

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### Abstract

The Kingdom of Saudi Arabia (KSA) has the largest construction market in the gulf region. Nevertheless, the sector faces issues related to inefficiency and ineffectiveness in project delivery. This research aims to explore the impact of current practices across projects lifecycles, and to utilize findings to develop an integrated strategic construction project management framework (ISCPMF) that may pave the way to efficient and effective project implementation. To achieve this objective, the authors have traced the implementation processes of nine projects for data collection. This was based on a deductive approach with preconceived themes. Within-case and cross-case analysis was conducted. The data was complemented by holding three separate focus-group discussions with a total of nineteen participants, and the initial findings were cross-checked with six experts. The deficiencies that surround the pre-construction phase and disconnected activities that are carried out in different timespans represent the first barrier to implement projects successfully. This is coupled with low capacities contractors and non-proactive construction teams that lack a management toolbox to alleviate accumulated issues and control project progress. The unavailability of infrastructure and utilities did not ease construction nor made inspection possible, which led to late occupancy of facilities, waste of resources and failure to deliver the desired benefits effectively. The adoption of ISCPMF will institutionalize and bridge project phases. This may play a vital role in implementing projects efficiently and effectively and building data to benefit future projects. Though the

research is limited to higher education facilities, the findings may be generalized to public construction projects.

## Keywords

**Saudi Construction Sector; Inefficient and Ineffective Processes; Strategic Management Framework**

## Introduction

The KSA has the largest construction market in the region with more than 33% of the total market share. According to [Fay, et al. \(2019\)](#), Saudi Arabia is one of the ten countries in which 73% of the world's construction and infrastructure investment exists. In line with the Kingdom's Vision 2030, there is an ongoing trend towards modernization of construction through renovation and new construction to meet the development needs and population growth.

While reports show that the KSA remains the most active construction market in the region, a significant number of projects are running years behind their original schedules and billions of dollars over budget. Many projects were either suspended or halted by ministries. As this research will focus mainly on the status of education projects, recent reports from the Ministry of Education (MOE) on pre-university education projects show that in mid-2020, the MOE withdrew 355 projects (delayed or stalled). Similarly, in 2019, the MOE withdrew 305 projects, cancelled 266 contracts, and in 2021 dealt with 452 stalled projects ([MOE, 2021](#)). A strong case to show the inefficiency and ineffectiveness in project implementation is the SAR 2.0 billion contract. Signed in July 2009 with a foreign construction company, the contract was to construct 200 schools within 14 months, to accommodate 150 thousand students ([Tatweer Building Company, 2020](#)). After ten years had elapsed, i.e., in 2019, the MOE decided to cancel the contract and to withdraw the uncompleted projects. The situation in post-secondary education projects is much more complicated due to the size and systems involved in constructing universities and technical institutes.

For years, the KSA government authorities have been complaining about delayed, incomplete, and halted projects. Nonetheless these projects exist and operate in environments that may have been influenced by them. The organizational culture, structure, governance, employee capability, along with the organizational process assets, influence the management of the projects ([PMI, 2017](#)). Successful projects begin with the owner as highlighted by [ASCE \(2013\)](#). The Saudi construction sector faces chronic challenges, some of which are the regulatory framework, delays in payments, low capacities of contractors, unskilled labor force, traditional construction methods, reliance on old equipment, and limited access to new construction technology ([US-SABC, 2018](#)).

The proliferation of construction projects post-2000 according to [Mitra and Wee Kwan Tan \(2012\)](#) has seen an explosion in non-standard, ad hoc methods and tools being used in construction. They found that there is an acute shortage of experienced and quality project manpower and contractors in the KSA construction industry. The outbreak of the coronavirus in 2020 has shown how fragile the construction contractor companies are. A recent survey of 600 Saudi contractors by the [Saudi Contractors Authority \(2020\)](#) revealed that the largest percentage of companies declaring bankruptcy are construction companies. It is predicted that after the pandemic, contractors will face unstable demand with a different mix of buildings and new building techniques that require technology adoption. Digital transformation is a reality, even while many of the contractors still use traditional paper-based processes.

The fact of the matter is that the constrained capacity the sector suffered from has resulted in difficulties in implementing projects efficiently and effectively. While a number of researchers have identified and have listed major sources of project overruns and defined the burden of each key player ([Alzara, et al., 2018](#), [Mahmid, 2013](#), [Gopang, et al., 2020](#), [Simushi, 2017](#)) the root causes of the problem have not been diagnosed. These causes are the organizational setup, the old-fashioned regulations, and pre-construction

procedures that yield issues for project implementation throughout the project's lifecycle. These problems, along with the absence of a strategic project management framework, create barriers to alleviating issues in a timely manner.

## EFFICIENCY AND EFFECTIVENESS IN CONSTRUCTION PROJECTS

Both efficiency and effectiveness are an integral part of successful management. Project management literature agreed on the definition of efficiency and effectiveness. [Zwikael, et al. \(2014\)](#), [Yamin and Sim, \(2016\)](#) and [Zidane and Olsson \(2017\)](#) define construction project efficiency as the extent to which the project is meeting both time and budget expectations. In comparison, effectiveness is the degree to which project specifications and beneficiary requirements are satisfied. The well-known and most cited criteria in literature to judge a project success (on time, to budget, to specification) were the highest ranked success criteria identified through the survey carried out by [White and Fortune \(2002\)](#). However, the fit between the project and organization as well the influence of the project on the business performance were also reported as important criteria, i.e., the need to meet organizational objectives and to minimize business disruption. Many organizations enter into projects without fully understanding how they should be managed, and the techniques required to ensure a project delivers according to expectations, ([Pinto, 2010](#)). [Love, et al. \(2009\)](#) suggested that there could be some inefficiency in project organization that promotes the occurrence of overruns rather than inhibits them, such as the actions of the project team members in the project organization ([Love, Ahiaga-Dagbui and Irani, 2016](#)).

Reviewing previous studies on delays in completing projects in the KSA and their ensuing consequences, [Almutairi and AlMunifi \(2020\)](#) concluded that most of these studies somehow linked delays to management inefficiency which results in an unsatisfactory final product that fails to deliver its intended purpose. This is confirmed by [Turner and Zolin \(2012\)](#) who stated that projects have been completed on time and at cost (efficient) but have left their investors dissatisfied because they have failed to deliver the desired benefits (ineffective).

