Sudan University of science and technology

Collage of Graduate Studies

Overheads and their impact on construction cost in Sudan

المنصرفات غير المباشرة وأثرها على تكلفة التشييد بالسودان

A thesis Submitted in Fulfillment of the Requirements for the PhD Degree in civil Engineering

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Feb.2020

الآيـــــة

قال تعالى :

﴿قَالُواْ سُبْحَانَكَ لاَ عِلْمَ لَنَا إِلاَّ مَا عَلَّمْتَنَا إِنَّكَ أَنتَ الْعَلِيمُ الْحَكِيمُ﴾

صدق الله العظيم

الأية 32 سورة البقرة

DEDICATION

To everyone who cares about us, and especially

Dr. Abdalla Mohammed Awadalla

Dr.Mansour Ahmed Mohammed

To our parents who have given us everything they can.

To my wife and my kids who assist and encourage me

very much to proceed and hand over produce this thesis.

To everyone who gave us support.

ACKOWLEDGMENT

I would like to express my heartfelt gratitude and sincere thanks to my supervisor Dr. Abdalla Mohommed Awadalla and co-supervisor Dr. Mansour Ahmed Mohammed for their continued supervision, guidance, advice and support.

I would like to thank all those who have given me enormous help to write this research. In particular, I am grateful to Prof. Salih Alhadi, Dr. Bakhit Alballa, Dr. Tarig Elrasheed; I thank also the respondents of my questionnaire and case study for their participation. Without their cooperation, this thesis would not have been completed.

ABSTRACT:

When preparing bids of construction projects all direct costs and project overhead costs should be included as line item costs (cost components) in the bid or project's budget. Overheads percentage (index) should be clearly identified in order to calculate projects cost accurately and precisely. The absence of logical overhead percentage in Sudan is the main reason of this research.

Based on the current situation in project costing in Sudan, and the practice for calculating the overhead charges, this study targets to achieve its main objectives including identifying the overhead charges, verifying and calculating the overhead percentage in Sudan.

The research is based on analytical methods by using a questionnaire and a case study. A questionnaire has been distributed to 156 construction contracting companies as well as business trade name whereas the case study was submitted to three contractors provided that all these contractors are working in Khartoum state whereas the samples were selected randomly. Statistical analysis has been used for the data analysis by using SPSS.

From the questionnaire and the case study analysis shows that the calculated overheads was 30.65% provided that there are many overhead items were not calculated because they are not occurring at the case study. The researcher recommended that more researches should be conducted for finding out overhead index that represents a reference (index or a code) for calculating an exact and accurate project cost.

Keywords: Construction cost, cost components, overheads, overhead index

المستخلص:

عند إعداد تكلفة أى عرض أو عطاء للتشييد يجب تضمين تكلفة كل المصروفات المباشرة وغير المباشرة بإعتبار أن ذلك يمثل مكونات وتكلفة المشروع الكلية. .بجب تحديد نسبة المصروفات غير المباشرة حتى يتسنى حساب تكلفة المشروع بصورة دقيقة وصحيحة .عدم وجود مرجعية علمية لحساب نسبة المصروفات غير المباشرة بالسودان هو السبب الرئيسى وراء هذا البحث.

حسب الوضع الحالى بالسودان لحساب المصروفات غير المباشرة بالسودان والمبنى على الممارسة المهنية أتبعت الدراسة فى منهجيتها الأساسية على تحديد المصرفات غير المباشرة وحصرها بدقة ومن ثم حساب نسبتها من تكلفة المشروع الكلية .

تم بناء الدراسة على طريقة تحليل البيانات وذلك بإستخدام الإستبيان ودراسة الحالة لجمع المعلومات . حيث تم توزيع الإستبيان على عدد 156 (شركة وإسم عمل) تعمل فى مجال المقاولات كما تم توزيع دراسة الحالة على 3 شركات مقاولات وكل هذه الشركات وأسماء الأعمال تعمل فى المقاولات بولاية الخرطوم حيث تم إختيار العينات عشوائيا ومن ثم عمل التحليل للبيانات بإستخدام التحليل الإحصائى.

من واقع تحليل الإستبيان ودراسة الحالة بلغت نسبة المصروفات غير المباشرة 30.65% مع الإشارة إلى ان هنالك 9 عناصر من المصروفات غير المباشرة لم يتم حسابها حيث لم تكن ضمن المصروفات التى شملتها دراسة الحالة.

أوصت الدراسة بعمل مزيد من الدراسات للمصروفات الغير مباشرة لمشروعات التشييد بالسودان حتى مرحلة الوصول إلى نسبة تمثل المرجعية الأساسية المتفق عليها لحساب المصروفات الغير مباشرة بالسودان وبالتالى حساب التكلفة الكلية للمشروعات بصورة دقيقة .

NOTATIONS

D OH	Direct Overheads
ID OH	Indirect Overheads
GDP	Gross Domestic Product
OCCF	Organizing Council for Consultancy Firms
OCEWC	Organization Council for Engineering Works Contractors
SF Estimates	Square Feet Estimates
CF Estimates	Cubic Feet Estimates
C.V	Curriculum Vitiate
USA	United States of America
SDG	Sudanese Pound
NN	Neural Network
RMS	Root Means Square
PCU	Palestinian Contractors Union
UNWRW	Nations Relief and Work Agency
VAT	Value Added Tax

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CHAPTER ONE

INTRODUCTION

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INTRODUCTION

1.1 General background

Construction is a large and complex industry comprising several types and sizes of organizations and a diverse range of professional and other representative bodies: clients, contractors and specialist firms.

Construction industry includes a wide range of fields, prominent examples of which are civil engineering works and building structure, but, generally speaking, construction ranges from construction of power stations, factories, chemical plants, roads, bridges to shipbuilding and satellite construction.

However, the description mentioned here is by no means a limitation to the sectors of this industry, which keeps developing and expanding continuously with the development of relevant sciences and needs.

Construction Industry plays a conspicuous part in the development of countries through the creation of employment, provision of social infrastructures hence, contributing to the gross domestic product (GDP) of the countries. Construction projects are unique and they entail great care about the various Complexities, uncertainties and risks that the parties might encounter during the execution of various projects.

The construction Industry in Sudan represents one of the largest industrial sectors which has ended up as one of the most dynamic sectors in the country, particularly after Petrol exploration (2000 -2010), and experienced real growth over the past few decades with a direct impact on the national economy.

The construction Industry, particularly the building industry in Sudan is considered one of the largest industrial sectors with direct effect on the national economy. Even though this sector faces number of difficulties and obstacles such as international economic sanctions, unstable market conditions, lack of

construction project management skills, workmanship problems, poor performance of projects management, rate fluctuations increase in all construction material costs, and devaluation and currency exchange rate.

Construction industry in Sudan has witnessed remarkable progress, so the proper project costing becomes highly needed for the contractors and even for the Engineer and the client.

Constituents of construction costs are numerous and the impact of individual components on the total construction costs is much related to the prevailing economic conditions, supplier structure and the size of the market.

Construction cost is affected by a large numbers of factors because of the fact that construction is a multidisciplinary industry and its work involve many parties such as the owner and various professionals, contractors and suppliers. Thus, a project cost not only depends on a single factor but a cluster of variables that are related to the characteristics of the project and to the construction team as well as the market conditions.

Most of the components of construction costs are integrated in the total construction costs. Labor and materials costs have not only been prominently cited as components in the construction cost structure but they have also been tagged as the largest proportion in the total construction costs.

Some costs that are simply recognizable and self-explanatory that relate to a specific item or product such as labor or material costs. Thus, they have been termed as direct costs. Other costs that are neither specific nor easily identifiable, i.e. overhead costs are often labeled as indirect costs.

The factors influencing construction costs were formed into four groups/layers; project-specific factors, client-contractor related factors, competition and market conditions, and finally macroeconomic and political factors.

Client-contractor related factors are very susceptible to the level of competition and the intensity of construction activity. The level of competition and construction activity influences the cost of inputs and could also have an

enormous impact on indirect costs. Competition and market conditions affect both direct and indirect costs but their impact on the latter is more exaggerated when client/contractor related factors are taken into consideration.

Some other factors affecting cost performance including construction projects location , designs the bid process, the quality and the constructability of the design, managements techniques employed by the contractor, pre-qualification requirements ,hostile socio economic relations estimate the number of bidders and their identity, which in turn can affect the level of their bids, the severity of the competition and accordingly in setting the optimum mark-up that maximizes expected profit and the chance of winning the project, and aggressive competition at tender stage .

The impact of project-specific factors on regional construction cost differences could mainly be linked to the indirect cost part of the construction costs where client-contractor related factors such as contractor/client type and the extent of relationship between contracting parties seem to influence these costs.

Subcontractors' costs as part of the direct cost and allowances for risk as part of the indirect costs. Subcontractors carry out up to more than 50% of the work of any particular project and hence the main contractors include subcontractors' prices in their estimation.

Construction cost increases seem to materialize after the commencement of the construction but the problem is deep-rooted during contract estimation and tendering stage.

Overhead costs comprise a significant part in the construction estimate; the evaluation of overhead costs is a key task for building construction. However, the unstable construction market makes it difficult for contractors to decide on the optimum level of overhead costs since the overhead percentage is not definite.

For project cost calculations, resources needed to complete the project activities should be maintained i.e. to be sure and exact that the project is going to be completed within the calculated budget and schedule.

Cost estimation involves developing an assessment of likely quantitative result-how much the project cost? Pricing is a business decision-how much will be paid to the contractor to execute the project, the words price and cost become synonymous and a source of confusion in construction context such as cost estimation, pricing, building cost or building price, the project cost must include but not limited to materials, labor, equipment's, any other overheads charges.

Cost estimate must be developed depending on the availability of design drawings and specifications during these phases: the conception phase, the development phase, the construction phase, and the commissioning phase.

When preparing bids for construction projects overhead cost should be included in the bid or project's budget. Overhead costs should be tracked, just as one prepares budgets for and tracks direct and indirect construction costs for each project.

Factors affecting the estimation of overhead costs are including the management capacity of the company and its policy, led by the company's experience and ability to implement the project within the time frame. The company's experience in implementing similar projects provide an opportunity for the contractor to determine accurately the amount of overheads expenses of the project planned to be priced otherwise the overhead cost increases and subsequently the project price increased.

Overhead vary from project to project but overhead items for the general contractor should be estimated in detail for all activities at construction documents.

When preparing bids of construction projects all direct costs and project overhead costs should be included as line item costs in the bid or project's

budget. The budget for these costs can then be monitored and tracked during the course of the project. Most of the construction companies often spend enormous amounts of time and effort budgeting, tracking, and controlling construction costs while ignoring general overhead costs. The construction cost should include the overheads and the markup.

Overhead pricing need special care and judgment for historical data, and current labor market conditions to establish overhead costs.

The overhead cost represents a considerable amount with respect to other building components and hence it has direct impact on the project cost.

The estimation of overhead percentage was influenced by historical data of the projects; a forecast of future activity, the ratio between main contractors' and subcontract work, competitive conditions, the size, nature and duration of the project and an evaluation of risk.

Overheads percentage (index) should be clearly identified in order to calculate projects cost accurately and precisely.

1.2 Research problem

Based on the researcher's observations from prospective in construction industry, regarding construction project costing, it was noticed that the overhead index is not that definite and there is a considerable discrepancy between the prices in tendering competitions. The absence of logical overhead indicator is the main reason for focusing on and the idea of this research.

Identifying and calculating all overhead charges is not that simple and the information required is not easily accessible but because of its importance some work has to be conducted in this topic.

The practice in Sudan for overhead charges estimation depend on percentage to the project cost (materials, labor, equipment's and subcontractors).

The main problems of the research are:

A. A. To generate an index for overhead charges i.e. to keep the quantities of resources (materials, labor & equipment's) constant and finding the

percentage of overhead charges cost relatively & proportionally by finding the dimensionless number(index) or ratio.

B. To avoid repeated calculation for overhead charges for every project separately, the index (ratio) generated can simply be used to calculate out overhead charges for that specific job.

C. To contribute with those concerned (consultants, contractors) to know the actual project price in order to assist on the selection of the right bidder with reasonable price for minimizing the discrepancies & contractual disputes.

D. To determine the impact of the overhead cost on construction contracting companies.

1.3 Research objectives

Based on the current situation in project costing in Sudan, and the practice for calculating the overhead charges, this study targets to achieve the following objectives:

A. To identity the overhead charges.

B. To verify and calculate the overhead ratio and subsequently the project cost.

C. To use questionnaire to measure the factors affecting the overheads cost at different stages of the projects life cycle whereas using the case study for calculating the overhead percentage.

D. To examine the overhead percentage in Sudan.

1.4 Research Hypothesis and questions

The main proposed hypothesis for determining the overhead charges can be outlined as follows:

A. Overhead costs are different from one contractor (company) to another but the overhead cost index should be the same.

B. Big contractors (companies) execute big projects and have big overhead costs and vice versa, hence the overhead costs are taken proportionally

(with dimensionless) ratio as a percentage called an index, the said index provides a comparison of overhead costs to the project actual cost for each and every project.

C. The concept is to establish an index to avoid having to estimate overhead costs for every project, reasonably assuming that the overhead costs ratio (index) is constant.

D. Overhead cost affects the construction cost and it has its impact on the construction companies.

E. Overhead costs represent a considerable ratio (Not less than 35%) of a project construction cost without adding the profit margin.

The main research questions are:

1. What are the overhead charges?
2. Is there any index given for these overhead charges?
3. How are these overhead charges determined and calculated?
4. What is impact of overhead charges on the construction contracting companies in Sudan?

1.5 Research Methodology

After identifying the problem, studying the literature review, data collection, designing questionnaire and case study and ending with the discussion and recommendation.

The methodology steps can be summarized as follows:

A. Research objectives has been selected and decided.

B. The research problem has been identified and formulated.

C. A Questionnaire is designed precisely to cover all the listed overhead charges of the project.

D. A Case study for calculating the actual overheads from previous executed projects is arranged.

The flowchart of research methodology is as described in **Figure 1.1**

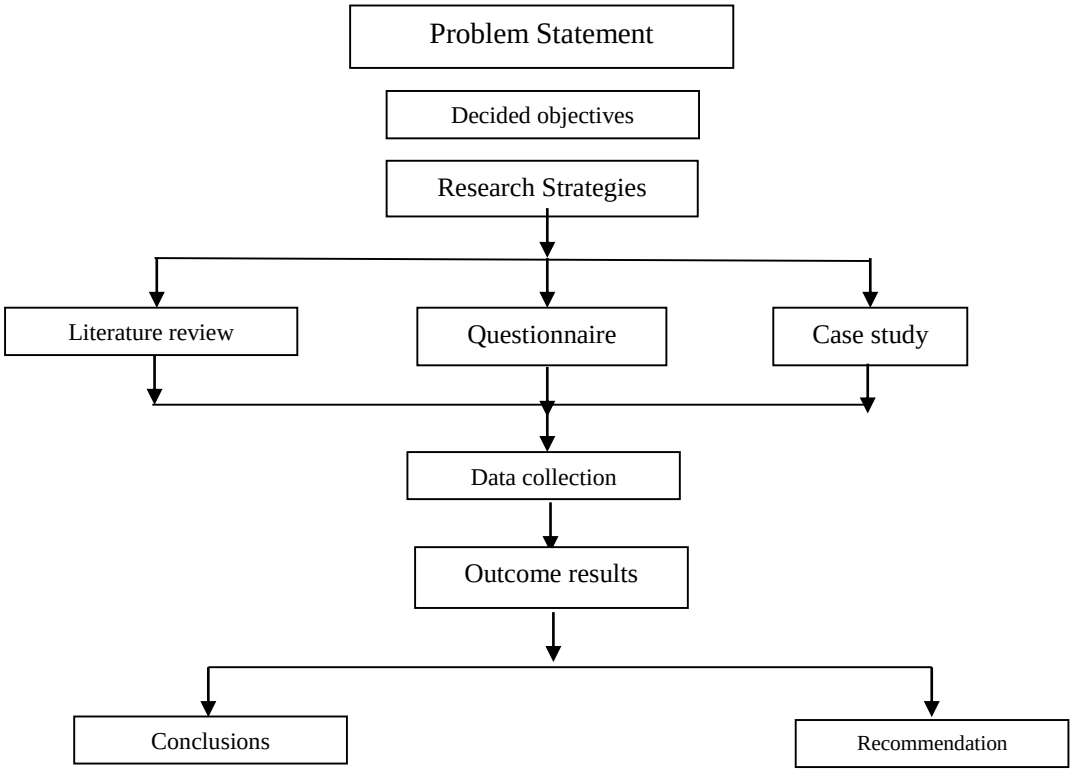

Figure 1.1 flow chart of research methodology

1.6 Research limitation

The study focused in determining the overheads for construction contracting companies in Sudan for assisting in calculating the project cost accurately and precisely.

The main limits of the research are as follows:

- **A.** The research focused on construction companies in Khartoum especially for building construction companies.
- **B.** The research has been applied to the construction industry in a very limited period of time (2012-2019).
- **C.** Limited case studies taken give general overhead ratio indicators.

1.7 Thesis Layout

The Thesis consists of six chapters spanning in 262pages including:

Chapter (One) identifying the problem, giving a background of the research as well as the problem definition, objectives, research hypothesis and questions, research methodology and research limitation.

Chapter (Two) represents the literature review in depth to theoretical framework of the construction industry with special focus in Sudan, it covered the importance of cost determination and cost estimate, related engineering firms, tendering, construction contracts and contracts documents in addition to overhead concepts.

This chapter includes previous studies regarding the overheads issues, comments and benefits gained from previous studies ending with current study with regard to previous studies.

Chapter (Three) contains data collected from several sources, where the researcher elaborated definitions of different overheads definitions and classifications in different project stages used in this research.

This chapter consists of building cost components, overheads evaluation, and overheads impact on the project cost as well as the practice in Sudan for overheads calculations.

Chapter (Four) contains the questionnaire, its design and the study population, the chapter also includes the case study and its calculation method

Chapter (Five) consists of data presentation, questionnaire analysis including general and personnel information data analysis, project different stages data analysis using frequency distribution, distributive statistics and Chi-squared test analysis as well as the factor analysis approach.

This chapter includes the calculations of the case study for the different stages of a project ending with overheads percentage (overhead index).

Chapter(Six) contains the results obtained and make recommendations on these results, furthermore this chapter recommending that future studies to be

conducted for overheads issue for reaching overhead index for calculating projects cost more precise and accurate.

CHAPTER TWO

LITERATURE REVIEW& PREVIOUS STUDIES

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LITERATURE REVIEW& PREVIOUS STUDIES

2.1 Construction Industry

The construction industry is one the largest industries globally, helping to build an environment within which most other economic activities take place. Buildings and other construction products have much influenced social activity in the modern society. Thus, the understanding of the nature of construction industry is crucial at both macro and micro levels in the management of the industry and its constituent organizations (Sakami, 2012).

Construction includes activity of the physical structure of infrastructure; superstructure and related facilities. The activities include the procreation of raw materials, the manufacturing of construction materials and their components (Places 2002).

Construction industry includes many businesses like constructed buildings, set-up and complete engineering projects; subdivide land for sale as potential building sites and site preparation. In addition, this industry exposure for alterations, additions, new developments or maintenance and repairs (Ann, 2004).

General construction is the construction of entire dwellings, office buildings, stores and other public and utility buildings, farm buildings etc., or the construction of civil engineering works such as motorways, streets, bridges, tunnels, railways, airfields, harbors and other water projects, irrigation systems, sewerage systems, industrial facilities, pipelines and electric lines, sports facilities etc.

The construction industry needs effective methods for gathering and utilizing performance information on industry, company, and individual project levels (Kärnä and Junnonen, 2016).

In the development of any country, the construction industry plays vital roles in transforming the aspirations and the needs of its people into reality by implementing various physical structures (Ahmed, 2002).

Construction industry is one of the most complex sectors in the world as many variables and factors are involved. Through the design stage of any construction project, assumptions have to be considered based on incomplete information or uncertainty, design errors commonly occur, change in original requirement also common issue in construction project and many other issues which lead to adjustment on later stage of the project. These adjustments lead to change orders and the impact of the change orders increase as much as the project progresses. The impact of the same change order during design stage is much less than if it happens during construction or commissioning stage.

The main parties involved in construction industry include architects, engineers, contractors, materials suppliers, manufacturers, researchers in building technologies and construction methodologies, government entities etc.

2.1.2 Sudanese Construction Industry

The Sudanese construction industry is characterized by many small and large projects and high labor intensity; it is also highly dependent on public regulations and public investments. The scope of Sudanese construction industry is very wide, including residential, commercial, irrigation systems, roads, tunnels, transportation, facility buildings, and heavy infrastructure construction.

In Sudan, some big infrastructure projects are executed and hence a fast development in construction Industry was obviously seen, all the parties in the industry are involved in this development, but for the research[1] purposes we will concentrate on the main parties, client (employer), Engineer and contractor in conventional construction contracts.

[1]) The author uses the term "research", "thesis or "study" which means this research or study of PhD.

After the petrol production and because of high price of oil and gas, Sudan economy witnessed a booming stage, a lot of investors and financers came to Sudan for different investment activities, then the Gross Domestic Production (GDP) growth registered more than ten per cent per year in the year 2007.