The Saudi construction sector faces issues related to inefficient and ineffective implementation of projects that undoubtedly results in waste of resources and damage to the image of the country's investment environment. As will be discussed hereafter, while sources of project overruns and key players have been identified by researchers, the root causes of the problem have not been diagnosed. The big picture has not yet been introduced to researchers and practitioners. This research is an attempt to formulate a good understanding of the culture dominating the construction sector in the KSA. This will be elaborated on through exploring current practices across projects lifecycle, from initiation to facility operation and evaluation. Real data from case studies that are in different states of implementation (bidding, ongoing, completed and in operation, completed but not operational) will be utilized. Projects may have been completed on time and within budget (efficient) but failed to deliver the desired benefits (ineffective). This is another dimension of this study that has not been tackled by previous researchers. The findings are utilized to develop an integrated strategic construction project management framework (ISCPMF) that may pave the way to efficient and effective project implementation. The findings and recommendations might fill the research gap and be of added value.

## RESEARCH QUESTIONS

To address and tackle the chronic issues that adversely impact the performance of construction projects in the KSA, we pose the following questions. Why and how do construction projects perform poorly throughout project phases from initiation to handover and operation? How does poor performance lead to inefficient and ineffective project implementation? How would the existence of an ISCPMF ensure that a project meets its time schedule, is completed within the allocated funds, and according to specifications and

professional standards, and most crucially, how the framework would ensure that the project output achieves the functionality objectives over different timescales, as appreciated by stakeholders, especially end users.

## RESEARCH OBJECTIVE

The large investment in the KSA construction sector has not been accompanied by reforming project governance to create an enabling environment including regulations as well as capacity building. Based on the previously stated questions, the current research aims to study issues in-depth to determine the sources of poor performance, and then use the findings to propose an ISCPMF that may lead to efficient and effective implementation of construction projects.

The sections of the research are structured as follows. A brief introduction on the current state of the Saudi construction industry, and the definition of efficiency and effectiveness in construction project management literature. The literature review covers the main principals and definitions of projects governance and its pertinence in the KSA, as the organizational culture has a major impact on the construction industry's efficiency. The relationship between project management methodologies and project success is addressed, as well. The main elements of the research methodology are outlined. An in-depth look at raw data from nine case studies, and systematic analysis through the different project phases is carried out. This is followed by an explanation of the acquired research results that is cross-referenced with focus-group discussions and structured interviews. The findings from the mixed method approach are triangulated to enhance and discuss results, and to build conclusions and recommendations.

In light of new driving forces and rapid changes in the country, particularly in the management of the construction industry, this study will be of high value and importance to decision makers in the country, as well as to practitioners and academics.

## Literature Review

### PROJECTS GOVERNANCE

The KSA government has introduced several initiatives to improve project governance. Recently, the government passed a law to set up a network of program management offices (PMOs) with the aim to oversee public sector projects. It is an attempt to find an efficient and standardized approach to project management. However, from the authors' observations and communication with earlier established PMOs, there are limited opportunities of success unless there is a parallel reform to the organizational culture. Organizational culture is acknowledged to have a major impact on the construction industry's efficiency. [Teräväinen, Junnonen and Ali-Löytty \(2018\)](#) investigated the presumptive correlation between construction project culture and efficiency in the Finnish construction industry. They found that projects with the highest performance and customer satisfaction levels seemed to identify their project culture as stronger than low level performing projects. Based on a face-to-face questionnaire survey on project governance among Chinese project management professionals, [Li, Akintoye and Holt \(2017\)](#) concluded that without effective organizational governance and management systems support, project governance and management cannot operate effectively. Systemic project failure is a failure of organizational governance ([Too and Weaver, 2014](#)). [Ward \(2018\)](#) emphasized that project management is a multidisciplinary process that creates complex relationships and a matrix organizational structure to achieve a satisfactory end result. Projects lacking effective senior management support cannot deliver the expected business benefits to an organization. The support from senior management, according to [White and Fortune \(2002\)](#), is one of the most frequently mentioned critical factors for successful project management.

## CONTRIBUTORS TO POOR PROJECT DELIVERY

The [PMI \(2017\)](#) informs that poorly managed projects may result in missed deadlines, cost overruns, poor quality, and rework. In spite of continuous growth of literature in the knowledge management processes, tools and techniques, researchers and professionals indicate that projects completion in a timely manner within the allocated budget and according to the contracted terms and specifications have not significantly improved.

The vast majority of research on time and cost overruns in the KSA construction sector have adopted a systematic approach of categorizing and dispersing responsibilities of the overrun occurrences among the main players. Reviewing existing literature in Africa, Asia and the Middle East, [Simushi \(2017\)](#) found that time and cost overruns in the Middle East were viewed to be mostly caused by the client through design changes, late payments to the contractor, and delays in decision making. The top five main delay factors as identified by [Gopang, Imran and Nagapan \(2020\)](#) in their attempt to assess delay factors in Saudi Arabia Metro construction projects, are “client's decision-making process, design errors, labour skills level, design changes by Client or Consultant and issues related to permissions/ approvals from other stakeholders”. [Mahamid \(2013\)](#), in his aim to investigate the contributors to delays from owners' viewpoint, identified other top contributors to schedule delays, namely: poor site management, poor communication and coordination between construction parties, payments delay, poor labour productivity and rework. Contracting with the lowest bidder was also found to be one of the top contributors to schedule delays in public construction projects in Saudi Arabia. [Alzara, et al. \(2018\)](#) analysed cost overruns in the construction of a higher education institute in Saudi Arabia and found that bids submitted by construction companies who eventually succeeded in getting the contract, were much lower than the market project costs. This was remediated through variation and change orders that led to cost overruns.

Despite the fact that several studies have examined the factors influencing delays in public construction projects in Saudi Arabia, [Alotaibi, Sutrisna and Chong \(2016\)](#) found in their review paper that little attention has been paid to how project management tools and methods have made an impact to the incidence of project delays. Although authors identified major sources of project delays and assigned delay factors to key players, nonetheless, they have not approached the role of professional management teams in alleviating them as stated by [Almutairi and AlMunifi \(2020\)](#). Professional management-related factors such as poor planning and scheduling, poor site management and poor resource management were found by [Mahamid \(2016\)](#) to be a severe source that contributes to poor performance of construction projects in Saudi Arabia. This is supported by [Assaf, Hassanain and Mughal \(2014\)](#) who have undertaken an empirical assessment of the linkages between team effectiveness and project success in the Saudi construction industry, where results showed a positive and high correlation between team effectiveness and project success.

Beyond the overruns issue, there were a number of projects completed nearly on time and within the budget, but the organizational development objectives had not been achieved. Clients were also not satisfied, especially in higher education facilities, where operational requirements are high. It is a research gap that begs the question; is meeting time, budget and scope an ideal measure of project success? [Williams \(2016\)](#) illustrated the increasingly recognized nature of project success as being multi-dimensional, with different criteria, only some clearly measurable. Though the three criteria used for judging project success were also the highest ranked success criteria identified through the survey carried out by [White and Fortune \(2002\)](#), the fit between the project and the organization and the consequences of the project for the performance of the business were also reported as important criteria, i.e., the need to meet organizational objectives and to minimize business disruption. Drawing from empirical data on project management professionals working in UAE project-based organizations, [Mir and Pinnington \(2013\)](#) demonstrated that project management performance is correlated to project success within organizations, and by paying greater attention to this

relationship, organizations can increase their rate of project success. [Pirotti, et al. \(2020\)](#) found a significant positive relationship between top management, project mission, personnel, communication, and project success.

Thinking about how well the final product (the facility) will be operated is not a concern in some organizations, where senior management considers the issues of delay in completing projects and the incurred cost overruns as the most recurring problems, until the end-user, starts suffering from the low standards of project execution. This is another dimension of the current study that has not been discussed in-depth in previous researches. [Turner and Zolin \(2012\)](#) state that project efficiency is an important contributor to stakeholder satisfaction and overall project success and concluded that the iron triangle is an indicator of project performance but not the best measure of project success. [Serrador and Turner \(2015\)](#) investigated to what extent project efficiency is correlated with stakeholder satisfaction and overall project success. They found that project efficiency is 60% correlated with stakeholder satisfaction and 56% with overall project success. To contribute to improving clients' satisfaction in construction projects in Saudi Arabia, [Alshihre, et al. \(2020\)](#) identified prominent factors that impact clients' satisfaction: effective financial management, use of skilled workers, use of advanced technology, customer relation, and time management. Effective team leadership, project monitoring, communication and adequate knowledge and skills contribute to clients' satisfaction. [Bubshait, Siddiqui and Al-Buali \(2014\)](#) revealed that communication and coordination are key factors in successful project management. Based on their findings on project critical success factors, [Mathar, et al. \(2020\)](#) recommend that stakeholders should have accurate and clear channels of communication, in order to avoid any possibility of misunderstanding, mistakes, and consequently loss of time and money.

Building on the previous efforts of researchers in the subject area, we concluded that there is a need to study in-depth the culture dominating the construction project implementation in the KSA, to be able to address the chronic issues that adversely impact project performance and lead to inefficient and ineffective project delivery.

## Research Methodology

### RESEARCH DESIGN

The type of research questions determined the appropriate research method which is the qualitative approach. Consequently, the design of the current research benefitted from concepts developed on the qualitative research, which according to [Denzin and Lincoln \(2018\)](#) involves a set of interpretive material. First, nine case studies were conducted to collect facts and knowledge about operational processes over time which led to cost and time overruns, as explained by [Yin \(2018\)](#). Following that, focus group discussions and interview techniques with projects managers and practitioners were adopted to gain a deeper understanding. Triangulation adds depth to the data that is collected. [Denzin \(2012\)](#) sees triangulation as a strategy on the road to a deeper understanding of an issue under study, and it is focused on combining various qualitative approaches where the issue under study makes it necessary, as emphasized by [Flick \(2018\)](#). Triangulation, as suggested by [Love, Ahiaga-Dagbui and Irani \(2002\)](#) is an appropriate research approach if construction management researchers are to effectively solve the problems that the industry faces, and to adopt a robust research methodology to better understand the phenomena that influence organizational and project performance in construction. In this context, the researchers present the findings from the mixed research methods; a comprehensive systematic literature review, sites visit, case study research, focus group discussions, meetings and interviews, through triangulation approach, as illustrated in [Figure 1](#).

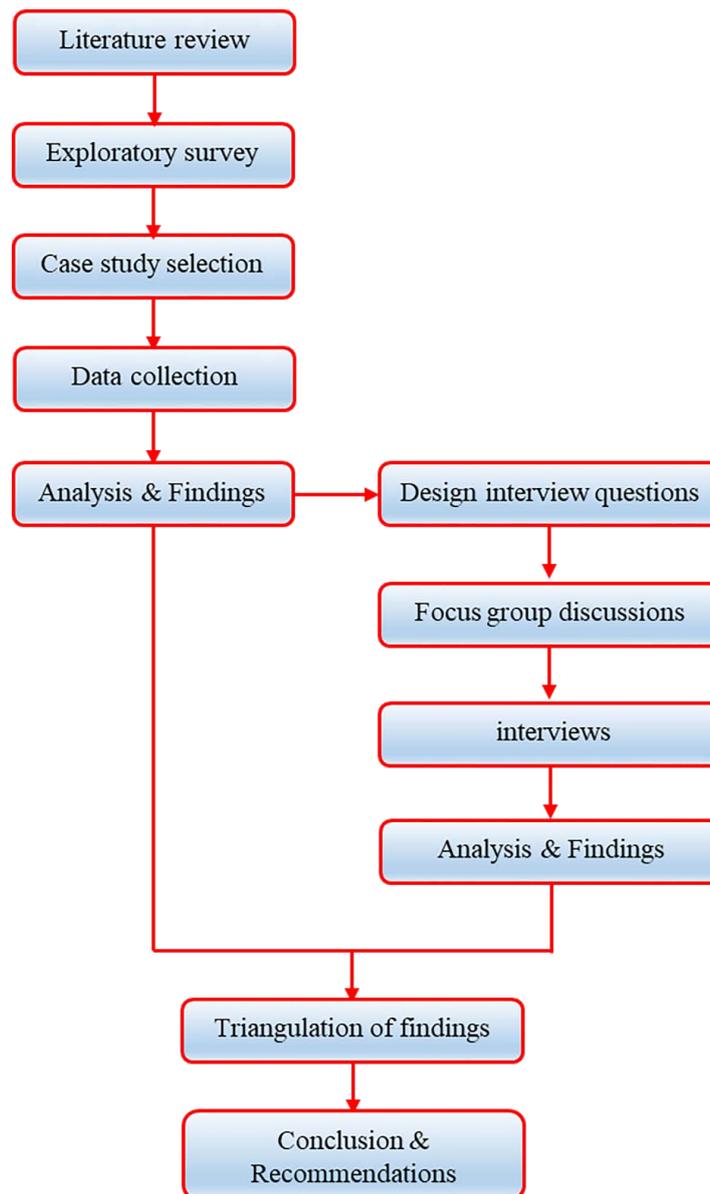


Figure 1. The research methodology framework

## DATA COLLECTION FROM CASE STUDIES

### Selection of case studies

Development and maintenance of infrastructure is one of the strategic objectives of a large public educational institute. To achieve this objective, a portfolio that includes a number of programs and projects is underway including construction of college buildings. An exploratory survey on ongoing projects was carried out to collect basic data and to establish criteria for case studies selection. Therefore, out of twelve case studies of construction projects, nine were selected based on the current status of the projects (bidding, ongoing, completed and in operation, completed but not operational), and proximity for regular visits. Each case study also gives additional information and at the same time different dimensions to the efficiency and effectiveness issue, the research subject matter.