Construction industry in Sudan faces a lot of problems including, but not limited to: high construction costs, delays in payment and schedules of construction, quality of work performed and lack of technicians and skilled labors.

Construction industry in Sudan suffers from the high level of taxes and fees on the production, transportation, and sales of building materials, taxation, custom duties, zakat, highway taxes, and provincial fees beside other types of fees contribute to the high prices of building materials (Elkhalifa & Shaddad 2008).

As construction Industry developed hence tendering has become predominant and the tendering procedure became more transparent. Thus contracting companies tried their best to be technically qualified, with a very competent staff, well equipped and aware about how to do pricing precisely and perfectly.

2-1.3 Sudanese Construction Industry Organizing Firms

There is no doubt that, construction industry cannot be successful without adequate organization and strong support of the government and all stake holders, there are some government entities for organizing and developing the engineering sector, consultant and contractors, the most related entities are: Sudanese Engineering Council, Organizing Council for Consultancy Firms, Organization Council for Engineering Works Contractors and Sudanese Contractor Association.

2.1.3.1 Sudanese Engineering Council

Sudan Engineering council established 1977, under the first Engineering Council Act issued in 1978; the council has the following powers, duties and functions:

1- Organize and promote engineering profession, control the practice in the most ideal way and guide the bodies having competence, on engineering business, in such way, as may lead the same.
2- Enhance the preparation, training and classification of manpower in the various engineering sectors and fields.
3- Ascertain that the curricula and the standard of qualification and training in the engineering faculties, faculties of engineering technology and engineering technological and technical institutes satisfy the required standard, in order to maintain a high scientific standard for engineers, technologists and technicians.
4- Strive to solve the professional disputes and differences, between engineers, technologists and technicians, and between them and others.

With reference to above powers and duties the council made internal regulations and established six standing committees to cover his role and responsibilities. The engineering ladder consists of four categories:

1. The engineer.
2. The technician.
3. The engineering technician.
4. The skilled labor.

Each category has three levels, each level needs specific regulation and standard.

The Council constitutes of 30 members, chairman, deputy chairman, secretary general in addition to 27 members of different engineering organization and universities according to the council Act.

The engineering council created to the engineering register, the register contains names and level of engineers, technologists, technicians and skilled labor. the engineering, technological and technical faculties and institution that wants the council to register their graduates, they must submit to the council

the curricula and conditions, which they award, the list of teaching staff and educational qualifications of the same and the list of external examiners.

Sudan engineering council has well established longtime relationship with the scientific engineering societies established in Sudan such as such as Sudanese Engineering Society & Sudanese Architectural Society.

2.1.3.2 Organizing Council for Consultancy Firms (OCCF)

The OCCF is a government entity under the Council of Ministers established in 1999.The major role and terms of reference of the OCCF can be summarized as follows:

1. Registration and classification of consultancy firms.
2. Identification of consultancy areas.
3. Set the competition basis for consultancy services wards to be adopted by clients.
4. Set the basis for a code of professional ethics to be adopted by consultancy firms.
5- Set the criteria and measures for registration.

Any qualified person, or any number of qualified persons may, upon the approval of the Council, establish a consultancy firm, in any of the areas of Engineering, Information Programming, Architecture, Environment, Agriculture, Veterinary Science, Industry, Finance, Economics, Administration or Law, independently, or jointly, or in any such other similar professional fields, as the Council may prescribe, for rendering all, or any of the following consultancy services:

1. preparing the preliminary studies, and economic and technical feasibility studies for different projects.
2. Planning, designing and preparing the detailed documents necessary for execution.
3. Preparing studies of the environmental impact of development projects.

4. Evaluating the performance of any establishment; company or otherwise, to determine the financial position thereof, and evaluating the existing projects technically and financially.
5. Rendering any such other services, as the Council may prescribe.

A consultancy firm shall be required to: -

1- Include academically qualified founder or founders as to such professional standards, as the Council may approve, in the field of specialization, on which the consultancy firm works; and at least one of them should be full – time.
2- Include one, or more experts, on the specializations, in which the consultancy firm works.
3- Be specialized in rendering consultancy services in the fields of work under which it has been registered.
4- Have headquarters, in the Sudan, equipped with such appropriate facilities as may be fit, for the nature of work.

2.1.3.3 Organization Council for Engineering Works Contractors (OCEWC)

OCEWC is a council established in accordance to the council law of the year 2003 under the minister's council.

The major role and objectives of OCEWC is: Registration and classification of the contractors in addition to Organization and development of contracting sector.

A- Registration and classification of the contractors:

The criteria and procedures for registration includes, but not limited to the following:

- The contractor should be registered (company, business name).
- The contractor should be capable technically (equipment, machineries, etc.) and financially.

- The contractor should have qualified staff (engineers, technicians and administrative staff).
- The contractor should have a permanent office.

B- Organization and development of the contracting sector:

The organization represents an indicator that shows the contractor's capability (technically & financially) according to the criteria and degree of evaluation set by OCEWC.

The importance of this classification can be briefly outlined as follows:

- Evaluation of the contractor's capability to execute the projects accordingly.
- Give the clients the levels and level of grade of each contractor in order to choose the proper contractor for the specific job.
- Managing and controlling the contracting sector.
- Encouraging the contractors to develop themselves in order to get better classification levels.

As per the regulations and law of OCEWC the contractor has no right to bid for any government project unless he is registered and having the registration certificate from OCEWC.

OCEWC starts the classification of the contractors based on their capabilities in order to set them in different grades according to work category and contract maximum value, then a contractor of the same grade can bid for the same project, and this will set a fair ground for competition and minimize the discrepancies in tender prices.

2.1.3.4 Sudanese Contractor Association

The Contractors Association was registered as a part of the business union in the year 2000 and then after registered as a separate entity under the name of Sudanese Contractor Association in the year 2007.

The main objective of the Sudanese Contractor Association can be outlines as follows:

1- The contribution of the development of the infrastructure projects and hence increasing the GDP.
2- Creating partnerships with government, civil society and similar associations aboard for the development of the contracting sector.
3- Putting the right and proper criteria for competition and transparency for the contracting sector.
4- Protection of the members with respect to the development of the laws and regulations in addition to protection to their intellectual properties and rights.
5- Trading and upgrading of the member skills and knowhow.
6- Representing the members in and outside Sudan in expeditions, workshops, seminars, similar associations and financial institutions

The Sudanese Contractor Association has its administrative system and organization structure for executing the works, the general assembly selected the executive committee (10 persons) by free election periodically as per the worker's union laws and regulations.

The number of the registers members for the Sudanese Contractors Association is about 3800 (2019).

2.2 Project costs

The project cost must include, but not limited to materials, labor, equipment's, subcontractors and any other overheads charges.

The words price and cost become synonymous and a source of confusion in construction context such as cost estimating, pricing, building cost or building price. A clear and exact definition of construction cost not only helps to identify relevant elements of construction cost but also facilitates the identification of the factors that affect construction cost (Supplier Structure and Housing Construction Cost; Stockholm 2006).

Construction cost increases when unexpected events or actions occur that forces costs to increase for the project as a whole and where the risk is already

allocated in advance. This situation is often caused by factors that are beyond contractors control such as inflation. The second situation comes up when an unexpected event occurs but where the risk allocation is not specified in advance and the extra costs will depend on the bargaining power and anticipation of other party's behavior.

2.2.1 Project costing procedures

The Designer and Consultant Team prepare a construction schedule to support the project costing that is consistent with the plans and specifications for completion of the work, identifying the sequence and duration of the tasks upon which the cost estimate is developed.

Normally the Engineer prepares the drawings, specification, bill of quantities and all other tender documents. He should do his best to be precise and accurate in order to adjust the contract cost and to minimize the discrepancies between what he was calculating and what is going to be executed and measured later at the site The contractor should study all the tender documents carefully and visit the site, collecting all the required data which include: Geographical and demographical data, water and electricity sources, materials and labors prices and availability, government regulations and laws, logistics, owner requirements, changes in industry environment and any other embedded temporary work items required for job completion . Finally, he should be sure that all the cost items have been incorporated in the total cost i.e. the project cost must consider the scope, constructability and risk.

Overheads costs are generally added during bidding to the contractor's estimate of construction cost, they are added as a percentage number, and this percentage includes overhead costs, contingency and profit (CM Journal; 2001).

The contractor has to be confident that his firm secures some margin (profit). The contractor must examine closely the completion date for the project as well as any intermediate contractual milestone dates for portions of the project,

allowance for contingencies which might arise; failure to complete a project on time can seriously damage the reputation of a contractor.

Then after the contractor's materials take off engineer make the breakdown analysis i.e. analysis of the items to its components. He lists required materials, labor, equipment and other overhead charges required in order to calculate the project construction cost and then add the profit margin as agreed upon by the company in order to calculate out the bid price.

The quantity take-off engineer is an important part of the estimate and should be based on all available design data. All quantities should be shown in standard units of measure.

The detail in which the quantities are prepared for each task is dependent on the development phase of the design. Quantity calculations and unit build ups beyond design detailing may be necessary to determine a reasonable price to complete the overall scope of work for the cost estimate.

The bid schedule is part of the procurement package and is included in the solicitation for bids. The estimate must show the unit prices, quantities, extension of unit prices, lump sum items, and costs consistent with the schedule provided with the bid documents.

It is important to thoroughly understand the project scope of work and the bidability and constructability aspects of the project being estimated. The cost estimator must thoroughly review drawings, specifications and other references to formulate a construction sequence and duration.

A site visit for all Consultants is recommended to relate the physical characteristics of the project to the available design parameters and details. Developing a construction sequence as soon as possible is necessary for creating a formalized sequence, to be used throughout the entire cost estimating process as a checklist of construction requirements.

To develop appropriate contingency allowances, the estimator must identify the uncertainty associated with an item of work or task, forecast the risk/cost

relationship, and assign a value to this task, this will limit the cost risk to an acceptable degree of confidence depending of a single factor, but rather off a cluster of variables that are related to the characteristics of the project and to the construction team as well as the market conditions.

The unit rates for each of these items are carefully analyzed and developed as the summation of all direct and indirect costs that will likely be incurred by an experienced and well-equipped contractor. For small and easily identified work noted in the drawings and included in the estimate, lump sum bid items may be used. The cost of the lump sum item should be based on cost data related to the item's total direct and indirect costs.

Notably, the quantity surveyor's role is related to the function of the cost estimating, planning, and preparation of bills of quantities and tender documentation, procurements, manage payments, contractual claims and final accounts (Ashworth and Hogg, 2007). Quantity surveyors have seen the potential of further enhancing their role become more efficient and productive in performing their measurement and management oriented functions. As shows previously, cost estimator and quantity surveyor function is related to each other. Most of an estimator's work includes surveyor's work.

The profit assigned to a project should recognize the nature of the risk that the company is facing in the project and an appropriate return on the investment being made in the project. The reality is that the profit is limited by the competition. The profit usually taken as a percentage of the contract price.

Considering all the above mentioned parameters, then the final step involves the development of quantities of work to be performed and their translation into expected cost. The cost will be more accurate if enough information is available.

The cost estimator is responsible for the accuracy of quantity take-offs from drawings and specifications prepared by the Architect or other Consultants.

The process of assigning profit is usually performed by the company policy and top manager’s decisions (James E.Rowings, Jr.; 2003).

2.2.2 Cost control

Cost control is one element of the overall process of management of investment in the project or contract. It is achieved in a careful planning of the allocation and commitment of resources linked to an appropriate policy for the procurement of materials. The overall management process must take into account the agreed objective and the commercial requirements of the job.

According to Ritz (1994), "cost control though namely easy, but it gives a different meaning to different people. Some people engage it with engineering costs; some states that it is a cost report, value engineering, cost management etc. Cost control involves all the activities above at different times. All the parties involved in a project have their own responsibilities and roles in reducing and controlling the costs".

Project cost control includes monitoring cost performance, ensuring that only appropriate project changes are included in the revised cost baseline, and informing project stakeholders of authorized changes to the project that will affect costs. Cost control is analyzing the data in order to take corrective action if needed. It must be performed by all personnel who incur costs. In fact, it is the cost, which reflects performance in all areas. Therefore, a well-managed project will incur lower cost than the one that is not.

According to Nunn ally (1998), "cost control of a project involves the measuring and collecting the cost record of a project and the work progress. It also involves the comparison of actual progress with the planning. The main objective of cost control of a project is to gain the maximum profit within the designated period and satisfactory quality of work. A systematic procedure of cost control will give a good result in collecting important cost data, to estimate and control the costs of the coming projects in the future".

Cost Control helps monitoring the status of the project to update the project costs and managing changes with the cost baseline.

Managers must have an access to accurate cost and scheduled data so that the trend of the cost can be determined when possible, and correction actions taken if needed. The key benefit of cost control process is that it provides the means to recognize variance from the plan in order to take a correction action and minimize risk.

2-3 Cost Estimates

The cost estimate is one of the main elements of information for decision making at preliminary stage of construction. According to Samphaongoen (2009). It reflects the inherent risks, direct costs of a project involving materials, labor, professional services, etc. Jared and Alkass (2007) consider that cost estimating is one of the most essential and crucial phases of a construction project.

Cost estimate must be developed depending on the availability of design drawings and specifications during these phases: the conception phase, the development phase, the construction phase, and the commissioning phase.

Cost estimation involves developing an assessment of likely quantitative result-how much the project cost? Pricing is a business decision-how much will be paid to the contractor to execute the project (PMBOK Guide; 2000).

Pratt (2011b) presented a definition of the cost estimates in its essence; ‘‘is an assessment of the probable total cost of some future activity’’. Jackson (2010) also has defined that the estimate is “a summary and an educated guess which was based on the best information available of probable quantities and costs of materials, equipment, labor, and subcontracts to complete a project which also contain taxes, overhead, and profit. Consequently, they used to develop the project bid price”.

Dysart (2006) defined a cost estimate as, “the predictive process used to quantify cost, and price the resources required by the scope of an investment

option, activity, or project". Moreover, a definition was given by Smith and Mason (1997) which is "Cost estimation is a fundamental activity of many engineering and business decisions, and normally involve estimating the quantity of labor's, materials, utilities, floor space, sales, overhead, time and other costs for sets series time of periods ".

Cost estimates are prepared and used for different purposes including feasibility studies, tendering phase, avoidance misuse of funds during the project, etc. The primary function of cost estimation is to produce an accurate and a credible cost prediction of a construction project. However, the predicted cost depends on the requirements of a client and upon the information and data available (Elhag, et al., 2005). The other functions of cost estimates; it allows the designer and engineer to be aware of the cost implications of the design decisions they make while still in the design phase.

The main reasons of making cost estimation are; first, to ensure tenders received do not exceed the budget. This is achieved by making design decisions early with advice from the cost team. Changes made early in the design process can be accommodated without too much effect on other elements. Second, to collect cost information from a number of buildings, at various stages of development thus improving the quality of cost data for future projects.

The estimator plays a very major role for the success of the project. The estimator is responsible for forecasting the costs for construction in a way that is both clear and consistent. Lack of time and information, and complexity of the building project allocated for cost estimation often lead to a poor performance. An estimate depends on the experience of the estimator who may be the best and fastest one to produce quality cost estimate, also is the gained the knowledge from past experiences.

There are different types of construction estimates depending on: the purpose of the estimate, the project stage, availability of information, techniques and

method of calculation, accuracy range expected, prospective of the estimator and other related factors.

The most popular types of cost estimates are: Preliminary Estimates, Square Foot Estimates and Cubic Foot Estimates, Measured Estimates, Final Estimates, Unit Price Estimating, Schedule of Rates (Consulting Estimating Manual; Feb.2006).

2.3.1 Preliminary Estimates

Preliminary Estimates are employed in the early planning phases of a proposed project to match client needs, assess the programmatic requirements, and budget constraints in order to establish project scope and quality expectations. Estimate comparisons at this stage are utilized in evaluating the feasibility of strategic alternatives being considered to satisfy current and projected space requirements.

The information available in these early stages is usually high-level information, such as, number of building occupants, gross square foot area, or building enclosed volume. More importantly, the historical information is used to predict future cost of the new project (Leng, 2005).

Consequently, the conceptual and preliminary estimates have been considered for pretender stage according to the accuracy of calculation. Thus, in this research, the preliminary estimate will be adopted for pretender stage; this term contains the conceptual and preliminary estimate, which is very important to the owner to accept the project from marketing point of view.

Preliminary estimate affects the cost implications of design decisions and answer the first question that is asked by the project client which is “How much will the project cost me”, which helps in decision-making. Then, the client can decide going on or not.

Regardless of insufficient data in the early stages, a preliminary estimate is necessary for making project decisions before project objectives are clarified, before project scope is defined, before requirements are fully spelled out,

before the functions are clearly defined, and even before the system architecture has been formulated.

Aibinu and Pasco (2008) examined the accuracy of pre-tender building cost estimate, they stated that it is not improved over time and most of experts are not satisfied with the accuracy of estimates. Furthermore, there are factors which affected the accuracy of estimating process; the project information, client requirements, cost data and team experience.

2.3.2. Square Foot Estimates and Cubic Foot Estimates

Based on historical data, Square Foot Estimates (SF Estimates) and Cubic Foot Estimates (CF Estimates) are methods commonly used to develop preliminary budgets.

SF (Square Foot) rates are actively used to balance program needs, specification levels, and budget/time constraints in both study and schematic design phases.

They are effective in preparing more accurate estimates as the design is developed enough to allow for measurement and calculation of floor areas and volumes of the proposed spaces.

Several historical databases support this method of estimating, and provide regularly updated unit costs ($/SF Estimate and $/CF Estimates).

Estimates made using this method need to allow for adjustments and additions for regional cost indices, local labor market rates, and interpolation between cost tables.

Further adjustments may be made to account for other unique aspects of the design, such as special site conditions or design features being planned.

2.3.3 Measured Estimates

Measured Estimates are developed after proceeding with the preferred solution during the latter part of the study phase. These estimates maintain accountability for initial budget projections, and are used as a means of

evaluating competing alternative construction assemblies, systems and materials.

This estimate is known as: a bottom-up, fair cost, bid estimate, or quantity take-off which can be tabulated of all quantities for a project. A fair-cost estimate is carried out by owner for bid evaluations, contract changes, legal claims, extra work, permits and government approvals. Then, a bid estimate is prepared by contractor in order to be submitted as the proposed cost to the owner for carrying out the construction work. Since the careful take-off can reduce or eliminate the unknowns of the amount of work, which would be performed, the margin of error is considerably reduced.

2.3.4 Final Estimates

At the completion of design development and during construction documentation, a complete pre-bid estimate can be prepared using Unit Price Estimates. This estimate allows for a comparison of the final estimate with the bids received and may aid in any contract negotiations.

The detailed estimate method is considered to yield a price that is an accurate forecast of the actual costs of construction project rather than any of the other estimating methods considered. In the detailed estimate, the form of a quantity take-off is the accurate assessment of the work and can only be gained from the full design of the project. In addition, it consumes time rather than the preliminary estimate which is prepared by other quicker but less accurate.

Moreover, ElSawy et al. (2011) stated that the detailed cost estimate is a great importance in tendering phase as well as a key function for acquiring new contracts at right price in order to provide gateway for long survival in the business. Therefore, an accurate estimate of the bid price for a construction project is important to secure the project contract and achieving a reasonable profit, where in practice, the available bid-estimation time is often insufficient (Akintoye and Fitzgerald, 2000).

2.3.5. Unit Price Estimating

The entire project is divided into small discrete work items, and a "unit price" is established for each item. The unit price is then multiplied by the required quantity to find the cost for the work item. All costs are summed to obtain the total estimated construction cost.

2.3.6. Schedule of Rates

A project may contain significant quantities of repetitive elements, without the exact amounts being defined. In this instance, may issue the bid documents as a partial or complete schedule of rates contract. A list of items and projected quantities is provided, leaving the bidder the opportunity to provide a rate for each item. The schedule of rates submitted by the successful bidder is used as the basis for the final contract measure of each item. Estimators are required to submit estimated rates for items defined within a schedule of rates contract. The rates may be built up from system components if necessary to accommodate a nonstandard format.

2.3.7Accuracy of Cost Estimate

The cost estimate gives the project cost and budget indication according to the project stage and the method of estimate. The accuracy of the estimates will depend mainly on the information available and the technical backup and good experience of the cost estimator.

The difference between estimated cost and the final cost of the project indicates the accuracy of the cost estimates i.e. to what extent the estimated cost agrees with standard value of the actual cost, so the variation between the estimated cost and actual cost gives the degree of accuracy.

Cost estimate accuracy definition obtained by Rad (2002) as ''the expression of accuracy of the estimate is related to the expression of the probability that project's actual cost will match the prediction cost''.

Liu and Zhu (2007) debated that the accuracy of early estimation has dependent on the historical cost data and level of professional expertise among

other factors. Nonetheless, the assumption about the design details of a project must be taken, which may not eventuate as the design, planning, and construction evolve.

Furthermore, Westney (1997) stated that the four trades-offs were the availability of information, time, available resources (people, equipment, and money), and estimating methodology or algorithm, determine the classic estimate as the following:

- The more accurate the estimate; the more information is required.
- The more information required; the more time is required to produce the estimate.
- Consequently, the more resources are required to develop the estimate.
- And, the more money it will cost to produce the estimate; the more money spent the more pressure to reduce resources, time, information and accuracy.