### Within-case analysis and findings

An extensive and thorough review of relevant contractual documents and a good number of unpublished reports and communications was carried out. The case studies that had been monitored by the researchers for two years are peculiar in terms of size, project implementation phase, and issues. Some were near completion and investigated during inspection, commissioning, operation, and maintenance. Others have already been handed over, but not operated. Others completed but need investment and rework to accommodate new purpose for use. [Table 1](#) presents within-case analysis and findings.

### Cross-case analysis and findings

Many similarities were observed throughout the in-depth study and analysis of case studies, as listed in [Table 1](#). Issues such as change to construction sites, change in scope, design alteration, deficiencies in design documents, errors in BoQs, inexperienced contactor, lack of infrastructure and utilities to occupy and operate the building, and change in the purpose that it is built for, are cross-cutting. The researchers found that there was a need to enhance and complement findings through focus-group discussions and structured interviews with experts.

A set of research axes were developed. The themes for focus-group discussions were developed based on best practices and standardized construction management processes, as well as the identified main phases that public construction projects go through in the KSA. The headlines and contents of axes reflect sub-project phases, as illustrated in [Fig. 2](#), under which questions on issues that projects faced across their life cycle were outlined for focus-group discussions. These include the project alignment with the strategic and implementation plan of the organization; procedures for contracting an engineering design firm; how they work with clients through stages of preparing tender documents and invitations to bid; the contracting and preparation for project execution; handing-over, commissioning and building occupancy.

### Profiles of participants in focus-group discussions

Three sessions of focus-group discussions took place at projects sites of the most problematic and available cases. The profiles of participants in focus-group discussions are shown in [Table 2](#). For completed projects that are currently in operation, deanship, teaching staff, administrators and contractor's site engineer were met with as part of the discussions. For ongoing projects where changes occurred, the formal project manager, current project manager, and current contractor engineers were useful sources of data.

The discussions with those professionals gave the researchers a clear view on issues projects faced across the life cycle, and to what extent there exists a clear mandate for implementing management processes, and the causes of the inefficient and ineffective project implementation from the different parties' viewpoints. As a matter of fact, it was concluded that the under-consideration construction projects faced problems from their initiation until present time.

Having in hand the data from case studies and focus group discussions as well as the results of the analysis, the researchers shared initial findings with experts that were purposely selected and individually met with. They are the most experienced and were part of the focus group discussions acting as heads of teams from their organizations, as illustrated in [Table 3](#). The findings were enhanced by their valuable input.

### Promoting ethical and participatory research

To best protect the interest of participants and avoid any social and ethical implications that may result from the participants' engagement in this research, the researchers made pre-arranged official visits to the projects directorate and sites to meet participants and hold focus-group meetings. The researchers identified themselves and the purposes of research. It has been a policy to repeat in all meetings that information gathered will be used for research purposes only confirming ethical issues, anonymity and confidentiality.

Table 1. Within-case analysis and findings

Case study description	Date of contract signing	Contract duration in days	Date to be completed	Progress in % as of mid-2019	Progress in % as of Dec. 2020	Within-case analysis
A three-story reinforced concrete building with annexes to accommodate 3850 students and 180 staff. The contract value is SAR130.0 million	May 2012	1260	Dec. 2015	66	57.7*	<p>It reflects the non-involvement of the beneficiary in the pre-construction phase. The beneficiary decided to change construction site, at the time where site handing over is to take place, to another plot of land outside the campus master plan with different topography that varies from the one designs were tailored for. The beneficiary also requested some alteration to the design documents at the time the contract with the engineering design firm came to end years before. The contractor had to carry out the required alterations to the design documents. The cost of these changes in the structural works amounts to more than 20% of the total cost of structural components. These enormous changes and other issues have also caused delays. The project should be completed</p>

Table 1. continued

Case study description	Date of contract signing	Contract duration in days	Date to be completed	Progress in % as of mid-2019	Progress in % as of Dec. 2020	Within-case analysis
						and handed over to the owner by the end of 2015. Today after exceeding another extra time period of 42 months the project is still not completed and the percentage of progress as of end of 2020 is only 60%. Additionally, there is a lack of infrastructure for building occupancy after completion. This is also a case to show the waste of investment. Once the project completed and closed out, the plan is to use the facility not for the purpose for which it is built.
A cluster of three-story reinforced concrete buildings to accommodate 1200 students. The contract value is SAR15.5 million	Jun. 2014	408	July 2015	75	81	In spite of the project being just lecture halls without any complicated systems, the very low technical and financial capacity of the contractor coupled with project poor management resulted in tremendous delays. Again, it will time to equip the project area with infrastructure and utilities for building occupancy after completion.

Table 1. continued

Case study description	Date of contract signing	Contract duration in days	Date to be completed	Progress in % as of mid-2019	Progress in % as of Dec. 2020	Within-case analysis
A three-story reinforced concrete building to accommodate 3600 male students of Arts & Sciences. The contract value is SAR122.2 million.	May 2010	900	Dec. 2012	Prelim. Hand over	Plan for final hand over	This project should be completed and handed over to the owner by the end of 2014. Since the preliminary handover in 2018, the facility was not occupied due to the lack of infrastructure and utilities. The owner decided to change the facility users which required more spaces as well as alterations in many aspects including the use of labs rooms as lecture halls, building boundary walls, and adding an annex building to serve as labs. The facility is in use since beginning of 2020
A three-story facility to accommodate vocational training students. The contract value is SAR111 million.	Feb. 2010	900	Sep. 2012	Prelim. hand over	Plan for final hand over	The use of the facility has been changed completely. The investment to establish a vocational college went astray. The facility spaces, labs and workshops transformed to lecture halls. Alterations had been carried out to serve higher education humanities programs

Table 1. continued

Case study description	Date of contract signing	Contract duration in days	Date to be completed	Progress in % as of mid-2019	Progress in % as of Dec. 2020	Within-case analysis
A cluster of two-story reinforced concrete buildings to accommodate 1200 students. The contract value is SR14.2 million	Apr. 2014	289	Feb. 2015	62	71	In spite of the project being just lecture halls without any complicated systems, the very low technical and financial capacity of the contractor coupled with project poor management resulted in tremendous delays. Again, it will time to equip the project area with infrastructure and utilities for building occupancy after completion.
This facility was originally eight single-story reinforced concrete units for the amount of SR13.0million	April 2013	420	June 2014	Handed over in 2018. It is in use with ongoing corrective measures & maintenance	In use	A facility that originally designed to be composed of eight one-story reinforced concrete units. At the time of the site handover to contractor, it was found that the available plot of land is inadequate to accommodate the eight units. Consequently, the owner suspended the project for 6 months to change the type of structures and construction materials for some units from concrete

Table 1. continued

Case study description	Date of contract signing	Contract duration in days	Date to be completed	Progress in % as of mid-2019	Progress in % as of Dec. 2020	Within-case analysis
						<p>to steel. Unqualified contractor particularly to the new type of structure and poor supervision resulted in a poor-quality work and substantial delays in project completion. The final product can barely carry out its intended purpose. Many operational issues appeared, and it took about 20 months to remedy while the facility is in operation. These changes among other notable risks that adversely affected the project, such as, delays at the beginning of the project, owner tardiness in decision making, and scope changes, resulted in a substantial delay in the completion date of the project that exceeded three years. Moreover, the final product can merely perform for the purpose that built for.</p>

Table 1. continued

Case study description	Date of contract signing	Contract duration in days	Date to be completed	Progress in % as of mid-2019	Progress in % as of Dec. 2020	Within-case analysis
Residential villas for the academic staff for the amount of SR323.5 million.	Sep. 2009	1080	Sep. 2012	Plan for final hand over	Plan for final hand over	The contract for constructing accommodation for the academic staff signed in 2009. Since the preliminary handover mid-2015, the campus not in use until date, and may need at the present costly maintenance. 2. Lack of infrastructure and utilities to occupy the building. Networks services, such as electricity, water, waste drainage systems are lacking. It is a wasted investment as of mid-2021 the facility still not yet in use.
Conferences and multiple-use buildings for an amount of about SR200.0 million.	Dec. 2012	1080	Dec. 2015	60	71	It is intended to be a multiple use facility and consequently a good time invested in design to bring the final product up to at least local standards. The construction site handed over to contractor in December 2012 and expected to complete works by the end of 2015. Because of shortage in financing the project, the works commenced only in three buildings instead of

Table 1. continued

Case study description	Date of contract signing	Contract duration in days	Date to be completed	Progress in % as of mid-2019	Progress in % as of Dec. 2020	Within-case analysis
						<p>five with changes in design. The inexperience contractor in similar construction, poor supervision and weak safety culture resulted in a major accident, the collapse of large under construction floor killing 10 people. The owner decided to withdraw the project in Sep. 2018, where work progress did not exceed 41%. The second contractor in the list took over and progressing very slow. The project is still not completed and the progress as in 2020 is only 66%.</p>
New building to accommodate engineering students	In the tender process					<p>Design documents were developed in 2014, the initial cost estimate at that time was SR100.00 million. In December 2018, after five years had elapsed, the invitation to bid was issued using the same tendering documents. As of mid-2021, bids evaluation and negotiation continues, and the contract not yet been awarded.</p>

\*The % of progress went down due to a request for additional works, i.e., infrastructure.

Table 2. Profiles of participants in focus-group discussions

Organization	Role	Experience in years		
		Case 1	Case 5	Case 8
Client	Project Manager	15	10	12
	Former Project Manager	-	-	20
	Engineer	6	5	17
Supervising consulting firm	Senior Engineer	16	-	-
	Site Engineer	8	5	-
Contractor	Project Manager	22	-	25
	Planning Manager	15	-	-
	Site engineer	10	5	15
Beneficiary/end user	Department Head	-	4	-
	Teaching staff	-	6	-
	Administrative staff	-	8	-

Table 3. Profiles of experts

Organization	Position	Experience in years
Client	Portfolio Director	15
	Former Project Manager	20
Supervising consulting firm	Senior Engineer	16
Contractor	Project Manager	22
Beneficiary/end user	Vice-Dean	6
	Teaching staff	8

## Analysis, Findings and Discussion

The data collection process that was based on a deductive approach that implied pre-established and preconceived structured themes (Fig.2), has simplified the integration of data for analysis, interpretation, and results presentation. The first step was to examine the data contents that were in the Arabic language, then to retrieve and tabulate responses according to the pre-established themes. The researchers then translated the responses verbatim into English. The analytical technique which was followed is the deductive content analysis that is based on earlier identification of main issues throughout project implementation phases.

### TRIANGULATION OF FINDINGS

According to [Oesterreich and Teuteberg \(2016\)](#), triangulation offers to researchers the opportunity of viewing and analysing the research topic from different perspectives. As a result, the research questions can be better answered because researchers can put together the different findings from the various methods

and produce more consistent and convergent results. The benefits of using a mixed method research design ([Abowitz and Toole, 2010](#)) is that they are especially applicable to areas of construction research that align with the social sciences, and involve human actions in construction processes, such as leadership, innovation, and planning. This approach enabled researchers to triangulate the collected data to enhance results and findings. Data from field visits, direct observation, contractual documents analysis, case studies, focus groups discussions and interviews have been used to formulate an understanding of the culture dominating the construction project implementation in the KSA. [Figure 2](#) serves as a reference point for this discussion.

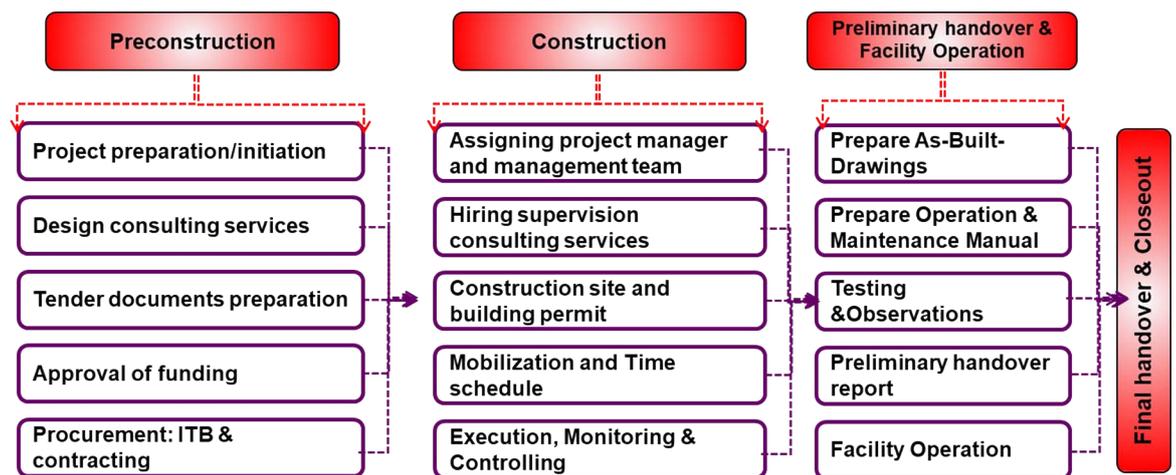


Figure 2. Phases and sub-phases of construction project life cycle

## PRE-CONSTRUCTION PHASE

Walking with participants through the observed issues in the case studies, and after cross-checking findings with experts, it was easy to grasp the sources of barriers and snags that show up throughout the projects lifecycle. Most of these issues can be prevented during pre-construction according to [Autodesk \(2020a\)](#) by having an integrated preconstruction strategy.