2.4 Tendering (Bidding)

Tendering (bidding) is the process for the selection of suitable contract for specific job at a certain amount and time appropriate to the Employer's circumstances and agreed with him an acceptable offer upon which a contract can be placed.

The most popular types of tendering are competitive tenders which either open competitive tender or selective competitive tender both types give chances and opportunities to contractors on fair grounds of competition and transparent selection.

The other popular type of tendering is the negotiated assignment tender and this type take place for certain reasons like incase of financing the project or if a special equipment's or services is required or even because of the time saving reason.

The decision to tender for a particular contract is mainly the responsibility of senior management for both public and private projects after getting the

information of the bidding, as well as the ability of company to obtain information about projects that are out for bid as part of the marketing effort (Pratt, 2011b, Shehatto, 2013).

In order to make decision to bid, there are many factors must be taken into consideration, but are not limited to: type of project, and size and (rough) estimate of contract value. As well, location of the project, quality of drawings and specifications, reputation of owners and designers, specialized work, anticipated construction problems, safety considerations, need for the work, and bonding capacity are also the factors of making decision (Pratt, 2011b).

When the contractor has decided to bid, the documents of bedding must be obtained and reviewed, in which the contractor wishes to proceed or not, the reviewing for documents to verify the information necessary, in order to complete the bid report and also to highlight the data that the estimator will need to refer to later in the estimating process. Therefore, the team approach technique is a good manner to achieve accurate high- quality.

2.4.1 Tender (bid) Analysis

A systematic evaluation of bids would include but not limited to the examination of the following:

- Compliance with the contract terms and conditions.
- Correction of bids prices (arithmetical check).
- Selection of the best bids and makes the recommendation to the Employer.

Prequalification is one of the methods used for the contractor's selection, this method can be described as an open tender for technical capabilities of the contractors then selected contractors shall be short listed to compete later for the financial parts and successful bidder will be selected according the selection criteria.

In bid analysis pricing assumes a procurement process with competitive bidding for every portion of the construction work, and assumes a minimum of three bids, including each filed sub-bidder.

The estimating contingency should be identified (a percentage to cover cost increases that will occur during design elaboration or unforeseen design issues).

The selection criteria consist of the technical and financial Capability (Nassar, 2010) of the contractor for the project including:

- Relevant experience: description and relevance to the tendered project, role of tender, project cost, duration of the project.
- Past performance: project name, clients project manager, quality standards, target performance level, tender price, variations and final cost, completion date and extension of time granted, details of occupational safety and housing records.
- Technical skills: Names of project team function of project team, technical expertise of project team and CV, s to be provided.
- Management skills & systems: quality system, project management tools, program software, environmental management system, occupational safety and housing management system.
- Resources': specialist equipment, labor, by trade skills and facilities.
- Methodology: program of work, key performance indicators, division of work into subcontractors, innovate procedure to be used, reporting, reporting system and quality plan.
- Price: fixed capital cost, variable tender cost during the contract period, special adjustments during the contract period, operating cost and maintenance costs.

Sample of project bid (tender) analysis:

This can be summarized as follows:

1-General:

- Project Owner: Housing & Development Fund-Khartoum State.
- Project location: Khartoum Amarat Street (57).
- Project consultant: Housing & Development Fund-Projects department.

2-Project brief description:

Construction of concrete Skelton which can be described briefly as below:

- Project components: One building (G+7), concrete Skelton only.
- Number of flats/floor : 4
- Total build up area/floor : 950 mm

3- Tender documents:

The submitted tender documents for the contractors include the following:

- Instruction to bidders.
- Drawings.
- Specification.
- Bills of quantities.
- Conditions of contract.

4-Invitation for tender (open tender):

The dates for bid and submission for the tender are as follows:

- Call for tender (date) : 20/2/2019
- Submission date : 5/3/2019

5-Analysis:

The main outlines for the bid analysis are as below:

- A technical and financial criterion for bid analysis was agreed upon.
- Project cost estimate =16,726,984 SDG
- Number of tenderers =6

- One of the tenderers has been rejected because he did not submit the bid (security) bond as per the tender requirements.

Table 2.1 shows the financial offers for the five contractors.

6-Bidder selection:

After technical and financial analysis and evaluation, the bidder (3) was selected as a successful bidder with total amount of16, 732,900 SDG, the financial offers comparison shown in **Figure 2.1**

7- Comments:

From the analysis of tender, we can conclude the following:

The main building (Skelton) components costs are: materials, equipment, labor and overheads which can be described briefly as follows:

A-Materials:

Includes the following:

- Reinforcements steel.
- Cement.
- Aggregates and sand.

B-Equipment:

The required equipment needed for the job includes the following:

- Shuttering.
- Tower crane.

C-Labor

By checking and pricing the above components (materials, equipment and labor) we concluded that their prices are almost similar and the maximum possible difference between them will not reach 10 %. (plus or minus).

Then what is the reason of the big variations and discrepancies between the competitive bidders:

To answer the question of what is the behind the big variations seen in the tender (16,273,937-36,993,455) SDG and according to the bid analysis we can answer:

1. Contractors of different sizes are competing in the tender and subsequently big contractors have big overheads and vice versa and this affect directly the overheads cost and hence the project price.
2. Because of unstable market and the continuous rapid increasing of building material prices, the contractors cater for this risk in different way of expectations.
3. Overheads cost ratio is not definite, and then this has direct impact on the project cost

Table 2.1 shows the financial offers

Bidder No	Offer amount SDG
1	36,993,455
2	22,496,947
3	16,732,900
4	16,273,934
5	21,884,331

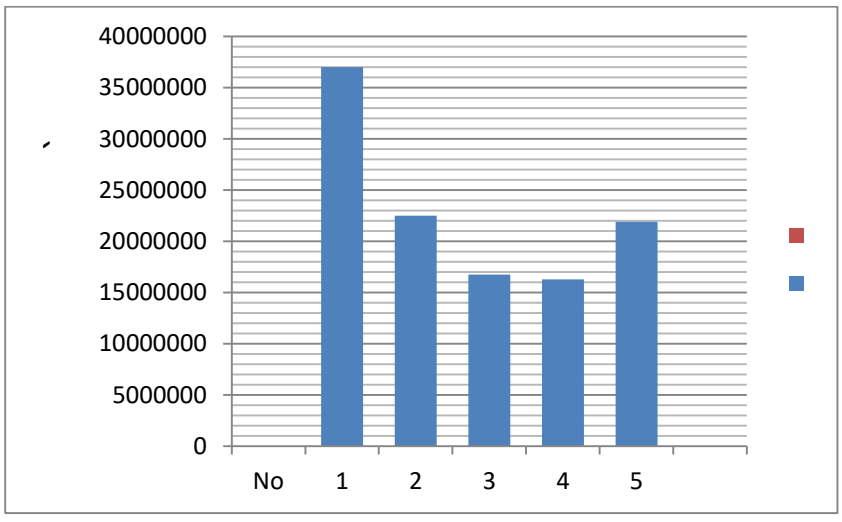

Figure 2.1 financial offers comparison

2.5 Construction Contracts

The contract can simply be defined as an offer introduced by one part and accepted by another part for specific job and then agree together to implement that specific job according to certain obligations for each party.

Construction contracts are treated according to the general rules of the law of contract but statutory rules could have great impact on the formation and the performance of such contracts. There are so many relationships, which are created by conventional construction contracts. The parties involved in a construction project, usually, include the owner of the property, engineer (consultants) and the contractor.

The party who promotes or commissions the construction project is generally referred to as the owner in construction contracts but in some cases the same party is called the client, the employer, the purchaser or the promoter. For the purpose of this research it was taken as an employer.

The parties who give advice on the construction project are referred to as consultants; they can be architects, engineers.

Contractors are the parties who take the responsibility for the physical construction of the works. Their scope of work used to be the execution of the construction works and its completion according to the terms and conditions of the contract.

There are different types of contract, the more popular related types are: bill of quantities, schedule of rates contract, fixed priced contract (lump sum), Cost-plus contract.

2.5.1. Bills of quantity contract

This is a common form of contract in engineering (especially civil engineering and building projects) in which the design has been completed by the employer (consultant) and can be specified in the tender.

The works are broken down into many parts or activities as possible and these are billed (from drawings) in the tender with the quantity from each item.

The tenderer enters his rate for each item which, when multiplied by its quantity, gives his total price for that item. The total contract price can therefore be established by summation.

The contract conditions must specify clearly whether these quantities are fixed or subject to re-measurement on completion of the actual work on site.

The chosen bidder often obtained according to competitive prices in which the final quantity of work is difficult to predetermine. Therefore, the detailed estimate approach mainly is used, but the price has implicitly included an overhead and profit component.

2.5.2 Schedule of Rates contract

An alternative to the bills of quantities contracts and used in case, for any reason, the quantities of the items of the bills of quantities cannot be established with reasonable accuracy at the tender enquiry date.

Broad estimates of the quantity of each item are given and the tenderer enters his rates accordingly.

Measurement of completed work is done by the Engineer on behalf of the Employer.

Commonly used for installation works for mechanical or electrical services when exact routes are not fixed.

2.5.3 Fixed priced contract (lump sum)

In this type of contract, the contract price is fixed and agreed at the time the contract is signed and does not subsequently change except as a result of variation of the contract specifications or under limited circumstances specified in the contract conditions.

Any risk of increased cost due to inflation, introduction of higher taxation, increase in material prices etc. is taken by the contractor.

A fixed price contract can comprise any number of separate prices for parts of the works, each price is invariable.

In this type of the contract, the contractors estimate the projects by detail method to determine the sum of the bid without separating into items.

2.5.4 Cost-plus contract

This is a contract in which the contractor is reimbursed his actual cost, plus a specified amount of money, without any total contract price being quoted. Competitive negotiation of a contract will be based on technical aspects alone.

Cost–plus contract is generally used in case, the work gets underway quickly or the total cost of construction uncertain when the work begins but also, the owner may not be able to avoid paying for mistakes or even inefficiencies of the contractor.

The contractors have to offer their price to perform the work for a guaranteed maximum price in which based on the allowances.

Difficulties of define the work which leads to some conflicts between the Employer and contractor, so cost-plus contract needs goods details records from the contractor approved by the Engineer.

Rates of payment may become a very thorny point in case plus contracts as there is no restriction on the contract offering unnecessarily glamorous wages.

2.5.5 FIDIC Contracts:

It is also common to find other more complex standard contract forms, which address different construction needs. Some of the well-known and widely used contract forms are those known as FIDIC contracts.

- FIDIC is an abbreviation of the French title of the international federation of engineers and consultants, “Federation Internationale des Ingénieurs-Conseils (FIDIC)”.
- FIDIC has developed model standard form contracts for use in the international construction industry. They are commonly referred to as FIDIC contracts.

In September 1998, FIDIC published four new or revised standard form contracts comprising new editions of two existing forms. The forms are the

Red Book, the Yellow Book, the Silver Book and the Green Book. Each of the mentioned books deals with a particular form of construction agreement.

- The Red Book (fourth edition) deals with civil engineering works.
- The Yellow Book (third edition) with electrical and mechanical works in instances, the employer and/or the engineer either supplied the design or played a central role in producing it.
- The Orange Book (first edition) to provide a contract where the contractor supplied the design and took single-point completion responsibility. The Orange Book, unlike the old Red and Yellow Books, contemplates the use of an employer's representative and does not use the term "Engineer".
- The Silver Book is intended to deal with a turnkey contract where the contractor takes responsibility for design and the contract is on a strictly two-party basis; that is to say there is no intermediary such as the engineer.

2.5.6 Contract Documents

The contract contains attachment forming the contract termed contract documents, these documents are a part of the contract read and construed together. The intent of the contract documents is to include all items necessary for the proper execution and completion of the work by the contractor.

The documents forming the contract are to be taken as mutually explanatory of one another, but in case of ambiguities or discrepancies the same shall be explained and adjusted by the Engineer who shall thereupon issue to the contractor instructions thereon and in such event, unless otherwise provided in the contract(FIDIC,1987).

The major contract documents include but not limited to:

- The Contract Agreement.
- The Letter of Acceptance.
- The Conditions of Contract.

- The Specifications.
- The Drawings.
- The Bills of Quantities (conventional measurement contract).
- List of equipment's.
- Rates of daily labor.
- Cost of basic material prices.
- List of Sub-contractors.

2.6 Overheads Cost

Overheads costs are those costs that cannot be attributed to a single task of construction work. Costs that can be applied to a particular item or work should be considered a direct cost to that item and not be included in overhead costs. The overhead costs are customarily divided into two categories: general (office) overheads, site (job) overheads.

Overhead will vary from project to another depending on the project location and size, and from contractor to another due to the contractor reputation and creditability.

Overheads are generally described as company costs incurred by the contractor for the benefit of all projects in progress. This is the actual cost, which is an essential part of the cost; overhead costs cannot be directly allocated to a project.

The percentage of overhead in cost estimation is considered principal parameter in estimating the financial value of bid offer (Assaf, 2001)]. Many contractors take the risk and do not allow the actual cost of overheads, especially the general (office) overhead in order to win the tender.

Overheads costs are generally added during bidding to the contractor's estimate of project costs. Normally a percentage from the project construction cost taken to represent the overhead cost. Actually this in practice how the overheads enter in to the project price. Overhead items should be estimated in detail for all activities at construction documents for the project.

When preparing bids for construction projects overhead cost should be included in the bid or project's budget. Overhead costs should be tracked, just as one prepares budgets for and tracks direct and indirect construction costs for each project.

The cost estimator must use considerable care and judgment in estimating overhead costs. For the source of pricing, the cost estimator must rely on judgment, historical data, and current labor market conditions to establish overhead costs.

Most contracts tell the contractor to spread or allocate their overhead and profit costs across all pay items in the schedule of values. Setting aside the issue of unbalanced bid breakdowns, the contractor is expected to spread their overhead and profit cost uniformly across all pay items in the contract.

The overhead budget is a plan of all expenditures for the company that cannot be billed to a construction project. The overhead budget should be used when making day-to-day decisions that involve the expenditure of company funds.

The general overhead budget should be compatible with the company's goals and future strategies. The best sources of data for future costs are historical costs; however, these costs must be adjusted to take into account the uniqueness of each year's financial objectives. For example, if the company is going to expand its business next year, the general overhead budget needs to be adjusted to take into account the expansion of the business.

2.7 Bonds & guarantees

Throughout the project stages, the contractor is entitled to submit bonds and guarantees for the signed contract, under taken by third party. Such payment undertakings are known by various names but the most known popular name is 'letter of guarantee'.

The third party shall issue a letter of guarantee acceptable to the employer as per the description and form of the said letter agreed and signed on the contract.

The guarantee must be paid by the guarantor (often a bank), irrespective of whether the underlying contract has, in fact, been breached and irrespective of the loss actually suffered by the beneficiary. The guarantee mentioned are either a certified cheque or a Letter of guarantee (issued by Banks or others) usually provision of a written undertaking by bank in favor of the employer, payable on demand.

The employer can call bank guarantee in various instances; for example, if a tenderer fails to enter into a valid contract, or if there is actual or, in some cases likely failure of the contractor to perform properly in terms of the contract (i.e., underlying contract).

The major required guarantees for the construction contracts during different stages of the project life cycles can be shown in Figure 4.1

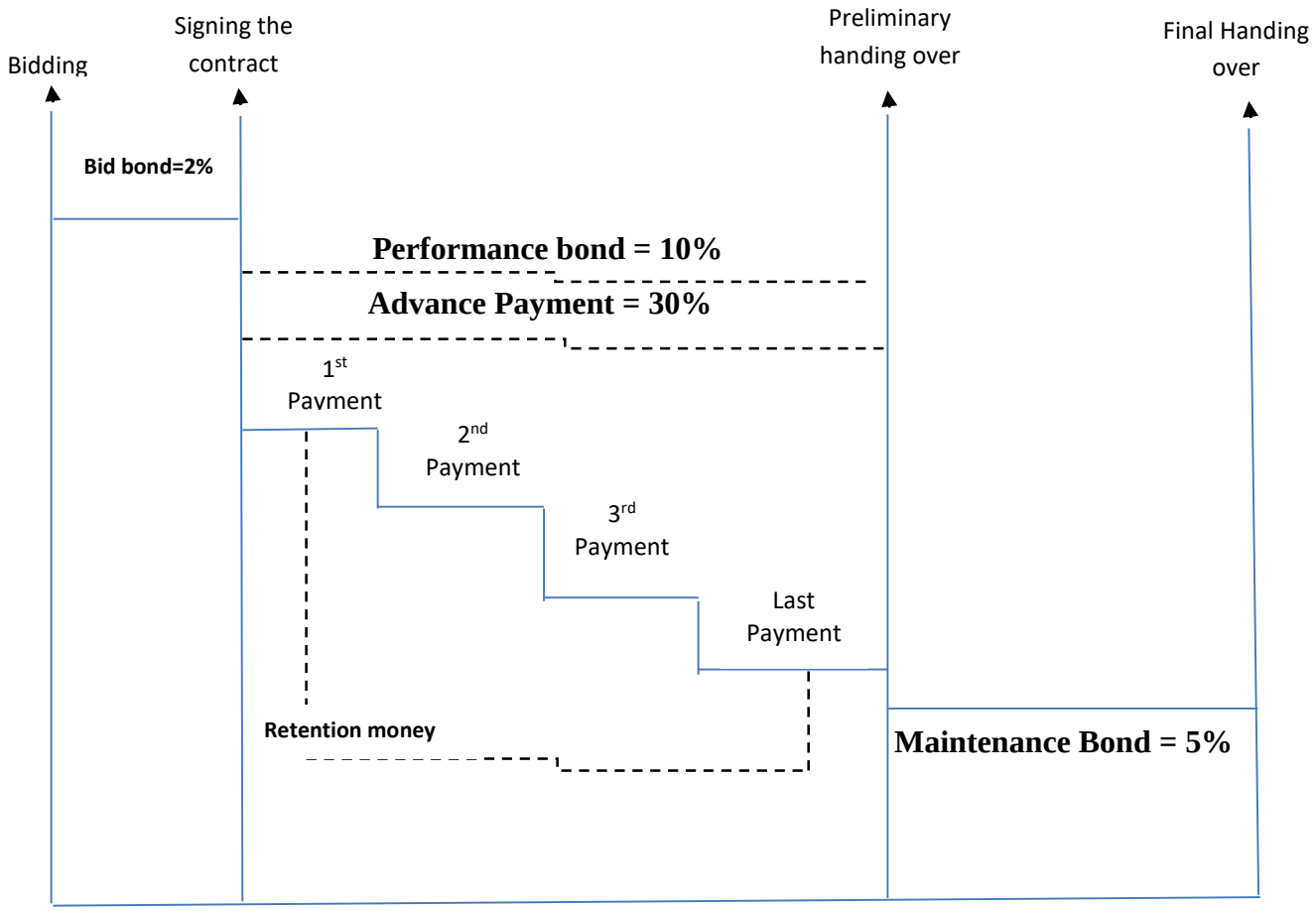

Figure 2.2 Bonds & guarantees procedures

Source: DR.Salah Agbani –Lecture notes 2005

A-Forms of bonds &guarantees

A-Certified cheque (Bank Cheque):

The certified cheque is acheque issued by a bank with equal amount of the required guarantee, the issued cheque is due and can be cashed immediately by the employer in case of any default of the contractor.

B-Bank letter of guarantee:

- Letter of guarantee issued by a bank located in the country of the employer or by a foreign bank through a correspondent bank located in the country of the employer
- Should be issued in the same currency stated in the contract
- The general description of the bank letter of guarantee includes briefly: irrevocable, unconditional, nontransferable and payable on first demand.
- An irrevocable demand guarantee constitutes a definite undertaking of the bank to pay the employer, depending on the circumstances, provided that the stipulated documents in the instrument (if any) are presented to the bank and that the terms and conditions of the instrument are complied with. It gives the beneficiary a high degree of assurance that he will be paid, provided he complies with the terms of the guarantee. An irrevocable demand guarantee cannot be amended or cancelled without the consent of the employer.

B-Bank letter of Guarantee- costs

The letter of guarantee is guarantee issued by a bank according to the formed required and as agreed upon.

For issuing a bank letter of guarantee the contractor shall mortgage a building (normally with an amount equal to 125% of the required guarantee) in addition to a cash margin (about 20 % from the amount of the required guarantee). The letter of guarantee cost includes:

- Asset (land or building) evaluation fees provided that each bank has specific special acceptable consultant for asset evaluation.

- Land mortgage &Land free of mortgage by the end of the project provided that the asset cost to be mortgaged = 125 % of the cost of required guarantees (according to the central bank regulation).
- Blocked cash margin (about 20 %) throughout the execution period
- Bank administration fees.
- Renewal fees: The bank issue the letter of guarantee for 3 months then the contractor should renew the letter periodically up the required duration, subsequently paid the required bank charges for that.
- Advocate and contractor administration fees.

The total cost of bonds and guarantees were calculated from Danfodio company records as specified in the case study according to the actual cost based on the guidelines mentioned above.

Water and electricity expenses, government charges, testing and quality control will be calculated as per the invoices paid to each authority.

Overheads percentage is calculated by dividing the total overheads by the project basic price.

2.8 Previous Studies

An overhead cost of projects has significant role and influence on the performance of the construction companies. In addition, maintaining a good performance and quality of work away from all possible loss.

When preparing an estimate, key cost components such as labor, material, subcontract, equipment, are analyzed as to the amount of resources needed to perform the job. Those costs are relatively straightforward and easily understood. These costs are charged by the specific identification method, necessary to run the business, but are not assignable to a specific job or project. Different researches on overhead costs investigate a lot of diverse problems related to the evaluation and allocation of overhead costs to different projects and cost drivers.

In this part of the research the researcher will highlight the previous studies on overheads related to this research. The researcher considers many countries as existing examples of applying overhead cost methods and analysis.

The previous studies include:

1- Two study from Arabic countries.
2- Two studies from foreign countries.

2.8.1 Arabic Countries Studies

1-Eygpt

A Neural Network Model for Construction Projects Site Overhead Cost Estimating in Egypt

Ismaail ElSawy1, Hossam Hosny 2 and Mohammed Abdel Razek 3

A-Objectives

The main objectives are:

1-Comparison between the list of site overhead factors collected from previous studies and the applied Egyptian site overhead list of factors that is adapted by construction firms in Egypt.

2-Collection of all required site overhead cost data for a sample of projects in Egypt to be used during the analysis phase and site overhead cost assessment model development.

3- To develop a neural network (NN) model to assess the percentage of site overhead costs for building projects in Egypt.

B-Research Methodology

1-Previous researches served as key source in the identification of the main factors affecting site overhead costs for building construction projects.

2-Based on an extensive review for the previous studies conducted in this area of work, the survey for such factors mainly include projects need for specialty

contractors, percentage of subcontracted works, consultancy and supervision, contract type, firm's need for work, type of owner/client, site preparation, projects scheduled time, need for special construction equipment, delay in projects duration, firms previous experience with projects type, legal projects cash-flow plan, project size, and projects location.

3-The study shed a great deal of light on the area of site overhead costs for building construction projects in Egypt. Through seeking the expert's opinions regarding the building projects overhead costs. They will be used during the development of the model. Such factors were mainly identified based on the expert's opinions from selected groups of prominent industrial professionals and qualified academicians from the most prominent universities in Egypt.

4- The principal objective of this survey study was to reinforce the potential model, based on the expert's opinions from the aforementioned expert professionals.

5-Expert opinion included the reviews from nineteen prominent industrial professionals and sixteen qualified academicians from the American University in Cairo and the Arab Academy for Science and Technology and Maritime Transport.

6-Reviews from experienced industrial professionals were essential for developing the overall model as these professionals are directly associated with the leading Egyptian building construction firms.

7- Each expert from both contractor and academic background were approached based on their personnel experiences.

8-Half of the responses were obtained via personnel interviews and the other half were obtained through delivering the questionnaire and collecting back the same, E-mail or Fax.

C-Data Collection

1- To perform a comparison between the overhead cost factors from the comprehensive literature study and the Egyptian construction industry. Hence, the main factors affecting site overhead costs can be clearly identified.

2- To collect data for 50 projects from several construction companies that represent the first and the second categories of construction companies, in Egypt.

3-A questionnaire is prepared to investigate the main factors affecting site overhead cost for building construction projects in Egypt.

D-Neural Network Model (ANN-Model)

Neural network models are generally developed through the following basic steps:

1. Define the problem; decide what information to use and what network will do.
2. Decide how to gather the information and represent it.
3. Define the network, select network inputs and specify the outputs.
4. Structure the network.
5. Train the network.
6-Test the trained network.

E-Summary

1-Construction firms should carefully examine contract conditions and perform all the necessary precautions to make sure that project site overhead costs factors are properly anticipated for and covered within the total tender price.

2-The study conducted a survey that investigated the factors affecting project's site overhead cost for building construction projects in the first and second categories of construction companies.

3-An ANN model was developed to predict the percentage of site over.

4-head cost for building construction projects in Egypt during the tendering process. A sample of building projects was selected as a test sample for this study.

5-The Impacts of different factors on the site overhead costs were deeply investigated.

6- The survey results illustrated that site overhead costs are greatly affected by many factors. Among these factors come project type, size, location, site conditions and the construction technology. All of these factors make the detailed estimation of such overhead costs a more difficult task.

7-Hence, it is expected that a lump-sum assessment for such cost items will be a more convenience, easy, highly accurate, and quick approach. Such approach should take into consideration the different factors that affect site overhead cost.

8-It was found that an ANN-Based Model would be a suitable tool for site overhead cost assessment.

F-CONCLUSIONS

The following conclusions are drawn from this research:

1**.** Through literature review potential factors that influence the percentage of site overhead costs for building construction projects were identified.

2. The analysis of the collected data gathered from fifty-two real-life building construction projects from Egypt illustrated that project's duration, total contract value, projects type, special site preparation needs and project's location are identified as the top five factors that affect the value of the percentage of site overhead costs for building construction projects in Egypt.

3**.** Nature of the client, type of the contract and contractor joint venture are the lowest affecting factors in the percentage of site overhead costs for building construction projects in Egypt.

4. A satisfactory Neural Network model was developed through fifty-eight experiments for predicting the percentage of site overhead costs for building

construction projects in Egypt for the future projects.

5. The results of testing for the best model indicated a testing root mean square error (RMS). Testing was carried out on five new facts (Projects) that were still unseen by the network.

6-The results of the testing indicated an accuracy of (**80**%). As the model wrongly predicted the percentage of site overhead costs for only one project (**20**%) from the testing sample.

2-Investigating the overhead costs in construction projects in Palestine

Adnan Enshassi, Abdul Rashid Abdul Aziz and Ala'a El Karriri

A-Background

The financial components of any construction item consist of three main parts, the direct costs, indirect costs and profit margin. As the indirect costs are a crucial part of these costs, it is beneficial to investigate this part and investigate its influence on the contractors' strategies and their business progress.

The researches explore the perceptions of Gaza strip's contractors regarding the overhead costs trends and its importance in future.

The contractors in the Gaza Strip belong to two main groups, the first under the Palestinian Contractors Union (PCU), while the other under the United Nations Relief and Work Agency (UNRWA) lists. Both categories include the classification of building, infrastructure, and repair works, mechanical, and steel structure works. If any institutions or governmental ministry desire to implement any project, they ask the qualified companies to submit their classification based on PCU classifications, except the UNRWA that approve its category list or PCU lists.

The UNRWA, through their engineering department, covers a large area of the construction industry at Palestine that includes building projects and infrastructure projects. The UNRWA has a unique contractor classifications

based on the technical evaluations, financial evaluation and the reputation of the companies inside and outside the UNRWA's projects engagements.

The technical evaluation considers the characteristics of similar projects which had been implemented by the company (e.g. size of the project, location, type of the project, implemented duration, etc.), the financial evaluation which is based on the financial capabilities of the company, and project value, the running costs, the available cash in hand and other related criteria.

The UNRWA classifies contractors under three categories (i.e. A, B and C) while PCU has five categories (first, second, third, fourth and fifth). The first PCU category is nearly equivalent to the UNRWA's A category, while the second and third PCU categories are equivalent to UNRWA's B and C categories respectively. The fourth and fifth categories can be considered lower than the UNRWA's C category.

The financial ceiling for projects for the first PCU category is US$5 million, second category is US$2 million, third category is US$1 million, fourth category is US$0.5 million and fifth is US$0.25 million.

B-Research methodology

1-The data needed for this research was collected by questionnaire and interview with local experts to reflect the existing level of overhead or indirect costs and how the contractors deal with this subject.

2-The questionnaire comprised of two parts: the first part sought to collect the perception and opinions as well as general information about the overhead costs, while the second part was used to obtain data about the companies'/contractors considerations regarding the overhead under their works such as the value of the overhead costs as a percentage of the total project cost, the controlling and management system if applied by the company, the main considered components, among others.

3- The questionnaire includes 22 main questions. A pilot study was applied on six companies from the North, South and Gaza areas, to achieve the demographic distribution overall of the Gaza Strip.

4-The contractors were from first, second, third, fourth and fifth categories to achieve the highest benefit of this pilot study and to obtain the necessary and the main information which can support and strengthen the study.

5-The target population in this study was the companies classified under the building categories in both the PCU (first, second, third, fourth and fifth) and UNRWA's (A, B, C) categories. These are the building contractors'/company categories classified under the PCU and UNRWA categories.

6- A total of 100 questionnaires were distributed geographically in the Gaza Strip (48 South, 8 Middle, and 44 North Area).

C-Results and analysis

C-1 Components of the overhead/indirect cost

1-The results showed that 90 percent of the contractors roughly understood the meaning of overhead costs and gave examples of overheads such as staff wages, taxes, insurances, financial bonds, transportation, temporary constructions at the project, communication costs, offices renting, and other components.

2-The supervision costs including the staff wages were the highest overhead costs component. This finding is to be expected as the required staff should be available during the project period, maybe even before the beginning of the project and after the completion of it.

3-The second highest component of the overhead costs was insurance, taxes and bonds costs. Any contractor who wins a contract must pay three types of financial payment to the taxation department and the interior taxation department, 0.008 for any contract just when the contract is recommended (before the beginning of the project), then the contractor must pay an average value of 20 percent of each contract value multiplied by 14.5 percent of VAT

(value added tax). Then the contractor must pay to the interior taxation department on average 2-3 percent of the total annual contracts that were awarded to them.

4-Regarding bid bonds, the contractor must pay a premium value for each bond as surety, and in case of serial participation without chance of winning, the contractor will bear a high part of risks and financial losses.

C-2 Percentage of the project overhead costs

The obtained results in **Table 2.2** show that the overhead costs represent 11.1 percent of the total project costs.

Table 2.2 Overhead cost ratio

Range of overhead cost to total project cost	Frequency	%
10% or less	27	67.5
11-15%	12	30.0
16-20%	1	2.5
21-25%	0	0
More than 25%	0	0
Total	40	100
Ratio of overhead costs to total project costs		11.1

Prepared by the authors

D-Conclusion

1-The results of the survey showed that the average overhead cost in Gaza strip was 11.1 percent of the total project cost.

2-Increase overhead costs was detected due to several reasons such as cost inflations, currency exchange rate, increasing financial costs, firm growth, delayed payments and others.

3-The overhead costs were affected by several factors such as project complexity and location, supervision restrictions, contractors' cash availability and others.

4-Most of the contractors believed that applying controlling and management system over their overhead cost improve their chances to win more bids and profit margin.

5-Managing and controlling overhead costs can start from estimating and measuring it precisely with details from the contract documents and to apply a pre-determined plan for the work, in addition to apply periodical measurements during the projects life to understand clearly the actual expenditures.

5-Separating between job site overhead and the general and administration overhead is considered one of the main important issues under the management and controlling process.

6- The staff wages were the highest overhead component, while the insurance and taxes fees were the second highest.

7-It is recommended that courses are offered to Palestinian contractors periodically to increase their knowledge and awareness about the overhead costs concept.

8-The owners, donors and other relevant parties are recommended to use the unified currency payment and expenditures in New Israel Shekels (local currency) to avoid variance of exchange rates and to enhance lower the level of risks for contractors.

9-It is advisable that the concerned parties and those responsible at the taxation department minimize the payable taxes to motivate the contractors to minimize their overhead costs, which would then give them a great chance to absorb more labor and execute more projects.

2.8.2 Foreign Studies

1-India

A SYSTEMATIC STUDY ON SITE OVERHEAD COSTS IN CONSTRUCTION INDUSTRY

R.Janani1, P.T.Rangarajan2, S.Yazhini3

A- Objectives

1- To investigate the overhead costs in construction companies.

2- To find out the major factors affecting the project overheads.

3- To control and minimize the overhead costs.

4- To eliminate the unnecessary costs and that is used to manage the overheads in efficient manner.

B-OVER HEADS

Overhead costs are said as indirect costs. Overhead costs are not a component of actual construction work but they support the main work. However, there are two types of construction overhead costs, Company overhead costs and Project overhead costs. Company overheads are administration costs and the project overheads are site overhead costs.

Site overhead costs will be 10 to 12% and inclusive of company overhead costs will be 15% on contract value.

Overhead costs are included in every estimate for any type of construction or reconstruction projects which are generally added as a percentage to sum of labor, material and equipment. Overhead items shown in **Table 2.3**

Table 2.3 Site overheads

Staff Salaries	Annual Benefits
Conveyance	Telephone Charges
Printing & Stationary	Project Expense
Postage and Courier	Xerox

Staff Welfare	Insurance
Photos & Videos	Bank Charges
Site Accommodation	Freight Charges
Testing Charges	Safety
Sundries & Others	Tools & Tackles
Water Charges	Temp Structures
Labor Miscellaneous	P & M for Overheads

Prepared by author

C-Percentage on Contract Value

Some of the overhead items have high percentage on contract value approximately shown in **Figure 2.3**

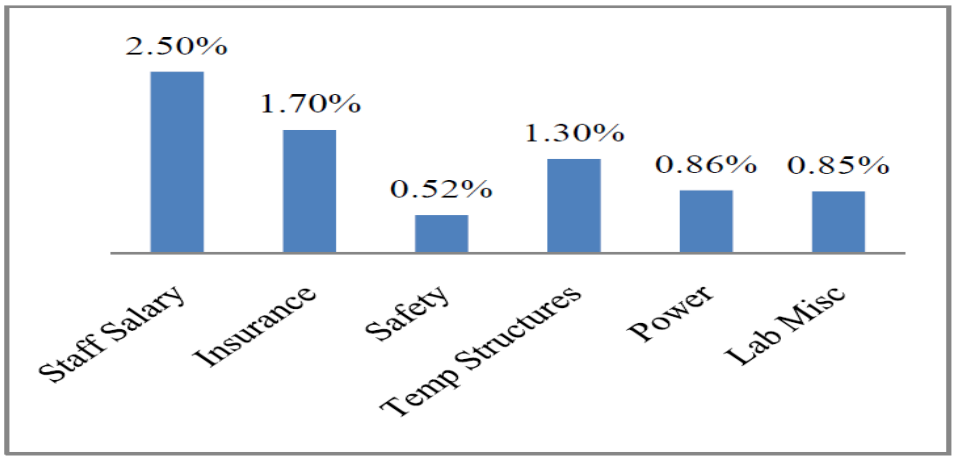

Figure 2.3 high parentage overheads in contract value

D-Methodology

Some of the Questionnaires were prepared and the answers and the suggestions have been arrived from the Experienced Engineers/Contractors.

E. Results

1- The costs for the overheads are not directly mentioned in Bill of quantities. From the review, engineers/contractors are not much aware on overhead costs.

Hence the senior engineer's/experience engineers to work out the overhead costs during tender.

2-Construction companies should carefully examine the contract conditions overhead costs and perform all the necessary precautions to make sure that the project site overhead cost factors are properly anticipated and covered with in the total tender price.

3-The site overhead costs are mainly affected by the type of project, size of project, area of project, conditions of site.

F-Suggestions given by the experienced Engineers

1-The project has to be completed on time without any delay, so the overhead costs can be controlled. If delay cannot be controlled, then the overhead costs also cannot be controlled.

2-If the project duration increases, then the overhead costs increases. Delay of materials to site, increases the duration of the project and hence results in increased overheads.

3-Unnecessary costs can be eliminated and the engineers those who are working on overhead costs should be aware while working out the cost.

4-Delay in payment indirectly affects the overhead costs.

5- Reviewing the previous similar projects, and to list out the major factors affecting, and the risks faced by the contractors on overhead items, then to start the estimation on present project overheads.

6-Understanding the overhead works properly will help to control the costs in most efficient manner.

Suggestions given below in **Figure 2.4** can be followed by the engineers/contractors to reduce the overheads cost overrun and to reduce unnecessary spending, and to control throughout the project

Figure 2.4 Suggestions to reduce the overheads cost

2-United States of America (USA)

An Analysis of Construction Overhead Expenses During the "Great Recession"

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University of North Carolina at Charlotte
Charlotte, NC

Brian Lines, Ph.D.
University of Kansas
Lawrence, KS

Jeff Sawyer, M.S. and Kenneth Sullivan, Ph.D., M.B.A.
Arizona State University
Tempe, AZ

A-Back ground

The study was taken in United States of America (USA), provided that the "Great Recession" had a significant impact on numerous industries in the United States. Construction was particularly affected: by January 2010, unemployment reached approximately 20 percent. Construction is cyclical,

continuously responding to various market and geopolitical pressures. When the industry is in a lull, competition for the limited construction dollars' increases. Many contractors attempt to maintain their same volume of work, but doing so may decrease profitability. One way to combat declining profits is to adjust general overhead costs (indirect expenses).

B-Objectives

The main objectives of the study:

1- To collect information from general contractors about how the Great Recession reduced their internal overhead expenses.

2- To conduct how the industry adjusted their overhead costs because of the 2008-2013 declines.

C-Methodology

1-The authors developed a two-part online survey which was distributed through the national and local chapters of the Associated General Contractors, various LinkedIn groups, and numerous personal contacts of the authors.

2-The first part of the survey requested the respondent to classify their company's percentage reduction from a set of typical overhead categories.

3-The second part of the survey collected demographic information about the respondents, including estimated annual revenue, number of full-time employees, and business sector.

D- **Data Collection**

1-The survey was first piloted with 12 companies, who helped develop the list of corporate overhead categories to measure. The original survey had four categories of overhead expenditures, but at the recommendation of the pilot respondents, six categories were identified for the final survey (0%, 1 – 10%, 11 – 25%, 26 – 50%, 51 – 75%, and more than 75%).

2-Respondents were asked to identify any overhead reductions from their perspective within the company (i.e., local, region, corporate). While each

question was optional, nearly 100 percent of the respondents provided an answer on all questions.

3-Once the survey was finalized, it was emailed out to the various contacts. A total of two reminder emails were sent before ending the data collection.

E-Results and Data Analysis

The authors conducted an analysis to test the strength of association between two different relationships. The Overall Overhead Reduction is the mode of a respondent's overhead reduction cost categories.

1. Overhead Category and Percentage Reduction.

2. Firm's Annual Revenue and Overall Overhead Reduction and Firm's Number of Employees and Overall Overhead Reduction.

3-A total of 140 general contractors returned surveys for this study.

4-Home office overhead had the fewest reductions (70 percent of respondents did not make a change) while bonuses, contributions to retirement plans, and company functions had the highest reductions (about 23 percent of respondents reduced them by more than 75 percent).

F-Discussion and Conclusion

1- That majority of firms reported cutting some level of overhead indicates that much of this cost may have been excess in the first place, so much as the literature suggests, while the recession had a negative impact on many people, and especially those in construction.

2- As the market continues to improve, companies will need to begin bringing back these overhead costs (people, assets, and so on).

3- The challenge is restructuring organizations to become more agile, rapidly responding to changing market conditions through a flexible internal financial structure.

2.8.3 Comments on the previous studies

The previous studies can be summarized as follows:

1. The most important features that characterize the previous studies are comprehensive worldwide studies (Arab – foreign).
2. Most of the studies addressed the overhead in general, and focused on how to allocate the overhead and how they were affecting a project cost.
3. They involved different community samples.
4. The majority of these studies used questionnaire as the main research tool.

2.8.4 Benefits gained from the previous studies

1. The researcher became familiar with the subject through access to the previous studies.
2. Learning the methods and techniques used in these studies.
3. Selecting the appropriate curriculum and tool for the research (descriptive curriculum – questionnaire tool).
4. Knowing and awareness of the factors affecting the overhead cost.
5. The researcher set the assumptions of the research and the questionnaire's questions based on the previous studies.

2.8.5 Current study with regard to previous studies

The researcher has not found a research typical to the one he wants to do, the previous researches have focused on the general overhead as a part of the project components cost. The researcher wants to calculate out the overheads in a systematic approach for the evaluation of both general and site overheads and to come out with an overall overhead index.

2.9 Summary

Construction industry includes much business such as constructed buildings, and completes engineering projects; subdivide land for sale as potential building sites and site preparing.

Construction industry in Sudan is one of the major industries, playing a very important role in the socio economic of the country, providing infrastructures for the development, reserving considerable chances for the employment and has a significant share in the GDP.

Cost estimates are prepared and used for different purposes including feasibility studies, tendering phase, avoidance of misuse of funds during the project. There are different types of construction estimates depending on: the purpose of the estimate, the project stage, and availability of information, techniques and method of calculation, accuracy range expected, prospective of the estimator and other related factors.

Tendering (bidding) is the process for the selection of suitable contract for specific job at a certain amount and time appropriate to the Employer's circumstances and agreed with him an acceptable offer upon which a contract can be placed. When the contractor has decided to bid, the documents of bidding must be obtained and reviewed.

Overhead costs are generally added during bidding to the contractor's estimate of project costs, normally a percentage from the project construction cost is taken to represent the overhead cost, actually this is the practice how the overhead is included in project price. Overhead items should be estimated in detail for all activities at construction documents of the project.

Previous studies cited in this section, show the different methods of how the overheads affect the construction cost, though the studies did not give the overhead percentage, and how much it cost compared with other building components. In the subsequent chapter, the researcher will offer his own method to measure the impact of overhead cost percentage, through a case study and a questionnaire prepared by the researcher.

CHAPTER THREE
OVERHEADS CLASSIFICATION AND EVALUATION

CHAPTER THREE

OVERHEADS CLASSIFICATION AND EVALUATION

3.1 Overheads Definitions

Overheads for any project can be defined as the unaccounted for charges that are not spent as materials, equipment, labor or subcontractors for the said project.