### Project initiation

The process of building sufficient data with which owners can address risk and make decisions to commit resources in order to maximize the potential for a successful project is not a practice. It is obvious that there are missing learning opportunities for KSA construction sector that can be gained through projects final review and evaluation, which would benefit similar future projects. This is supported by [Algahtany, Alhammadi and Kashiwagi \(2016\)](#) who found that decision making is based on lack of information. Project estimates are not based on accurate calculations but retrieved from outdated and limited similar projects data that misinform budget allocations. “The initial project cost estimate is not based on accurate calculations, and the annual allocation for ongoing projects is inaccurate” a statement that was agreed upon on in focus group discussions. It is in line with [AlSehaimi, et al. \(2013\)](#), [Mahamid \(2016\)](#) and [Almutairi and AlMunifi \(2020\)](#) who confirm that poor planning and scheduling is one of the top severe factors contributing to inefficient implementation and to not achieving the project development goals.

The research findings prove that there are a number of disconnected activities, and crystal-clear weaknesses in the pre-construction planning (PCP) or front-end planning defined by the [Construction Industry Institute \(2012\)](#), as there is no pre-construction team to handle this phase. Even the “project manager is appointed after contract awarding” as quoted by a PM.

One of the main findings is that there is a disconnect between projects' phases and people. The construction phase is not integrated into the pre-construction phase. Therefore, the final product could differ widely from what had been initially planned. The inefficient and ineffective project implementation is a result of traditional regulations as well as poor management practices; either those of the owner's organization, the pre-construction team or the construction team, as referred to by [Gopang, Imran and Nagapan \(2020\)](#), [Mitra and Wee Kwan Tan \(2012\)](#), [Simushi \(2017\)](#), [Alofi, Kashiwagi and Kashiwagi \(2016\)](#) and [Alzara, et al. \(2018\)](#). The project manager as a focal point is appointed after the contract awarding. The construction team is unaware and not involved in pre-construction activities. The hand-off from pre-construction to the construction team is a critical aspect of the preconstruction process to ensure that the construction team knows where all of the critical construction challenges are ([Autodesk, 2020a](#)).

It is crucial to define the project scope ([Fageha and Aibinu, 2014](#)) at the earliest stage and involve all stakeholders, and in particular, the end-user. The Cases 1 & 2 are exemplary cases for not involving end-users in project initiation and design. "They do not consult us", a former college Dean complained. This resulted in lack of ownership or exaggerations in showing ownership by imposing changes to designs and construction sites that were costly and exposed the projects to overruns from the very beginning, as can be read in the case studies, and in line with [Mitra and Wee Kwan Tan \(2012\)](#) and [Alshihre, et al. \(2020\)](#).

### Design documents preparation

The weaknesses in engineering practices and standards that organize the profession is one of the major issues in the KSA construction industry. Recruiting a design engineering firm that has no specific experience in the organization business has serious consequences, as it is one the most significant causes of deficiencies in design documents ([Assaf, Hassanain and Abdallah, 2018](#)), such as producing identical designs for facilities that run completely different educational programs. "It is not stated clearly in the RFP that the EDCF must have experience in designing educational facilities" as quoted by one PM. The lack of partnership with owners characterizes the design firms work. It was found that no conceptual design is presented, with few exceptions, to be discussed with the owner and beneficiary, and to get the necessary approvals. The same applies to architectural and structural designs. By all means, it is akin to having no partner from the owner side. There is a capacity issue in the project management directorates. However, there is also a belief that the design firm is the most knowledgeable and nobody can sound the alarm or comment on their work. Under time-bounded contract, the designer works in one direction characterized by a disconnect between inter-relational design activities as illustrated below.



It was also found that it is not a practice to have a peer design firm to review design documents and run value engineering, nor constructability analysis in the production of the design documents. This is in line with findings from [Assaf, Hassanain and Abdallah \(2018\)](#) and [Love, Ahiaga-Dagbui and Irani \(2013\)](#). To protect professional liability, the designer should avoid any conflict between construction specifications and drawings and should work toward limiting the number of errors and omissions to produce accurate cost and time estimates. In traditionally procured projects as is the case of this research, drawings contain the highest number of errors, followed by the bill of quantities and specifications ([Dosumu, 2018](#)). The owner relies completely on the design firm, and the lack of interest by approving authorities to carefully check the design is one of the top causes of discrepancies ([Chaudary et al., 2017](#)).

### Procurement: invitation to bid and contracting

When a budget is allocated for a project, things then move very hastily without updating the tender technical documents that were developed years prior, as the main focus at this stage is to use the allocated funds. The time gap between producing design documents, bid invitation and construction, which is referred to by [Love, Holt and Li \(2002\)](#) as “procurement gap”, is one of the reasons for design alterations and variation orders. This is valid in almost all case studies, and particularly in Case 9. A supervision engineer expressed frustration: “the design documents of the project that I monitor were prepared 7 years ago and have not yet been contracted to start execution”. He added: “the project is just announced for tendering without any reviewing and updating design documents.”

The traditional procurement method, design-bid-build, dominates and is extensively practiced in the KSA. This method lacks innovation and does not make use of new developments in design, materials, and construction approaches, and constitutes a potential cause of projects poor performance ([Simushi, 2017](#); [Alofi, Kashiwagi and Kashiwagi, 2016](#); [Alzara, et al., 2018](#)). Procurement is more important than the construction phase according to [Kabirifar and Mojtahedi \(2019\)](#). The lengthy procedures and deficiencies in tender documents along with payments delay are risks that are priced by bidders. Data from case studies show that unit cost is higher in governmental projects than in non-governmental projects. This is in line with [AlMunifi and Alameri \(2019\)](#) who found that contractors add up to 20% for the client’s procurement procedure, approvals and payment cycle. In the absence of the inadequate attention to the technical and financial capacities of the bidders, the data collected from the nine case studies show that the outcome of the evaluation process of bids was in favour of lowest price bid ([Alzara, et al., 2018](#)). This was also the participants’ common concern.