Overhead charges can be classified as: direct overheads (General Overheads), indirect overheads (site or job) overheads. Project overhead costs include expenses that cannot be charged directly to a particular branch of work, but are required to construct the project.

General overheads are the charges concerning the contractor(headquarter) and the administration cost incurred whereas site overheads charges occur and take place at a specific Job and are not included in direct project cost.

General overhead consists of those costs that cannot be specifically identified to the completion of a construction project. It includes all main office expenses costs that cannot be billed to a specific construction project. General overhead costs are controlled on a company wide basis; the responsibility for controlling these costs falls on the contractor company's top manager.

A few commonly accepted definitions of overhead costs appear in scientific sources worldwide. One of them, more suitable for construction industry, is presented by Cilensek (1991): "Overhead costs are defined as those costs that are not a component of the actual construction work but are incurred by the contractor to support the work". Generally, the building contractor's overhead costs are classified in two categories: project overhead costs and company's overhead costs (Peurifoy and Oberlander, 2002). Project overhead costs include expenses that cannot be charged directly to a particular branch of work, but are required to construct the project. Company, or so-called "general", overhead costs are items that represent the cost of doing business and often are

considered as fixed expenses that must be paid by the contractor (Dagostino and Feigenbaum, 2003).

Carr (1989) defined direct cost as the costs that are not counted if the activity has not been performed and indirect costs as the ones that would have occurred even if an activity had not been performed. Materials, labor, and equipment qualify as direct costs because of their physical traceability to the construction activity taken place while project and general overhead, and (perhaps) profits are indirect costs. Indirect costs are also those small costs that would be direct except that assigning them to activities is not economical. Ferry et al (1999) did not consider profit as part of the contractor's costs. They see it as the difference between the builders' cost and the client's price. Akintoye and Skitmore (1991) regard the mark-up as a prior estimate of profitability.

Variable and fixed costs are two often-used terms in the construction literature that relate to direct and indirect costs respectively in an unclear way, while the distinction of direct and indirect costs depends much on traceability of specific cost to a particular activity, variable and fixed costs emphasize the rate at which different costs vary when the level of the work activity changes. Costs that remain virtually unchanged and continue to be incurred even though the workload might fluctuate between extreme limits are termed as fixed costs (Lock, 2003). Indirect costs usually represent the largest component of fixed costs. To the contrary, variable costs are typically confined to the direct costs and their rate of incurrence depends on the level of work activity. Stewart (1982) claims that fixed costs are only truly fixed over a given range of output because of the inflation that swells the operating and general overhead costs over time.

More broadly defined and less used construction cost terms are *hard* and *soft* costs. Geltner and Miller (2001) describe the former as direct costs of the physical components of the construction project such as land cost, labor,

material and equipment, developer fees, construction management, and overhead costs. The soft costs included cost of design, legal, and financing.

3.2 Overheads classification

In this chapter we make classify of overheads as per the management practice in Sudan by tracking the overheads whereas it is general or project overheads. The difference between general and a project overhead may vary from project to project based on what is billable to the project's owner under the construction contract.

Overheads may be classified on the basis of behavior such as variable Overheads, semi-variable overheads and fixed overheads. Collection of overheads means the pooling of indirect items of expenses from books of account and supportive/ corroborative records in logical groups having regards to their nature and purpose**.**

Overhead costs may be divided into three types of costs: variable costs, fixed costs, and mixed costs. Variable costs are those costs that tend to vary with the volume of work, which is most commonly expressed as a percentage of the revenues from construction projects. Fixed costs are those costs that tend to be fixed over a specific range of revenues. Mixed costs are costs that contain both a variable cost component and a fixed cost component.

Overheads are collected on the basis of pre-planned groupings, called cost pools. Homogeneity of the cost components in respect of their behavior and character is to be considered in developing the cost pool. Variable and fixed overheads should be collected in separate cost pools under a cost center. A great degree of homogeneity in the cost pools are to be maintained to make the apportionment of overheads more rational and scientific.

General overheads are classified into two categories: administration and general whereas the project overheads are classified according to the project life cycle stage namely: tendering stage, execution stage and maintenance and defects of liability stage.

3.2.1 Direct Overheads (D OH) or General overheads

The charges concerning the contractor (headquarter), administration and general cost incurred including but not limited to:

3.2.1.1 Administration charges

Administration charges and all other administration expenses that can be summarized as follows:

1-Office: Office expenses include the following:

A-Office Rent:

This refer to the rent of the contractor headquarter as well as branches (if any) and in case that the contractor has his own building then the equivalent rental rate is found.

B-Office furnishing and equipment:

This cost includes the office furnishing and equipment's (computer and office furniture should include all costs associated with the purchase or lease of personal property used in the main office).

C-Office Supplies:

Office supplies include consumable supplies used by office and general management personnel, such as paper, printer cartridges, pens, and so forth.

D-Repairs and Maintenance:

Repairs and maintenance include the cost of maintaining office facilities and the associated capital equipment, computers and furnishings covered under the general overhead budget.

E-Office Utilities:

Office utilities include the cost of:

- Electricity expenses and monthly invoices.
- Water expenses and monthly invoices.
- Sewer expenses.
- Garbage collection.
- Telephone & internet services.

The contractor pays monthly invoices of the mentioned utilities to the concerned authorities.

F-Office cleaning:

Include the cost of regular cleaning services. It also includes the occasional cleaning of the carpets and other infrequent cleaning costs.

2- Wages & Salaries:

The contractor pays monthly salary to the employees as per the contract including vacation salary in addition to any other incentive. Employee wages and salaries include:

- All wages and salaries paid to office and general management personnel (Including intensives, bonuses & overtime).
- Holiday's gift (paid salary).
- Employers benefit (health insurance, vacation, holidays, sick leave and retirement).
- Board of directors (Incentives, bonuses).

3-Publications and Subscriptions:

Include the cost of:

- Stationeries, profiles, brochures and marketing tools.
- Advertising in different types of media (TV, newspapers), scientific and professional magazines.
- Promotion includes items given away to promote the company, such as hats, shirts, and cups printed with the company's name and logo.
- Publications and subscriptions include the cost of trade magazines and newspapers used to keep the company's staff up-to-date with respect to potential projects and with other changes in the industry.
- Newspapers and publications used in the waiting area.
- Employee recruiting, typical employee recruiting costs include the cost of newspaper and other advertising to find employees and hiring personnel agencies and other costs incurred during the hiring process.

1- Car and Truck Expenses:

Include the cost of**:**

- Vehicle costs associated with office and general management personnel.
- Petrol & oil expenses.
- Car parking, tires, maintenance, and repairs for the vehicles (It includes the costs associated with rental cars and mileage reimbursement).
- Travel expenses include the cost of lodging and transportation for office and general management personnel while they are away from the office.

5-Training:

Include the cost of:

- Training and capacity building to improve the employer's skills (courses, seminars, workshops, researches).
- Participating in forums and conferences.

6-Running expense& Social Contributions:

Include the cost of:

- Running expenses.
- Social participations (contractor's association activities, besides different personal social contributions).
- Charitable Contributions: especially donations that are donated to a qualified organization.

7-Others:

Other different items including the cost of:

- **Bank Fees:**

  All fees charged by the bank to provide banking services and include returned check fees.

- **Taxes and Licenses:**

Property taxes, business licenses, and other government-mandated permits required to operate a business.

- **Dues and Memberships:**

The fees paid to professional organizations, such as the Associated General Contractors and Associated Builders and Contractors.

- **Legal and Professional Services:**

The cost of legal services used in the setup of the company, collection of bills, review of contracts, dealing with lien rights, and other legal matters. It also includes professional accounting services used in the preparations of financial statements, preparations of taxes, set up and review of accounting systems, and bookkeeping services. It also can include fees paid to professional engineers and architects that cannot be billed to a construction project.

- **Government charges**:

Any other government charges i.e. for the municipality charges & state charges.

- **Working Capital** :

The contracter have a working capital to secure the salaries, office expansés basides a réserve amont for continue the woks in case of delay of payement.

3.2.1.2 General charges:

The general expenses include government expenses, depreciation and others as summarized below:

1-Taxes: The contractor pay different taxes cost including:

A- Income taxes.

B- VAT (value added tax).

C- Employer’s taxes.

The contractor managed and pays the income tax for the employees as far as the income earned by a person is taxable, it includes;

- All taxes paid by the employer for office and general management personnel.
- Social security& Medicare.

2- Zakat

The employee has to be zakat. The zakat value is decided by zakat chamber authority.

The contractor manages and pays the income zakat for the employees.

3-Depreciation

The contractor calculates and pay the cost of the depreciation. Depreciation is defined as a decrease in the value of an asset resulting from deterioration, wear, tear, obsolescence etc. arising from improvements in the design and construction of new equipment's. Depreciable property is that which contributes to income and have a life time of more than one year.

Purpose of depreciation in construction economics is to distribute the initial cost of and asset (less any salvage value) over the lifetime of the asset.

The depreciation includes:

- Depreciation of cars.
- Depreciation of equipment's and furniture.

4-Insurance:

The contractor makes the necessary insurance and pays the cost required for it including:

- Health insurance for the employee.
- Workers' compensation insurance.
- Vehicles and car insurance.
- Equipment's and furniture insurance.
- Office insurance.

3.2.2 Indirect overheads (ID OH) or Site (Job) overheads

Any overhead charges occur and take place at a site of a specific Job and are not billed to the project are termed indirect (Site or job overheads).

The site or job overheads are including but not limited to the following:

3.2.2.1 Tendering Stage:

The indirect overheads at tendering stage can be summarized as follows:

1- Tender documents fees

Normally the consultant prepares the document required for the project and makes all necessary arrangements for tendering provided that the documents will be submitted to the contractor upon paid fees.

The contractor pays nonrefundable fees for receiving a bid documents (purchasing the tender documents).

2-Site Inspection & tender costing

The contractor pays the cost of site Inspection & tender costing which includes:

- Site visit for the purpose of bidding and making any necessary inspection and studies.
- Technical and financial team for tender costing, preparing all the means of access to the needed site and the accommodation required.
- Check the materials necessary for the execution and completion of the works and the remedying of any defects.
- Checking the sub-surface condition and the hydrological and climatic conditions.
- Obtaining all necessary information, subject as above mentioned, as to risks, contingencies and all other circumstances which may influence or affect his Tender.

3- Duty stamp:

Duty stamp is one of the tender requirements which can be summarized as follows:

- Stamping the tender documents by duty stamp tax authority and paying the required fees.
- Tax duty stamp fees will be as per the rate decided by the duty stamp Tax authorities.

- By stamping the tender document, the tender will be legal and satisfying the competition requirements.

4-Bid Bond 2%:

The bid (security bond) of 2% of the tender price is required to enable the contractor to compete for the tender otherwise his tender will be rejected. The bid (security) bond can be described as below:

- The bid (security) bond safeguard the employer against breach of such an undertaking and to prevent frivolous bidders from submitting a tender.
- The main idea behind this bond is that the tenderer undertakes to sign the contract if it is awarded to him.
- The contractor obtains security bond of the contract; the security bonds shows the contractor financial capability.
- The bid (security) bond has to be valid until sorting and analyzing the tender and selection of successful bidder (normally 3 months).
- The bid (security) bond will be either a bank guarantee or insurance company guarantee.
- The bid (security) is either given back to unsuccessful bidder or completed to 10% in the case of successful bid.

3.2.2.2 Construction Stage:

The indirect overheads at construction stage can be summarized as follows:

1-Mobilization

The contractor makes mobilization to the site and pays any cost required for:

- Equipment's, tools and materials.
- Temporary works and others necessary for project execution.
- Maintains any damages on the roads and keep the employer safe of any indemnities caused by that.

2-Performance Bond 10%:

The contractor obtains security of his proper performance of the contract, the performance bond assures that the contractor will be punctual and faithful in carrying out the works provided that:

- The performance bond designed to safeguard the employer against breach of contract by the contractor and his performance of his obligation as per the signed contract.
- Performance guarantees are a means of ensuring completion of the contract or of extracting a financial penalty from the contractor, if he fails to fulfill his obligations in terms of the contract.
- The performance security shall be valid until the contractor has executed and completed the works and remedies.
- The security performance will be either a bank guarantee or insurance company guarantee.
- The performance bond guarantee will be valid from the date of signing the contract until the completion of the project.

3-Advance payment guarantee up to 30%:

The employer pays a part of the contract price in advance as an interest free loan for mobilization detailed as follows:

- The advance payment guarantee is designed to secure the employer's right to repayment of the advance if the performance of the contractor is not as per the signed contract.
- The contractor obtain advance payment guarantee against equal amount paid to him in advance.
- The advance payment guarantee shall be valid from signing contract until the contractor has executed and completed the works and given the final payment.
- The advance payment guarantee will be a bank guarantee.

- The advance payment guarantee will be valid from the date of signing the contract until the completion of the project but it will be reduced according to each interim payment.

4-Temporary works:

Temporary works provided by the contractor shall, when brought on to the site, be deemed to be exclusively intended for the execution of the works and the contractor shall not remove the same or any part of it, except for the purpose of moving it from one part of the site to another. Temporary works and protection requirements include:

- Fencing to the site as well as protection for neighboring buildings.
- Buildings for the purpose of: health and toilets, the materials storage, security and guards at the site.
- Site offices well-furnished and equipped for his team and for the engineer.
- Necessary boards and signals.

5-Water:

- The contractor prepares all the internal connections for the water at the site and also the drinking water for the workers and pays any cost required for that.
- The contractor pays the monthly invoice up to the project completion period.

6-Electricity:

- The contractor prepares all the internal connections for the electricity at the site and pays any cost required for that.
- The contractor pays the monthly invoice up to the project completion period.

7-Right of way & facilities:

The contractor keeps the employer safe and pays any indemnities caused by him to the employer to facilitate reaching the site as follows:

- The contractor shall use every reasonable means to prevent any of the roads or bridges communicating with or on the routes to the site from being damaged or injured by any traffic of the contractor or any of his subcontractor and, in particular , shall select routes, choose and use vehicles and restrict and distribute loads so that any such extraordinary traffic as will inevitably arise from the moving of materials, plant, contractor's equipment or temporary works from and to the site shall be limited, as far as reasonably possible, and so that no unnecessary damage or injury may be occasioned to such roads and bridges.
- The contractor shall be responsible for and shall pay the cost of strengthening any bridges of altering or improving any road communicating with or on the routes to the Site to facilitate the movement of contractor's equipment or temporary works.

8- Safety, environment& health:

The contractor shall take full responsibility for the adequacy, stability and safety of all site operations and methods of construction including:

- The contractor shall, throughout the execution and completion of the works, have full regard for the safety of all persons entitled to be upon the site, and keep the site and the works in an orderly state appropriate to the avoidance of danger to such person.
- Provides and maintain all lights, guards, fencing, warning signs and watching, for the protection of the works or for the safety and convenience of the public or others.
- Take all reasonable steps to protect the environment on and off the site and to avoid damage or nuisance to persons or to properly of the public or others resulting from pollution, noise or other causes arising as a consequence of his methods of operation.

- Arrange first aid and safety equipment's and tools (wear safety shoes, wear protective clothing, wear goggles, wear helmet, wear gloves, wear masks, wear ear protection).

9-Site planning & survey:

The contractor shall be responsible for site planning and pays any cost needed for that as described below:

- Accurate setting-out of the works in relation to original points, lines and levels of reference given by the Engineer in writing.
- Correctness, subject as above mentioned, of the position, levels, dimensions and alignment of all parts of the works.
- The provision of all necessary instruments, appliances and labor.

10-Site office &Executing Staff:

The site office supplies utilities include:

A-Office:

The contractor pays the cost includes the office furnishing and equipment's (computer and office furniture should include all costs associated with the purchase or lease of personal property used in the main office.) in addition to any repairs and maintenance required.

1-Office Supplies:

The contractor pays the office supplies include consumable supplies used by office and general management personnel, such as paper, printer cartridges, and pens, in addition to stationaries (profiles, brochures and marketing tools).

2-Office Utilities:

The contractor pays the office utilities include: Telephone & internet services.

The contractor pays monthly invoices of the mentioned utilities to the concerned authorities.

3-Office cleaning:

The contractor pays the cost of regular cleaning services. It also includes the occasional cleaning of the carpets and other infrequent cleaning costs.

4-Running expenses:

The contractor pays the cost of any running expenses.

5-Others

There are other different charges to be paid by the contractor including but not limited to:

- **Bank Fees:**

The contractor pays the cost of all fees charged by the bank to provide banking services and include returned check fees.

- **Legal and Professional Services:**

The contractor pays the cost of legal services. It also includes professional accounting services used in the preparations of financial statements, preparations of taxes, set up and review of accounting systems, and bookkeeping services. It also can include fees paid to professional engineers and architects that cannot be billed to a construction project.

B-Executive staff:

Include the cost of salaries and wages in addition to the cost of transport:

1- Employee wages and salaries:

The contractor pays the cost of all wages and salaries paid to office and general management personnel (Including intensives, bonuses overtime) in addition to:

- Holidays gift (paid salary).
- Employers benefit (health insurance, vacation, holidays, sick leave, retirement.

2- Car and Truck Expenses:

The contractor pays the cost of:

- Vehicle costs associated (tires, maintenance, and repairs for the vehicles.
- Petrol & oil expenses.

11-Projects Reports:

The contractor prepares and keeps the records for the project and pays any cost for that including:

- Technical reports.
- Financial reports.
- Progress payments reports.
- Meetings.
- Letters and correspondence.
- Forms and others.

12- Insurance:

The contractor makes the necessary insurance and pays the cost required for that including:

- The works under construction.
- The materials and equipment's on site.
- Health insurance for the employee.
- Workers' compensation insurance.
- Vehicles and car insurance.
- Insurance against accident to workmen such as liability and shall continue this insurance during the whole of the work and employers.
- Insurance against liabilities of death or injury to any person or loss or at damage to any property arising out of the performance of the contract.
- Subcontractors risk.

13-Government charges:

The contractor pays any government charges required at the site including but not limited to:

- Building authority fees.
- Road authority fees including road toll.
- Municipality fees.
- Garbage fees.

14-Testing & Quality assurance:

The contractor makes any necessary testing and inspection for the project and pays any cost for that including:

- The Contractor shall afford every facility and every assistance in obtaining the right and access to the Engineer for making any required inspection.
- Facilitate examination of the cover up of work or uncover part of the work.
- The cost of sample supplied for testing.
- The cost of the test if the test is intended or provided for in the contract.
- The quality assures and appoints specialized personnel for that and provides him with necessary equipment's and tool.

15-Works rejected:

The contractor pays the cost of any rejected materials including:

- Loss or damage to the works occasioned by the contractor in the course of any operations carried out by him for complying with his obligations.
- The removal and proper re-execution.

16- Materials Rejected& losses:

The contractor pays the cost of any rejected materials including:

- Rejection of materials or plant which is not ready for Inspection or testing or if, as a result of the inspection is defective or otherwise not in accordance with the contract.
- The removal of improper materials or plant.
- The substitution of proper and suitable materials or plant.
- Losses of materials at the site caused by transporting, loading, &off-loading, storage, losses of scaffolding and tools.

17-Accidents at site & strikes and labor disputes:

The contractor pays the cost and indemnities of any accidents which take place at the site (unless it has been caused by the employer) including:

- Damages or compensation payable to arty workman or other person in the employment of the contractor or any subcontractor.
- Labor strikes or disputes and pays any indemnities claimed by labors in accordance with the labor laws.

18-Variations:

The contractor pays some costs because of variations. Variations of different forms may take place while the project is under construction, these variations affect the overhead cost and hence affect the contract price, the most popular variations are:

- Increase, decrease or omittance he quantity of any work included in Contract.
- Change of the character or quality of any kind of any such work.
- Change the levels, lines, position and dimension of any part of the works.
- Execute additional work of any kind necessary for the completion of the works.
- Change any specified sequence or timing of construction of any part of the works.
- Variation because of the changing some scope of works.

19- Payments:

In case of payments delays the contractor might pay additional cost in addition to the cost paid for taking retention money for each interim payment, these can be described as follows:

A-Payments delays:

Some delays of payment cause additional cost and time for the contractor. The contractor may pay some cost because of these delays, the main reasons for the delay of payment are:

- Delay by the engineer to certify to the employer the amount of payment to the contractor which he considers due and payable within acceptable time after receiving the payment statement.
- Delay of the Employer to pay to the contractor within acceptable time after the payment certificate has been delivered to him.

B-Retention money:

The retention money can be defined as an accumulated amount from each interim payment i.e. the amount certified in each certificate to be retained by the employer of the contract for a specified period as a safeguard against defects:

- The employer may be willing to release such retention moneys against a retention guarantee securing repayment of the released retention moneys if defects are later found or if the contractor fails to complete the contract.
- In the case of default by the contractor, the party containing the retention money is spared the need to resort to a legal process to secure final redress in so far as he may simply keep the retention money or a part of the contract.
- The retention money is taken from the first interim payment to the last payment taken as a percentage (usually from 5-10) %from the interim payment.

20-Increase in prices:

Some increase in prices may take place during the project execution and is not considered as escalation, the contractor may pay some cost because of these increases including increasing the cost of:

- Materials.
- Labor.
- Petrol and transport.
- Customs and taxes.

- Currency devaluation and money value.
- Services (*telecommunication* rates, water consumption invoice).
- Government fees.

21-Change of Laws:

Some regulations and laws changes e.g. then the contract price will be greatly affected, unless by the signed contract the prices are adjusted then the contractor will pay any additional cost for:

- Customs or tax laws.
- Government regulations.
- Currency policy changes.
- Currency restrictions like limited amount of money withdrawal.

22-Environmental and weather changes:

Unexpected environment and weather changes might affect the contract cost and the contractor may pay additional cost e.g.:

- Heavy and long duration time for the rains causes increasing the number of labors or the working hours.
- Heavy and long duration of storms period causes stopping the project execution and hence delays of time schedule.

23-Suspension of work:

Suspension of works causes additional cost, so if the suspension because of reasons referred to the employer or an engineer then the contractor should be compensated otherwise the contractor should pay any additional cost, this includes:

- Suspend the progress of the work or any pat and shall, during such suspension, properly protect and secure the works even if the work is necessary by reason of climatic conditions on the site or necessary for the proper execution of the works or for the safety for any part of it.

- Restriction on working hours or working days' even if the work is unavoidable or absolutely necessary for the saving of life or property or for the safety of the Works.

24- Depreciation:

A contractor calculates and pays the cost of the depreciation for:

- Cars.
- Equipment and furniture.
- Materials and others if necessary.

25-Liquidated Damages:

When construction is delayed by contractor-caused actions, the contractor requested to compensate for the delay. It is difficult to reach agreement on the causes and extent of delay and even tougher to agree on the cost of delay but a formula for a liquidated damage as agreed upon per the signed contract.

26-Drawings:

The contractor pays the cost of some drawings including:

- Engineering and shop drawings.
- As built drawings.
- Operation and maintenance manuals together with drawings of the permanent works as completed in sufficient detail to enable the Employer to operate, maintain, dismantle, reassemble and adjust the permanent works incorporating that design.

27-Delay of handing over:

The contractor shall pay any cost because of the delay of project handing over including:

- Delays of giving instructions to the contractor specifying all the work which, is required to be done by the contractor before the issue of such certificate.
- Delays after the request by the contractor for the engineer to issue a taking-over certificate in respect of the works, when the whole of the

works have been substantially completed and have satisfactorily passed any tests on completion prescribed by the contract.

28-Site clearance:

The contractor pays any cost for the site clearance including:

- The contractor keeps the site (during execution) reasonably free from all unnecessary obstruction and shall store or dispose of any equipment and surplus materials and clear away and remove from the Site any wreckage, rubbish or temporary works no longer required.
- Upon the issue of any Taking-Over certificate the Contractor shall clear away and remove from that part of die Site to which such Taking-Over Certificate relates all Contractor's Equipment, surplus material, rubbish and Temporary works of every kind provided that the Contractor shall be entitled to retain on Site, until the end of the Defects Liability Period, such materials, Contractor's Equipment and Temporary Works as are required by him for the purpose of fulfilling his obligations during the Defects liability Period.

29-Disputes:

If any disputes occur and have not settled amicably then they are to be settled through arbitration. Thus a contractor pays the disputes cost as described below:

- Dispute of any kind whatsoever arises between the Employer and the Contractor in connection with, or arising out of, the Contractor or the execution of the works, whether during the execution of the works or after their completion.
- Disputes shall not be commenced unless an attempt has first been made by the parties to settle such dispute amicably.
- If the dispute has not been settled amicably then the final step will be arbitration as per the signed contract.

30- Risks &Force major:

Risks causes extra cost for the project in particular the type of risks which an experienced contractor could not reasonably have been expected to take precautions, the contractor may pay some costs because of the risk including:

- Political risk.
- Financial risk.
- Natural risk.

In case of force major the project should be close out; this will cost the contractor more cost in additional to the loss of expected profit.

3.2.2.3 Maintenance& Commissioning Stage:

The contractor was responsible for the project for the maintenance defects liability period from the initial project handing over to final handing over stage by issuing a letter of Defects of liability guarantee and making the required maintenance.

The indirect overheads at maintenance & commissioning stage can be summarized as follows:

1-Maintenance &commissioning letter of Guarantee:

The contractor was entitled to submit a letter of guarantee for the period of maintenance and defect of liability and pays any cost needed for that as described below:

- The purpose of this guarantee is to ensure that, once the contract has been completed any defects occurs and he fulfill his obligations during the maintenance or warranty period.
- The contractor obtains a letter of guarantee for the period of maintenance and defects of liability to assures that he will complete his obligations to execute and complete the works and remedy any defects as required.
- Defects of liability guarantee will be (5-10) % from the project price.
- The defects of liability guarantee will be either a bank guarantee or insurance company guarantee.

- The Defects of liability guarantee will be valid from the date of initial project handing over to the final handing over of the project.

2- Defects of liability:

- Defects Liability Period'' shall mean the defects liability period, calculated from the date of completion of the works (initial handing over) up to the final handing over.
- The contractor supplies all the tools and facilities and manpower for making any required maintenance.
- The contract shall not be considered as completed liability unless certificate signed by the Engineer and delivered to the employer, stating the date on which the contractor shall have completed his obligations to execute and complete the works and remedy any defects as required.

3-Demobilizations:

The contractor makes demobilization from the site and pays any cost for:

- Demobilization of equipment's and tools.
- Demobilization of any remaining materials at the site.
- Maintains any damages on the roads and keep the employer save from any indemnities caused by that.

3-3 Building cost components

Project costing should reflect the fair construction of the project and should not be a prediction of low bid (Consulting Estimating Manual; Feb.2006). In project costing care should be taken to distinguish project costing from project pricing.

Meikle (2001) states that a contractor's construction costs are not generally known and describes them as an aggregate of the costs of materials, labor, and equipment to undertake the work and the contractor's finance, management and various site and office overheads.

Labor and materials costs alone would not provide an accurate picture of the movement of total construction costs (Adams, 1975). Wigren (1995) tries to

separate construction costs changes into three main components; change in factor prices, in quality, and in efficiency, he uses a factor price index that measures price changes of all factors of production i.e. wages, prices of different kinds of building materials, transport costs, interest, value added tax, etc. However, the index was not constructed to measure regional cost changes.

It is also difficult and subjective when one tries to differentiate between direct and indirect cost elements from the tender price (Tah et al, 1994) but one can simply define these costs in terms of their tractability to the specific work. Tah et al (1994) noticed similar components of direct and indirect cost as Carr (1989) but they also included subcontractors' costs as part of the direct cost and allowances for risk as part of the indirect costs.

Akintoye (2000) also considers subcontractor costs as a factor of production just like labor, material and equipment. He argues that it is often the case that subcontractors carry out more than 50% of the work of any particular project and hence the main contractors include subcontractors' prices in their estimation.

Fleming (1966) asserts that one way to ascertain the constituents of price is through labor and materials cost indices that may or may not incorporate some allowance for changes in productivity, overheads, and profits. Interestingly, in relation to the discussion about costs and prices, Fleming emphasizes that failure to allow for changes in profits means that the index will be insensitive to changes in market conditions and will be a measure of costs rather than prices (Summary of the construction cost component is illustrated **in Table 3.1**.

Table 3.1 A short Summary of the construction cost component

Author	Components	Comments
Adams, R. (1965)	Labor and material as well as overhead and profits.	Includes profits and overhead cost in the labor cost

Carr (1989)	Direct costs: labor, material, and equipment. Indirect costs; project overhead, general overhead, and profit	Did not include subcontractor's costs in the direct/indirect costs of the contractor. Considers project overhead as indirect costs.
Tah et al (1994) and Akintoye (2000)	Similar as Carr (1989) plus subcontractor's costs and risk allowance as indirect cost component.	Define mark-up as indirect costs without site overhead.
Jagren (2003)	Material, labor, equipment, transportation utility, electrical power, and overhead costs.	Emphasize the difference between total production costs and construction costs.

Cost components that are identified by the above listed authors are not necessarily an exhaustive cost structure. However, it is evident that the constituents of construction cost have changed over time; from Adams' simple labor-material break down to Jagrens' multi-itemized components. The significance of the inclusion of the different cost elements in the cost structure pertains to the scope of our analysis which is identifying factors that could be associated with cost increase differences among the regions. The direct and indirect costs components stated by Tah et al (1994) and Akintoye (2000) seems to be suitable in our analysis since it is neither too broad to include elements that have some trivial regional cost differences, such as electrical power, nor too concise to limit labor-material cost structure. Most of the major

components i.e. labor, materials, subcontractor's costs, overheads, and profits can be found in their cost structure.

Factors that could influence or determine the magnitude of construction costs are numerous. Chan and Park (2005) state that cost is affected by a large numbers of factors because of the fact that construction is a multidisciplinary industry and its work involve many parties such as the owner and various professionals, contractors and suppliers.

According to Shehatto (2013) and Marjuki (2006), they stated that the construction costs can be classified into five types as the following: material cost, labor cost, equipment cost, overheads, and mark-up as illustrated by the **Figure3.1**.

In addition, the subcontractors and risk item has been defined because of their importance and their impact on the construction cost.

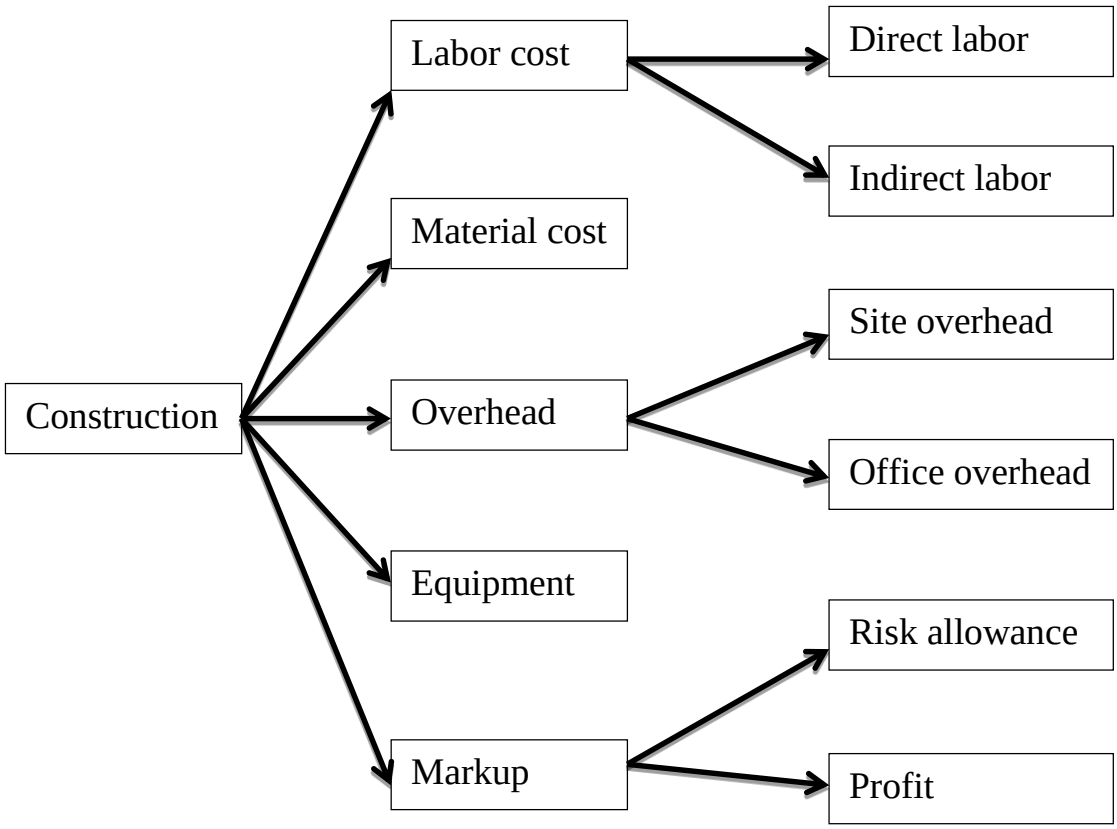

Figure 3.1 Construction Cost Classification, Shehato (2013).

3.3.1Materials cost:

Cost of materials includes the direct cost of the material items purchase, transportation, loading, storages, freight costs, losses and any other cost related expenses.

The price of tender sheet should be lump-sum amount including all cost related to the materials.

Most of the components of construction costs are integrated. Labor and materials costs have not only been prominently cited as components in the construction cost structure but they have also been tagged as the largest proportions in the total construction costs.

3.3.2 Labor cost:

The labor cost consists of both direct and indirect labor cost, direct labor cost of salaries and wages of labors (engineers, technicians, foremen, labors) whereas indirect labor cost don't relate directly to the project such as payroll, taxes, insurance and employee fringe benefits such as health paid vacations etc. The labor cost includes direct and indirect labor cost according to their relationship to the project.

Labor cost may be one factor that has the biggest impact on construction costs due to labor laws and salary structure in the sector for different countries.

3.3.3 Equipment's cost:

Equipment's used for construction operations including the cost of fuel, transport, erection, relocation, depreciation and any other related cost. Generally, Shehatto (2013) explained the equipment cost can be classified into two types; the first one for specific equipment which is used for specific construction operations and is removed it from the site by finished work; the second type is for general use equipment which is used by all the subcontractors on the site not for particular work.

Marjuki (2006) has stated another description for the equipment cost, which divides into owning cost and operating cost as well as the equipment hourly

cost should be determined. Moreover, the following factors should be considered and studied carefully to cost the equipment; number of hours per day, month and year, job conditions' severity, the way of maintenance, and the equipment's demand for selling.

3.3.4 Subcontractors:

A subcontractor is a person or entity that has a direct contract with the contractor to perform a portion of the work at a project site.

The use of subcontractors to execute parts of the construction work is one of the most prominent features of construction industry. It is quite usual to find that the main contract is providing certain agreed conditions and warranties to be included in the subcontract of sharing expertise and transfer of technology in addition to sharing the risk and responsibility or creating long term relationship.

Akintoye (2000) also considers subcontractor costs as a factor of production just like labor, material and equipment. He argues that it is often the case that subcontractors carry out more than 50% of the work of any particular project and hence the main contractors include subcontractors' prices in their estimation.

3.3.5 Overheads:

Overhead cost is any other cost incurred except for the cost of materials, equipment, labor and subcontractors. So the overhead cost is the cost doesn't belong to the specific item of work and it is a significant item of expense. Consequently, construction company's overhead costs are items that represent the cost of doing business and usually are considered as fixed expenses of the company. Overhead costs represent General and Administrative functions, such as Human Resources, Finance and Accounting, Information Technology, Legal Services, Purchasing and Procurement, Facilities Management and Strategic Planning. Overhead costs of construction company directly reflect its'

management system, organization of business activities and use of available assets as well as facilities.

3.3.6 Mark-up:

The markup is amount added to the project construction cost to give the total project price it including the profit and risk allowance.

According to Shehatto (2013) the mark-up's definition as ''as the amount added to the estimated direct cost and estimated job into overhead cost to recover the firm's main office allocated overhead (general overhead) and desired profit''.

3.3.7 Profit:

Profit is shown as a percentage loading and provides the Contractor with an incentive to perform the work as efficiently as possible. The Cost Estimator must use previous historical data to provide a suitable industry profit loading, modified by an in-depth understanding of marketing conditions likely to impact the current project.

A profit is a percentage that is added to the contract or to each items, this profit can be decided by the owner depending on the local market conditions, competition, and the contractor's need for new work (Shehatto, 2013, Marjuki, 2006). Normally the profit is added to contract price to getting the final bid price.

3.3.8 Risk allowance (Contingency):

The risk or the contingency allowance is the amount of money added to the estimate in to cover the probabilities of the error of inaccurate or incomplete design data, and the error of omission and commission in estimating. Ahuja (1994) also informed that the contingency is a specific provision which accounts on unforeseen element of cost.

Risks and uncertainties inherent in the construction industry are more than any other industries. Many industries have become more proactive about using risk management techniques in project. However, with respect to the construction

industry, the same is not used commonly. Risk is an integral component of any project. Risk is present in all projects irrespective of their size or sector. No project is totally free from risks. If risks are not properly analyzed and strategies are not trained to deal with them, the project is likely to lead to failures.

Risk is defined as being where the outcomes, can be predicted on the basis of statistical probability. This understanding of risk implies that there is some knowledge about a risk, as opposed to an uncertainty about which there is no knowledge. In most cases project risks can be identified from experience gained when working on similar project.

The terms risk and uncertainty are distinctly different. Uncertainty is a very widespread term, used to encompass a multiplicity of concepts and can arise from a variety of sources. Uncertainty is essentially the absence of information, information that may or may not be obtainable.

In the early stages of a project there are a large number of risks in the project, since few decisions have been made due to lack of information.

Nevertheless, as the project progresses more decisions are made, which should reduce the amount of risk in the project; however, this also reduces the ability to make changes to the project, and increases the cost of making these changes.

The major popular examples of the risk types are as shown below:

A. Financial and political: payment delays, inflation, fluctuation of materials and labor prices, cash flow problems.
B. Contractual: Contract ambiguity, incomplete contract documents, inadequate specification. unclear terms of arbitration and dispute resolution.
C. Consultancy: inefficient supervision, design defects, lack of communication, unclear specification.
D. Management: lack of coordination and cooperation between the project parties, poor planning and management, inefficient execution of works.

E. Physical and geological condition s: ground and soil characteristics, weather conditions, defective materials, works and materials rejected, samples testing.
F. Site conditions: Health and environment, damage and injury to persons and property, labor strikes, accidents, in proper documentation.
G. Government policies: More and extra taxes and other charges, changes of laws and regulations.
H. Act of Good; Earthquakes. war, wind damages, epidemic disease, flood.

Risk assessment is the act of determining the probability that a risk will occur and the impact that event would have, should it occur. This is basically a "cause and effect" analysis.

The "cause" is the event that might occur, while the "effect" is the potential impact to a project, should the event occur.

3.4 Overheads Evaluation

Construction projects have different cost codes for each resource such as project engineer or manager. They treat overhead costs separately and do not assign overhead costs to work divisions such as earthwork or to participants such as subcontractors. However, they assign overhead costs to work divisions in proportion to direct labor hours or direct labor costs when owners request the assignment of overhead costs (Sommer 2001). Such volume-based allocation results in cost distortion.

The problem of current practice regarding overhead assignment is that companies do not know real costs for each work division and those for each participant such as sub-contractors because either they do not assign overhead costs or they use a uniform cost driver (i.e., direct labor costs) for assignment of overhead costs. Therefore, it is difficult to find where money is being made and lost because progress payments for each work division or building from clients contain overhead costs. In other words, managements have difficulty in doing a profitability analysis.

Traditionally, construction overhead uses resource-based costing and volume-based allocation (Kim and Ballard 2001, Holland and Hobson 1999). Resource-based costing is the method in which costs are assigned by each resource, and volume-based allocation is the method of cost allocation in which costs are allocated to cost objects in accordance with the volume of direct labor hours, direct labor costs or contract amount.

When preparing bids for construction projects all direct costs and project overhead should be included as line item costs in the bid or project's budget. The budget for these costs can then be monitored and tracked during the course of the project. Most of the construction companies often spend enormous amounts of time and effort budgeting, tracking, and controlling construction costs while ignoring general overhead costs. The construction should include the overheads and the markup.

The estimation of overhead percentage was influenced by historical data of the projects; a forecast of future activity, the ratio between main contractors' and subcontract work, competitive conditions, the size, nature and duration of the project and an evaluation of risk.

(Stewart,1995), mentions that estimating the project indirect cost is a time-consuming and inexact task, and hence contractors often apply a percentage of direct costs as an estimate of indirect cost. The method of applying a fixed percentage to the total value for project overheads allowances particularly common in case of small-scaled, repetitive works. However, this may result in under-estimation; as many preliminary items bear no linear relationship to the value of works.

3.5 Overheads impact on the project cost

The contractor can determine the overheads expenses at the time of pricing depending on the payments policy, "owner's commitment toward payments as scheduled. The payments schedule may disburse the contract negatively and

affects the project's progress. Hence, delay of the project schedule, and automatically resulting in more and more overheads expenses than expected.

Factors affecting the estimation of overhead costs are including the management capacity of the company and its policy, led by the company's experience and ability to implement the project within the time frame. The company's experience in implementing similar projects provide an opportunity for the contractor to determine accurately the amount of overheads expenses of the project planned to be priced otherwise the overhead cost increases and subsequently the project price increases.

Delays and suspension of projects in execution are considered from the main causes of increasing the overhead costs. It causes of overhead disputes between the two parties and carried to the arbitration or court. Under these circumstances, it is not surprising that the number of disputes and claims within the construction industry continues to increase because of increasing the overheads.

Many contractors take the risk and not consider the actual cost of overhead, especially the general overhead in order to win the tender. Hence, neglecting overhead cost has forced some contractors out of business (Dagostino, 2002).

Since overhead costs comprise a significant part in the construction estimate, the evaluation of overhead costs is a key task for building contractors. However, the unstable construction market makes it difficult for contractors to decide on the optimum level of overhead costs that enable contractors to win public tenders and to manage large projects without financial losses (Assaf et al., 2001). Besides, if a contractor does not know his actual overhead costs, his unsuccessful effort to cover them may result in financial collapse of a construction company.