## CONSTRUCTION PHASE

### Project management team

The management team, the supervision consultant and the contractor constitute the construction team that is disconnected from the pre-construction work. While the team’s mandate is to ensure efficient project execution, enormous challenges stand before them from day one. The roots of the ensuing complications in the construction phase can be clearly seen. It was found that there are considerable delays in all projects. None of the case studies projects were completed or are expected to be completed according to the contracted time period. There is a capacity issue, lack of knowledge and leadership that would enable the PM to take on the role of managing all parties. This may result in high-level accidents as stated by [Wu, Li and Fang \(2017\)](#) and demonstrated in Case 8.

The findings show that there is neither a setup and competitive process to appoint the management team nor a set of criteria to monitor the management team performance. Having a formal management system for developing and updating KPIs can impact team performance and project efficiency ([Mir and Pinnington, 2013](#); [Arditi and Alavipour, 2019](#)).

### Site delivery: The readiness of the construction site:

It is common that construction sites are not delivered to contractors within the period specified in the contract documents. A PM stated: “The timeframe is two weeks, but usually it takes longer”. The non-involvement of the beneficiary in the pre-construction phase worsens the situation. The findings show that either designs did not fit on the assigned construction site, or the beneficiary moved the project to a site that differed in topography and soil conditions. This results in alteration of project scope, design, type of structural system as well as construction materials. Any alteration to design documents was carried out by the contractor as the design firm contract had already ended. These changes complicated the situation

and resulted in change orders and project overruns as supported by [Gopang, Imran and Nagapan \(2020\)](#) and [Assaf, Hassanain and Abdallah \(2018\)](#). It was found that the wasted time for handling such changes exceeded a year.

### Mobilization plan and time schedule

The findings show that there are no obligatory regulations to command contractors to submit site mobilization plans. "It is the contractor's business to handle site" quoted a site manager. It is completely left up to the contractor to manage site mobilization and de-mobilization. Some contractors used to develop suitable time schedules and update them frequently using planning software. They recruited skilled workers that contributed to timely project completion and led to owner satisfaction ([Alshihre, et al., 2020](#)). On the other hand, others just utilized a very simple tool, Gantt chart with bulk activities. Nevertheless, project time schedule is not respected by key players.

### Monitoring & controlling of project execution

In the absence of an integrated project planning document that identifies and schedules all resources to be used for efficient implementation of a project, it is normal that such project will be uncontrollable. The poor projects performance at the construction stage relates closely to KSA construction sector issues, such as drawbacks of the construction firms in term of the inefficient use of construction technology, advanced building materials and equipment ([Sayyed, Hatamleh and Alaya, 2021](#)) and management weaknesses in implementing the knowledge management processes, construction planning, risk management, monitoring and controlling of time, cost and scope ([Alotaibi, Sutrisna and Chong, 2016](#)). The findings also show that project management teams do not lead, they just manage the work of contractors. The issues that have accumulated from the pre-construction phase coupled with lack of a timely response from the supervisor engineer to the contractor quarries and claims, certificate approval and disbursement, require a very proactive and decision-making management as also concluded by [Assaf, Hassanain and Mughal \(2014\)](#).

### Preliminary handover and building occupancy

It is a crucial phase of the project in which project outsiders inspect if the product is truly what has been designed, and test if the facility works and delivers services that it has been built for. Therefore, it is essential for the project team to have all documents, such as As-Built Drawings, certificates and reports of systems testing and commissioning, operation and maintenance manuals, health and safety manuals, well-preserved and easy to access by the handover committees, owner and operation teams. Nonetheless, this phase is not given as much weight as other phases by most of the project stakeholders, which leads to information gaps between the project construction and post-occupancy phases ([Tan, Zaman and Sutrisna, 2018](#)). The findings show that the issues that govern the project performance throughout the construction phase have their negative consequences on facility operation. These can be seen through defects and re-work required after handover in almost all completed facilities. The findings also show a wide variation between the final product and initial design that is very relevant to poor planning in the pre-construction phase. There is a waste of investment where facilities remain idle for years after handover due to either alteration requirements or lack of infrastructure and utilities suitable for building occupancy.

### FINAL HANDOVER AND CLOSEOUT

The especially important question that arises after the elapsed maintenance period (12 months) from the preliminary handover is: has the facility satisfied the user requirements? The closeout phase includes a variety of activities requiring careful attention not only from the operation team but also from the management and contractor team who are now busy with new projects. Nonetheless and according

to [DeMarco \(2011\)](#) it is most often miscalculated. This phase involves a number of tasks and presents learning opportunities for the organization through the project final review and audit report that would benefit similar future projects. This is because it is an opportunity for post-occupancy evaluation, the implementation of which still faced barriers in the Saudi construction industry ([Hassanain, et al., 2020](#)). The Future is built on data ([Autodesk, 2020b](#)). Therefore, planning for future construction projects will draw upon the massive amounts of data collected from previous projects. This is a missed opportunity as the findings confirm. As it can be read in table (1), many facilities are not operated on a timely manner; neither are lessons documented for future use.

## Conclusions

The first research question is, why construction projects perform poorly throughout project phases, and how does this lead to inefficient and ineffective project implementation? The research design, methodology and data collection, helped in answering the questions. Assuming that a project goes through the major phases shown in the following diagram:



1. The pre-construction phase is not well-established in the KSA construction projects. Few disconnected activities are carried out in different time spans. The deliverables of these activities may collect dust on a shelf somewhere for years until funds are allocated. Even the last sub-phase of pre-construction, namely the contracting, may take years as clearly indicated in one of the case studies. The outdated designs, materials, specification, estimates, and even contractor quotations represent the first barrier in the road to implement projects efficiently and effectively. Therefore, it can be concluded that there is a very foggy pre-construction phase, and projects start at the construction phase as illustrated hereunder.



2. The non-existence of a pre-construction team to hand-off to the newly formed construction team is a challenge to the management team and supervision consultant. What has been practiced until signing a construction contract seems irrelevant to the construction site. Therefore, problems start immediately with site delivery to contractor, the unavailability of infrastructure and utilities, and in some cases the interventions of the beneficiary. The current practices do not challenge contractors to submit along with their offers proposed methods of construction, type of equipment, and personnel qualifications. Mobilization plans, and in several cases, even time schedules were not provided and, it appears, were not a requirement. Monitoring and Controlling is very weak. There is a lack of management toolbox and PMTs are not proactive enough. They react to problems instead of acting proactively to avoid these problems before they occur. The PMTs must be challenged and encouraged, and at the same time should be held accountable. A set of KPIs to measure the management performance would challenge project managers. Projects that are completed on time are usually not because they were managed well, but as a result of the contractor's technical and financial capability. Those very few contractors do the best not to gain a bad reputation. At the end, most of the failed projects are assigned to those contractors.