3.6 Practice in Sudan for overheads calculations:

With reference to the records of the government’s related entities or construction engineering firms in Sudan, we did not find any written

documents giving an overhead index or showing how the overheads cost can be calculated.

Consultancy firms are one of the most concerned entities dealing with project pricing and hence the overheads cost, they calculate the overheads cost as per the practice used in Sudan.

The practice used in Sudan for overhead charges evaluation, usually taken as a percentage of the project basic cost (materials, labor, equipment's and subcontractors).

The procedure used by assuming the overhead percentage is constant for different project i.e. Big contractors execute big projects and have big overhead costs whereas the vice versa, subsequently the overhead costs was taken proportionally with dimensionless ratio as a percentage. Thus the overhead costs percentage can be illustrated by the following simple equation:

Overhead costs of project (x)/Basic cost of project (x) =

Overhead costs of project (y)/Basic cost of project (y) =

Overhead (percentage) =Index Eq. (3.1)

The contract actual construction cost consists of the cost of: materials, equipment's, and labor in addition to subcontractors (if any).

The construction cost component is illustrated in **Figure 3.2** whereas the project price cost is illustrated in **Figure 3.3.**

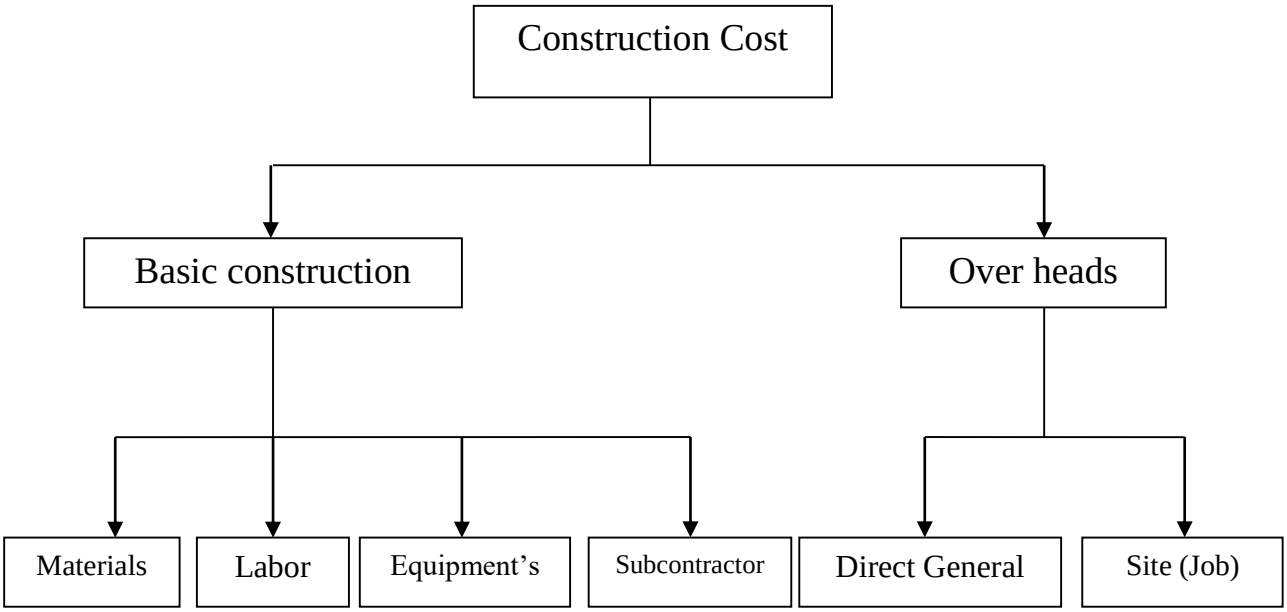

Figure 3.2 Construction cost components

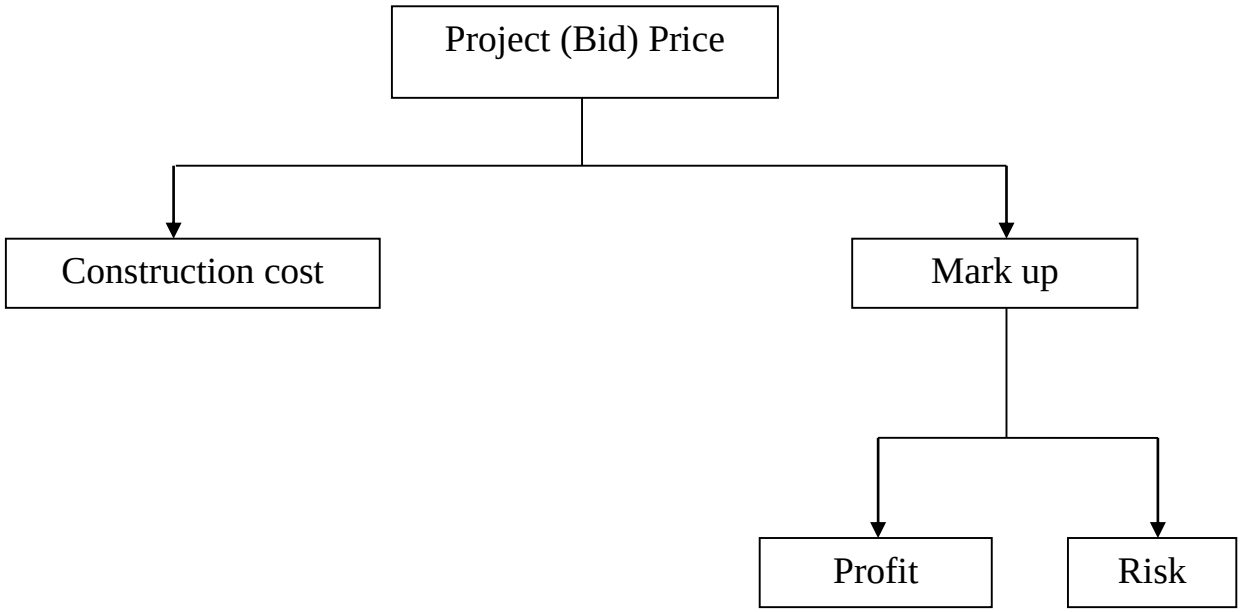

Figure 3.3 Project price components

The Project price relationship can be illustrated in the following steps as per the equations eq.3.1 up to eq.3.9 shown below:

Project Basic cost = Materials cost + Labor cost + Equipment's cost subcontractors …. **Eq**. (**3. 2**)

Project Actual cost = Project Basic cost + Overhead charges … … … . . … . . **Eq**. (**3. 3**)

Overhead charges = Direct (general) overheads + Indirect (site or job) overhead .... Eq. (3.4)

Project (Bid)Price = Actual project cost + Profit Margin … … … … … … … . … . . … … … . … . . **Eq**. (**3. 5**)

The percentage taken for the overhead percentage as per the practice in Sudan is usually about (20 – 30) % from project basic cost, this percentage was supposed to cover overheads charges and the project mark up.

$$\boldsymbol{Overhead\ percentage\ including\ markup} = (\mathbf{20-30})\% \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \mathbf{Eq.}\ (\mathbf{3.6})$$

$$\mathbf{Average\ (Overhead\ percentage\ including\ markup)} = \mathbf{25\% + -20\%} \ldots\ldots\ldots\ldots \mathbf{Eq.}\ (\mathbf{3.7})$$

$$\mathbf{Markup\ (Assumed\ average)} = \mathbf{15\%} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \mathbf{Eq.}\ (\mathbf{3.8})$$

$$\mathbf{Overhead\ percentage = Index = 25\% - 15\% = 10\% + - 20\%} \ldots\ldots\ldots\ldots\ldots \mathbf{Eq.}\ (\mathbf{3.9})$$

3.7 Summary

This chapter gives the overhead details whether direct or indirect overhead, the process follows for finding the project (site) overheads by tracing what affects the project price starting from the bidding stage till the project final handing over stage.

An understanding of the relationship of indirect costs to the individual jobs of a construction contractor is very important. Companies should develop and test their overhead allocations periodically in order to maintain accuracy in their estimating process.

Furthermore, classification of overheads is very important for the questionnaire and case study which will be discussed in the coming chapter finding the factors affecting the overhead cost and answering the question of the impact of the overheads on the project price.

CHAPTER FOUR

RESEARCH METHODOLOGY

CHAPTER FOUR

REASEARCH METHOODOLOGY

4.1 Introduction

The main objectives of this research are to identify and evaluate the overheads cost percentage as a part of construction cost. To achieve these objectives. There was a need to approach a significant number of professional contractors related to the construction field to collect enough data about the overheads cost.

Overhead costs are generally added during bidding to the contractor's estimate of direct costs and indirect overhead costs. This cost is typically added as a single percentage number.

In this research the researcher has calculated the overheads cost through a case study and a questionnaire in a certain respondent companies working in the field of construction industry in Khartoum state.

Khartoum state was selected for several reasons:

A. Construction activities have been executed and many are in action.

B. The big numbers of construction companies.

C. Easy to reach many sites.

D. Where the researcher lives.

The researcher selected the methodology of this research by taking the advantages of the previous studies (chapter three), where all of these studies relied on the analytical and descriptive approach. The questionnaire was the fundamental tool for data collection. One hundred fifty-six companies and/or business names working in the state of Khartoum were chosen as subjects (samples) for this research.

The research tool (questionnaire) was adopted after it successfully passed all the reliable tests, then it was distributed to respondent companies. The design of the questionnaire was done with the help of some professionals in the field of construction management and statistics. Respondent companies were chosen

within these companies were selected at a random sampling. After collecting the distributed copies of the questionnaire, these copies were subjected to an analysis by (Descriptive statistics, weighted mean and standard deviation).

4.2 Questionnaire

Many researchers in construction management have used a questionnaire which is considered a quick method of conducting a survey, to collect the information about the project's cost according the research strategy.

Questionnaires have advantages over other types of surveys, that they are cheap; do not require as much effort from the questioner but is a time consuming method.

A questionnaire, which was invented by Sir Francis Galton (Bulmer, Michael, 2003), will be the main tool used for collecting data. It is a set of written questions which calls for responses to find out the overheads cost.

A questionnaire survey approach was adopted in order to gather the necessary data required to conduct data analysis. This research aimed to investigate the perceptions of the participants on the factors affecting the overheads cost.

The research contains a case study related to the complexity and particular nature of the case in question; the main reason behind using this case study is to calculate out the overheads percentage and subsequently the cost of a specific project from the previous records and the actual data.

This chapter presented the research framework, derived from the literature review. It also presents the research methodology, which covered the case study, furthermore it highlights the measurement of the variables and presents the statistical techniques used in testing the hypothesis.

4.3 Questionnaire design

The questionnaire was design to meet the researcher's aims and objectives. It was structured as a research tool in order to gather data from the research population.

The questionnaire contain a wide variety of items designed to measure the factors affecting the overheads cost at different stages of the projects life cycle. The researcher also concentrates on closed form questions to stimulate the respondent to fill the form as far as the closed-ended questions have a finite set of answers from which the respondent chooses (Fellows & Liu, 2008). Also the researcher put the questions in lists and statistical tables in order to facilitate the summarization and analysis of the questionnaire and to stimulate the respondent to fill the form, because the answers of the questions are easy and they are neither need a long time, nor deep thinking as compared with the open questionnaire.

The questionnaire was divided into four parts as follows:

1-The first part is related to the respondent's organization, contains four questions through which the respondents were asked about type of their organization, sector, experience in the building construction and its registration in contractor association council, whereas the first part contains other five questions about the projects executed by the contractor ,types of contracts for these projects besides the documents attached to these contracts ending with a question of how much of the overhead cost.

2-The second part is related to the tender stage. It contains twelve questions about the factors affecting the overheads and have direct impact on the project cost.

3-The third part is related to the construction stage, and contains thirteen questions about the factors affecting the overheads and have direct impact on the project cost.

4. The fourth part is related to the commissioning and maintenance stage i.e. between the period of the project preliminary and final hand over of the project, they are eight questions about the factor affecting the overhead cost in this stage in addition to one question about what are the three main factors affecting the overhead cost in general.

4.4 Formatting questionnaire

This step involves the conversion of the research objectives into information required to obtain the necessary output of the questionnaire, it involves formatting of clear statements. All the research questions in this study had been converted into the relevant questions and clearly stated. Most of the respondents were familiar with Arabic language. Therefore, the instrument required a translation to Arabic language and then to English language again.

4.5 Administration of the field works

Data collection is considered as the crucial stage in gathering all required information from the fundamental sources in achieving the main objectives of the study.

The tools used in this research for collecting the data were the questionnaire and case study.

Generally, questionnaires may be administrated via different modes, including: face-to-face (personal contact); paper-and pencil; and computerized (E-mail or web-based) (Foddy, 1994).

Distribution of the questionnaire to large numbers of individuals simultaneously is less expensive and less time consuming.

The cover letter attached to the first part of the questionnaire explains the objective of the study and ensured the confidentiality of the information. In addition, the covering letter explains to the participants that the results of the questionnaire would be used to improve the ability of contractors to identify, analyze the overheads cost and their impact to the project cost.

The participants were also informed that their personal information was not going to be used for any other purpose and their privacy would be protected at all times.

Part (2) of the questionnaire includes two sections:

Section (1): It includes data of participants of the sample. It is a descriptive and a personal data consists of:

1- Registration form.
2- Sector.
3- Contractor years of experience in building construction field.
4- The contractor registered in Organization Council for Engineering Works Contractors (OCEWC).
5- The number of projects executed by the contractor in the years 2015-2018 and its classification according to ownership.
6- Largest project executed by contractor in the year 2015- 2018.
7- Type of contract referred to in question (6) above. Do you have a credited certificate in project management?
8- Documents attached with the contract referred to in question (6) above.
9- Overhead percentage (out of contract cost) referred to in question (6) above.

Section (2): Includes the basic phrases throughout which it recognized the study hypotheses. This section includes three parts:

Part (A): Measures (**There are some factors affecting the overhead cost considered by the contractor at the tendering stage from bidding until the bid analysis and the selection of success bidder and signing the contract**): It consists of (12 items).

Part (B): measures (**There are some factors affecting the overhead percentage during the construction stage, the contractor considers and takes care of**): It consists of (13 items).

Part (C): measures **(There are some factors affecting the overheads cost considered by the contractor after the project construction and handing over stage**): It consists of (8 items).

4.6 Measurement of the Variables

It is essential to measure the variables and to make sure of their approved degree and their statistical significance; the degree of potential responses measured by Likert Scale Pentathlon (Wuensch, et al. 2005) is used. The Likert

scale is an ordered scale from which respondents choose one option that best aligns with their view. It is often used to measure respondents' attitudes by asking the extent to which they agree or disagree with a particular question or statement In the distribution of weight to the respondents‟ answer which is distributed from the top weight give (5) degrees and represents the answer (strongly agree) to its lower weight given (1) degree and represents the answer (strongly disagree) and in between three weights. The purpose of that is to allow respondents to choose the exact answer to the discretion of the respondents.

The format of a typical five-level Likert item (as shown in **Table 4.1**) is:

1-Strongly disagree.

2-Disagree.

3-Neither agree nor disagree (Neutral).

4-Agree.

5-Strongly agree.

Table 4.1 The degree to approve a measure

Approved Degree	**Relative weight**	**%**	**Statistical Significance**
Strongly Agree	5	Greater than 80%	Very high degree of Approval
Agree	4	70 – 80%	high degree of Approval
Neutral	3	50 – 69%	Medium
Disagree	2	20 – 49%	Low approval
Strongly disagree	1	Less than20%	Nonexistent degree of approval

Source: Prepared by the researcher, 2019

4.7 Evaluation of Measurement Tool

Truth or validity of the measurement tool is defined as the performance ability to measure what was designed for and based on correct measurement theory dealing with free tool of measurement errors, whether random or systematic. The study in the first phase is based on evaluating the appropriateness of the measures used in the measurement of the study phrases and verify that the phrases that have been used to measure the concept of certain actually measure, this concept and warded other dimensions and features of these tests the reliability to provide a set of metrics that determine the applicability of the data to that has been detected and the exclusion of any other alternative model scan explain the relationship between the scale phrases based on the response of the study sample vocabulary. In the fore coming sections the researcher presents the results of the analysis of the measures used in the study.

A-The Sincerity of the Scale Content Test

Most of researchers advise to conduct a pilot study or pilot survey for testing the wording of the question, identifying ambiguous questions, testing the technique and to test the clarity of questions and the overall format/layout.

Hence the researcher has to carry out a preliminary analysis to see whether the wording and format of questions will present any difficulties when the main data are analyzed‖ (cited in Naoum, 2007).

The main idea behind the pilot questionnaire is to check the stability of the measurement, which means to make sure that the answers, will be approximately the same if applied repeatedly to the same people30 random samples from the selected population are taken as pilot questionnaire.

The pilot questionnaire was organized in a simple scientific way easy to be responded to in addition to minimizing the biased and leading questions.

The main outcome of the pilot process was a final version of the questionnaire that was much clearer than the initial draft in terms of navigation, question

wording and appropriate explanations. General revisions included the re-ordering of headings, numbering and minor textual amendments.

Firstly, this research was in English language, thus the questionnaire was also prepared in English language version as the language of study. Moreover, the study was conducted in Sudan the formal language of which is Arabic. Therefore, the questionnaire was translated into Arabic version.

After the completion of the preparation of the initial version of the questionnaire, the study was presented in the form of a questionnaire to a group of experts in construction management.

The experts were asked to express their views about the study to land validity of the statement to represent the hypotheses, also they were asked to amend and add what they thought suitable for the purpose of measuring the sincerity of the study. After the questionnaire has been retrieved from the experts, it has been an analyzed taking their observations and made adjustments that they have suggested.

A seminar has been introduced in Sudan University discussing the questionnaire and case study design and forms, the seminar was attended by a number of concerned teaching staff and experts, their comments has been considering. Then the questionnaire was in its final form (Appendix A) then translated in Arabic language (Appendix B).

B-Reliability of the measurement Instruments

A number of writers assert the importance of the reliability concept, among these writers is (Drost, 2003) who defines reliability as" the extent to which measurements are repeatable, when different persons perform the measurements on different occasions, under different conditions, with supposedly alternative instruments which measure the same thing". The same author goes on to illustrate that there are many ways and techniques to estimate the reliability of a scale, among the most widely used techniques is the Cronbach,s Alpha coefficient (Allen, M.J., 2002). Also, there is no

agreement among the scholars on the level of acceptance of the reliability of an assessment. Some like (Dawn and Adam2 ,vol, 13, No.) argue that the Cronbach's alpha coefficient level ranges between 0-1, where 0 indicates no internal consistency and I indicate the maximum degree of interrelatedness. In reality, the acceptance level may range from 0.3 to 0.7 in some cases. This study used Cronbach's Alpha Coefficient to test the reliability of each of its instruments dimensions and subscales (Streiner, 2003)

Cronbach's α is defined as per the eq.4.1 shown below:

Cronbach's α

$$\alpha = \frac{n}{n-1}\left(1-\frac{\Sigma Vi}{Vtest}\right) \quad \text{.....Eq. (4.1)}$$

n = number of questions

Vi = variance of scores on each question

Vtest = total variance of overall scores (not %'5) on the entire test

1-Reliability of the (Tendering stage):

The results of the reliability analysis summarized in **Table 4.2** Confirmed that all the scales display satisfactory level of reliability (Cronbach's alpha exceed the minimum value of 0.6). Therefore, it can be concluded that the measures have acceptable level of reliability.

Table 4.2 Reliability Test (Tendering stage)

N	Question	Alpha
1	Incomplete and in accuracy of detailed drawings affect the overhead cost of the project	0.75
2	Overhead percentage increases because of nonexistence of the general and special specification	0.84
3	Overhead percentage increases because of in accuracy in the bills of quantities	0.82

4	Inappropriate choice of general and special conditions of a contract affect the overhead percentage for the project	0.80
5	Nonexistence of many items(site planning, site offices, health and safety measures at site) affects the increasing the overheads	0.88
6	Long time taken between call for bidding and bid analysis affects increasing the overheads cost	0.83
7	Nonexistence of clear mechanism of bid analysis affects increasing overheads cost	0.84
8	Inaccuracy in project cost estimate by the contractor affect in increasing the overheads cost	0.89
9	Nonexistence of overhead index causes the variation of bid prices	0.83
10	Overhead percentage increase because of unclear payment terms	0.85
11	Overheads cost differs according to project type and the methods of its administration	0.80
12	Good planning decreases the overheads cost	0.79

Source Questionnaire data

2-Reliability of the (Construction stage)

The results of the reliability analysis are summarized in **Table 4.3** Confirmed that all the scales display satisfactory level of reliability (Cranach's alpha exceed the minimum value of 0.6). Therefore, it can be concluded that the measures have acceptable level of reliability.