3. The unavailability of utilities (electricity, water, and telecommunication networks) makes testing of systems impossible. A preliminary handover is based on superficial inspection and a report is issued with minor remarks.

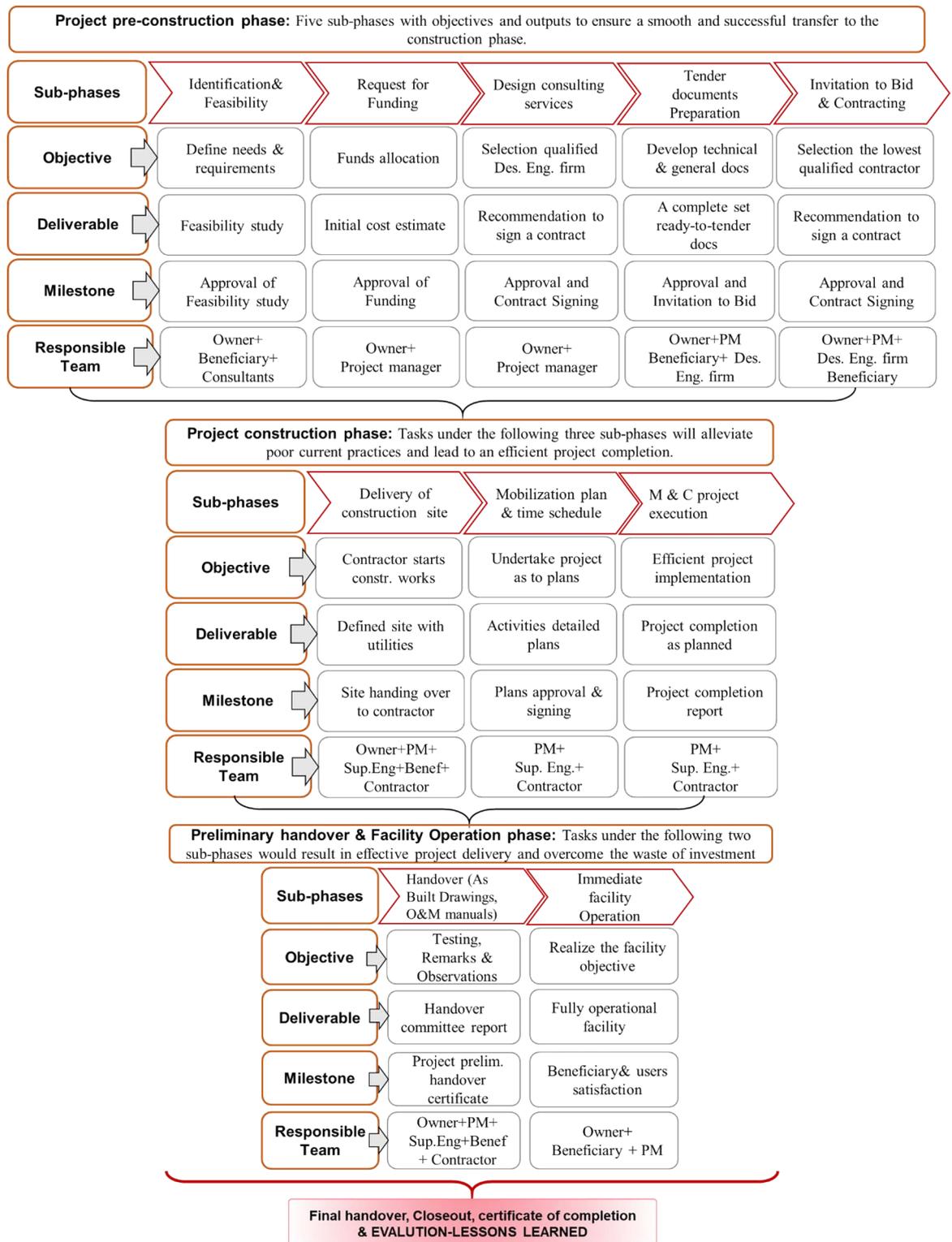


Figure 3. An integrated strategic construction project management framework

4. Most of the facilities have not been operational after the preliminary handover for a number of reasons. Buildings stand idle for years as shown in [Table 1](#), either because no infrastructure and utilities exist, or the beneficiary is not satisfied and attempts to avoid the moving problems. The future usage of the facility may differ from the purpose for which it was built. Then alterations start to adapt to the new requirements. In some cases, the facility failed to deliver the desired benefits effectively and additional investment is needed to treat deficiencies.

The second research question is, how an in-place ISCPMF would ensure efficient and effective project implementation. Having in mind the current practices and overall challenges facing the Saudi construction sector, the researchers propose an ISCPMF ([Figure 3](#)), which incorporates the findings of the present work as it benefited from best practices in the construction project management. The framework calls for institutionalization of projects phases by setting up for each sub-phase a matrix of objectives, deliverables, milestones activities and composition of responsible teams. It is expected that the sets of structured tasks that extend over the project lifecycle would ensure a well-established pre-construction team that will successfully accomplish activities in a timely manner from project identification to construction contract signing, and hand-off to the construction team. This will in turn ensure project execution and collaboration with beneficiaries for timely handover and facility occupation.

The foggy pre-construction phase should be given great attention to overcome issues listed earlier. Five project sub-phases are named, and each one has an objective and an output that should be produced by a pre-construction team in a timely manner and endorsed by the organization. This will ensure a smooth and successful transfer to the construction phase.

The main actors of the pre-construction team are now part of the construction team. The proposed tasks under the three-project construction sub-phases will alleviate poor current practices that have been elaborated in the findings and discussion section and will definitely lead to an efficient project implementation. To overcome the waste of investment by not operating facilities immediately after the handover, two sub-phases are named with proposed activities and teams that would result in effective project delivery. It is of great importance to conduct a project final review and evaluation and document lessons to be learned to benefit future projects.

## Future research

The adoption of the ISCPMF will greatly improve projects delivery. Evaluation and enhancement by researchers and practitioners should continue. The cost of investment in projects that take more than double the contacted period as well as the price of not using facilities that stand idle for years without operation, are areas to be explored. The outbreak of COVID-19 pandemic has maximized the Saudi construction sector challenges. The performance of the Saudi construction sector amid coronavirus pandemic in particular, and the capability of the sector to face such crises, needs to be investigated.

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