Table 4.3 Reliability Test (Construction stage)

NO	Question	Alpha
1	Overheads cost for the projects is affected according to the type of the contract signed	0.80
2	Delay of site handing over causes increase in overhead cost	0.83
3	Change of materials prices increases the overhead percentage	0.79
4	Overhead percentage increases because of the instability of labor cost	0.74
5	Overhead percentage increases because of the increasing in government fees	0.90
6	Overhead percentage increases because of the unpunctuality of payment by the employer	0.85
7	Overhead percentage increases because of the lack of supervision by the consultant	0.89
8	Overhead percentage increases because of the change in specifications	0.82
9	Overhead percentage increases because of variation in quantities	0.85
10	Overhead percentage increases because the extension of time for project execution	0.81
11	Choice of unqualified labor or in proper equipment's affect the overhead percentage	0.79
12	Negligence of insurance and safety measures causes increase in overhead percentage	0.76
13	Ineffective communication between the project parties affect the overhead percentage	0.86

Source: Questionnaire data

3-Reliability of the (Commissioning & maintenance stage)

The results of the reliability analysis are as summarized in **Table 4.4** Confirmed that all the scales display satisfactory level of reliability (Cronbach's alpha exceed the minimum value of 0.6). Therefore, it can be concluded that the measures have acceptable level of reliability.

Table 4.4 Reliability Test (Commissioning &maintenance stage)

NO	Question	alpha
1	Overhead percentage increases because of delay in the preliminary handing over	0.87
2	Overhead percentage increases because of the cost of defect of liability and commissioning guarantee	0.75
3	Overhead percentage increases because of unclear taxes fees	0.81
4	Overhead percentage increases because of the extension of time for project execution	0.84
5	Your firm cares to document the project overall expenses and overheads cost after its execution	0.79
6	There is no definite index for overhead cost percentage	0.89
7	Absence of overhead index(percentage) is the main reason of the variation in bid prices	0.77
8	Absence of knowledge of the overheads causes huge losses for companies pushing some of them out of the construction market	0.79

Source: Questionnaire data

4.8 Study Population

In statistics, a sample is a subset of a population. Typically, the population is very large; making a census or a complete enumeration of all the values in the population is impractical or impossible.

The sample represents a subset of manageable size. Samples are collected and statistics are calculated from the samples so that anyone can make inferences or extrapolations from the sample to the population.

Sampling can be defined as a process in connection with the selection of people who would be asked questions by questionnaire.

The objective of sampling is to provide a practical means of enabling the data collection and processing components of research to be carried out whilst ensuring that the sample provides a good representation of the population.

The selection of a target group to be surveyed involves either random sampling or non-random sampling of the population. A random sample is a one chosen by a method involving an unpredictable component where every individual in the population of interest has an equal opportunity (probability) of being selected for the sample.

The population for this study was taken randomly from the construction contracting companies registered (Organizing Council for Consultancy Firms (OCCF) i.e. construction contracting companies in Khartoum State were chosen as population of the study.

The registered and renewed construction contracting companies in OCCF from the year 2012 up to April 2019 is as shown in **Table 4.5** below:

Table 4.5 Registered Contractors (2012-April 2019)

No	Year	No of Contractors
1	2012	19
2	2013	40
3	2014	42
4	2015	79
5	2016	198
6	2017	208
7	2018	400
8	Up to April 2019	258

Source: OCCF records

The sample size can be calculated as per eq. 4.2 below (S.p Gupta, 1971):

$$n = \frac{\left(\frac{z}{d}\right)^2 * (0.50)^2}{1+\frac{1}{N}\left[\left(\frac{z}{d}\right)^2 * (0.50)^2 - 1\right]} \quad \text{..... Eq. (4.2)}$$

N = Number of population

Z= Significance =1.96

d=Error percentage

So by computation by using the eq.4.2 the sample size = 156

Data was collected using a structured questionnaire contributed on the selected construction companies by handing a hard copy of the questionnaire to each contractor office and then received out the result.

Follow-up efforts including telephone calls and reminders on some of the respondents with repeated visits were made. In the process one hundred thirty seven completed questionnaires were received out of one hundred fifty six that were distribute.137 completed questionnaires are received from the respondents (Appendix C) as shown in **Table 4.6.**

Table 4.6 Questionnaires Distributed &Returned

Issue	Number	Percentages%
Total Questionnaires sent to the companies	156	100
Completed questionnaire received from	137	87.82
Questionnaires not returned	19	12.18

Source: Prepared by the researcher, 2019

In addition to the registration in OCCF, the respondents had high experiences (Table 5.3 in chapter 5 shows that more than 65% of the contractor has an experience of 6 years and above in the field of construction contracting) which indicates that they could answer the questions of questionnaires with

more accurate according to their experience in the field. Therefore, this gave the author utmost confidence in regards to the results of the study survey.

4.9Testing the hypotheses:

This part includes the method of analysis of the basic data of the study to discuss the hypotheses according to the following steps:

A-Descriptive Statistics

Cross tabulation displays the joint distribution of two or more variables. They are usually presented as a contingency table in a matrix format. The frequency distribution provides the distribution of one variable, a contingency table describes the distribution of two or more variables.

The frequency of an event *i* is the number *ni* of times the event occurred in the experiment or the study.

These frequencies are often graphically represented in histograms or pie chart as percentages for the phrases of the study.

Absolute frequencies, when the counts *ni* themselves are given and of relative frequencies, when those are normalized by the total number of events:

(i) The Weighted Mean:

In statistics, **mean** has two related meanings:

A. The arithmetic means which is distinguished from the geometric mean or harmonic mean.

B. The population means which is the expected value of a random variable.

It is sometimes stated that the 'mean' means average. This is incorrect if the "mean" is taken in the specific sense of "arithmetic mean" as there are different types of averages: the mean, median, and mode.

Other simple statistical analysis use measures of spread, such as range, inter quartile range or standard deviation.

For a real-value random variable *X*, the mean is the expectation of *X*. Note that not every probability distribution has a defined mean (or variance).

For a data set, the mean is the sum of the observations divided by the number of observations.

For a data set, the mean is the sum of the observations divided by the number of observations. The mean of a set of numbers x1, x2, ..., xn is typically denoted by, pronounced "*x* bar". The mean is often quoted along with the standard deviation.

(ii) Standard Deviation:

Used to measure the dispersion in the result to the arithmetic mean standard deviation .The mean describes the central location of the data, and the standard deviation describes the spread.

An alternative measure of dispersion is the mean deviation, equivalent to the average absolute deviation from the mean. It is less sensitive to outliers, but less mathematically tractable. As well as statistics, means are often used in geometry and analysis; a wide range of means have been developed for these purposes, which are not much used in statistics.

B- Chi – Squared Test:

To test the presence of statistically significant differences between the number of approvers, neutrals, and non–approvers to the results of the above test (Chi. test) is used to denote the differences.

Chi-squared Test is statistical method used to determine goodness of fit (Ozdemir, 2005).

Goodness of fit refers to how close the observed data are to those predicted from a hypothesis.

The Chi –square can be calculated as per the eq. 4.3 shown below:

Calculating the Obtained Chi-Square

$$\chi^2 = \sum \frac{(f_e - f_o)^2}{f_e} \quad \text{.....Eq. (4.3)}$$

f_e = expected frequencies

f_o = observed frequencies

4.10 Factor analysis approach

A-Introduction

Factor analysis is a process in which the values of observed data are expressed as functions of a number of possible causes in order to find which are the most important. It is a statistical technique that serves to combine variables to create new factors.

The main application of factor analysis is to help in selecting small group of variables of representative variables from large set and to put objects into categories depending on their factor scores.

The factor analysis used in this study to investigate the principal factors affecting project overheads and to identify the main factors impacting overhead cost.

B-Objectives

1-The main objective of this analysis is to ascertain the principal factors affecting project overhead costs from tendering stage to the final handing over stage.

2-To identify and rank the major factors impacting the overhead cost.

C-Data collection

1-To meet the objectives of this study, primary data on the significance of factors affecting project overheads have to be collected from contractors.

2-A questionnaire survey was therefore considered as an appropriate tool for this study.

3-The questionnaire was divided into three parts containing closed type questions. (tendering stage, construction stage, commissioning and defects of liability stage).

D-Data analysis method

1-Analysis of relative importance of variables to study the order of importance of the variables, a relative importance index (RIIv), was calculated.

2-Identification of principal factors to bring the interrelated variables together and to identify the underlying principal factors affecting project overheads, the data were then analyzed by exploratory factor analysis using SPSS.

4.11 Case study

The case study is the best strategy to answer the question "How much the overheads percentage in practice?" This strategy aimed to provide practical assistance to help contracting companies to calculate the proper cost estimate in their projects.

Generally, the case study in the research design is the logical sequence to connect the empirical data with a study's initial research questions and, ultimately, to its conclusions. In addition, another way of thinking about a case design is to study questions and study objectives.

The main purpose of the case study is to calculate out the overhead percentage in different project stages i.e. from the tendering stage to the project completion and final handing over in order to calculate out the project actual and accurate cost.

The case study is a practical case to use this data in practice, explicitly; three construction firm was chosen to conduct the case study.

Overheads percentage can be illustrated as per the equations eq.4.4 up to eq.4.9 shown below:

$$\boldsymbol{Overheads\ Cost} = \boldsymbol{General\ Overheads} + \boldsymbol{site}\ (\boldsymbol{indirect\ overheads}) \ldots\ldots \text{Eq. (4.4)}$$

$$\boldsymbol{Basic\ Project\ Cost} = \boldsymbol{Materials} + \boldsymbol{equipment's} + \boldsymbol{labor} + \boldsymbol{subcontractor} \ldots \quad \text{Eq. (45)}$$

$$\boldsymbol{Project\ actual\ cost} = \boldsymbol{project\ basic\ cost} + \boldsymbol{overheads\ cost} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{Eq. (4.6)}$$

$$= \boldsymbol{project\ basic\ cost} + \%\ \boldsymbol{of\ project\ basic\ cost}$$

$$\boldsymbol{Project\ contractual\ cost} = \boldsymbol{project\ actual\ cost} + \boldsymbol{markup} \ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{Eq. 4.7)}$$

$$= project\ actual\ cost + \%\ project\ actual\ cost$$

$$\boldsymbol{Mark\ up\ =\ project\ +\ contingencies\ (risk)} \quad \text{Eq. 4.8)}$$

$$\boldsymbol{Overheads\ percentage\ =\ actual\ overheads\ cost/project\ actual\ cost} \quad \text{Eq. 4.9)}$$

The above equations can be solved by calculating the actual overheads cost and project actual cost from the case study.

4.12-Case study design

A case study is design as per the form (Appendix F) in English language and then translated in Arabic language (Appendix G) then submitted directly to one contractor namely: Danfodio Contracting Company.

The cover letter which was attached to the first part of the case study explains the objective of the study and ensured the confidentiality of the information.

The case study can be summarized as follows:

Project General Information:

1- Project Name.
2- Project Location.
3- Method of project acquisition (tender, direct assignment).
4- Overheads (General overheads and site overheads).
5- Total project cost (Basic project cost+overheads).
6- Contractual Project Cost (Total project cost+ Profit margin).
7- Overheads percentage =Total overheads / Total project cost.
8- Profit = Contractual Project Cost - Total project cost.
9- Profit percentage = Profit/ Total project cost.

The case study includes direct and indirect overheads:

1-Direct (general) overheads

A- Administration overheads for one year.

B- General overheads at the company headquarters for one year.

2-Indirect (site or project) overheads at different stages

A- Tendering Stage.
B- Construction Stage.
C- Maintenance & Commissioning Stage.

Danfodio Contracting Company (established 2003) has been taken as a contractor for the calculation of the overheads cost as tabulated in the case study (the other two companies did not submit back the case study).

The case study was taken and conducted for a project executed in Aldalang city (South Kordfan State) in the 2013.

The data sources for the case study were mainly documents, archival records.

4.13 Calculation of the case study data

A-General overheads:

The general overheads for the company head quarter will be calculated for one year (expect the site overheads), this includes:

1- Administration overheads for one year:

Calculated from Danfodio company headquarter office records as per the items (1-8) specified in 1.1 in the case study.

2- General overheads at the company head quarter for one year:

Calculated from Danfodio company headquarter office records as per the items (1-4) specified in 1.2 in the case study.

3- Taxes is calculated according to the rates and fees decided by the tax authority.
4- Zakat is calculated according to the rates decided by zakat chamber
5- Depreciation is calculated as per the rates shown in **Table 4.7.**

Table 4.7 Depreciation rates

Item	Description	Depreciation percentage (%)
1	Air coolers and fans	10
2	Electrical equipment's	5
3	Electronic equipment's	15
4	Furniture	10
5	Cars	15
6	Lories &trucks	15
7	Excavators	20
8	Machines & equipment's	7.5

Source: Shiekan Insurance Company

6- Insurance is calculated as per the shown in **Table 4.8.**

Table 4.8 Insurance rates

Item	**Description**	**Insurance percentage (%)**
1	Air coolers and fans	2.5%per thousands
2	Electrical equipment's	2.5%per thousands
3	Electronic equipment's	2.5%per thousands
4	Furniture	1%
5	Cars	1.4%
6	Lories &trucks	1%
7	Excavators	6.5%
8	Machines & equipment's	2.5%per thousands
9	Materials(site)	1%per thousands

Source: Shiekan Insurance Company

7- Share of the project cost from the general overheads is calculated by dividing the total of general overheads per the number of projects executed in the year.

B-site (project) overheads:

1-The site (project) overheads are calculated from Danfodio Company as per the records for the project selected for the case study (Aldalng hospital). The calculated cost includes all the cost for the project stages i.e. from tendering stage up to final handing over of the project including defects of liability and maintenance stage as specified in the case study.

2-The duty stamp is calculated as per the rates decided by the duty stamp tax authority in Sudanese pounds (SDG) is as shown in **Table 4.9.**

Table 4.9 Duty stamps rates

Item	Cost Range SDG	Duty stamp fees SDG
1	Less than 1000	20
2	1000 and less than 10,000	30
3	10,000 and less than 20,000	40
4	20,000 and less than 50,000	60
5	50,000 and less than100,000	100
6	100,000 and less than 200,000	150
7	200,000 and less than 300,000	200
8	300,000 and less than 500,000	250
9	5000,000 and less than 1000,000	500
10	1000,000 and less than 1,500,000	750
11	1,500,000and less than 2,000,000	1,000
12	2,000,000 and less than 3,000,000	1,500
13	3,000,000 and above	2,000

Source: Tax Authority

4.14 Summary

The final version of the questionnaire was submitted to the respondents and about 88% of them return back the questionnaire.

A case study was submitted and returned back from Danfodio contracting company.

Research design of this study discussed the strategy that is adopted in the data analysis which will be presented in the next chapter.

CHAPTER FIVE

DATA ANALYSIS AND DISCUSSION

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DATA ANALYSIS AND DISCUSSION

5.1 Introduction

Analysis is an interactive process by which answers to be examined to see whether these results support the hypothesis underlying each question.

Analysis of data is a process of inspecting, cleaning, transforming, and modeling data with the goal of highlighting useful information, suggesting conclusions, and supporting decision making. Data analysis has multiple facets and approaches, encompassing diverse techniques under a variety of names, in different business, science, and social science domains.

Before analyzing the questionnaires which were received to be analyzed, a Cronbach Alpha test was carried out in order to ascertain the reliability of the questionnaire's questions. Cronbach Alpha test is a test of reliability that measures the internal consistency of the questions using the Likert scale.

The data was analyzed using descriptive statistics. The descriptive statistical analysis carried out includes frequency distribution and measures of central tendency like mean and standard deviation.

For testing the data in this study, the measurement instrument should be reliable and valid. Thus, they should be evaluated for reliability and validity. In evaluating measurement instrument, reliability analysis should be conducted in order to understand whether measurement instrument was reliable and valid.

For accurate results as much as possible, the use of statistical program which is a program analyze data, which indicates a shortcut to the Statistical Package for Social Sciences (Statistical Package for Social Sciences SPSS).

The main rule of any form of analysis whether it is qualitative or quantitative data, is to move from raw data to meaningful understanding. In this study, the applied statistical analysis was used for questionnaire.

5.2 Data Presentation

Presentation is the practice of showing and explaining the content of the general information or the data analysis. In this chapter in order to achieve the objectives of the study and to verify the hypotheses, the researcher presents the analytical results of the collected data in the following statistical methods:

1. Graphic formats.
2. Tables
3. Pie charts

5.3: General and personnel Information

1-Registeration form:

Table 5.1 Contractor registration form

Items	Frequency	Percent %
Company	46	33.6
Business Name	90	65.7
Partnership	1	0.7
Total	137	100%

Source: Prepared by the researcher, 2019

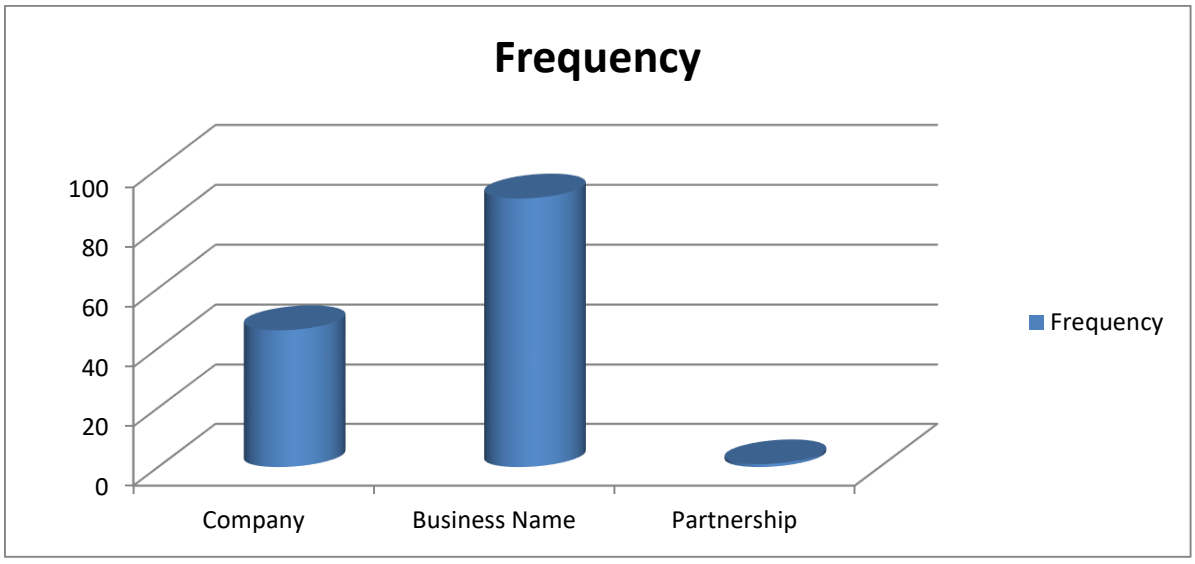

Figure 5.1 Contractor registration form-Bar chart

2-Sector:

Table 5.2 Contractor sector

Items	Frequency	Percent %
Public Sector	7	5.1
Private Sector	118	86.1
Public/Private (mixed)	12	8.8
Total	137	100%

Source: Prepared by the researcher, 2019

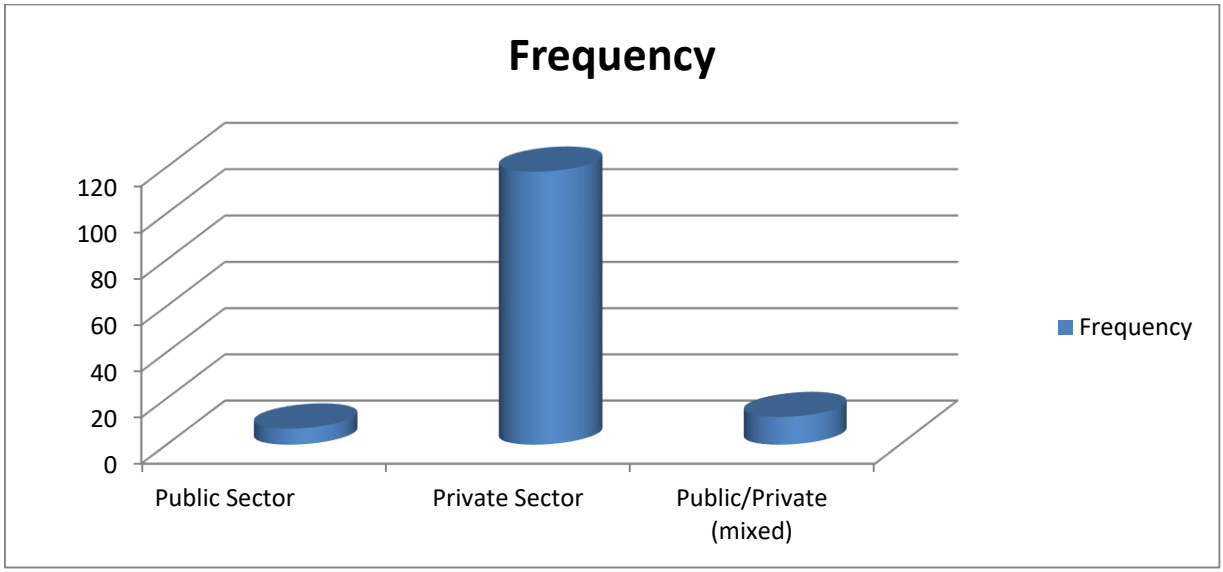

Figure 5.2 Contractor sector -Bar chart

3-**Contractor years of experience in building construction field :**

Table 5.3 Contractor years of experience

Items	Frequency	Percent %
1-3 years	12	8.8
3-6 years	35	25.5
7-9 years	25	18.2
10-12 years	22	16.1
More than 12 years	43	31.4
Total	137	100%

Source: Prepared by the researcher, 2019

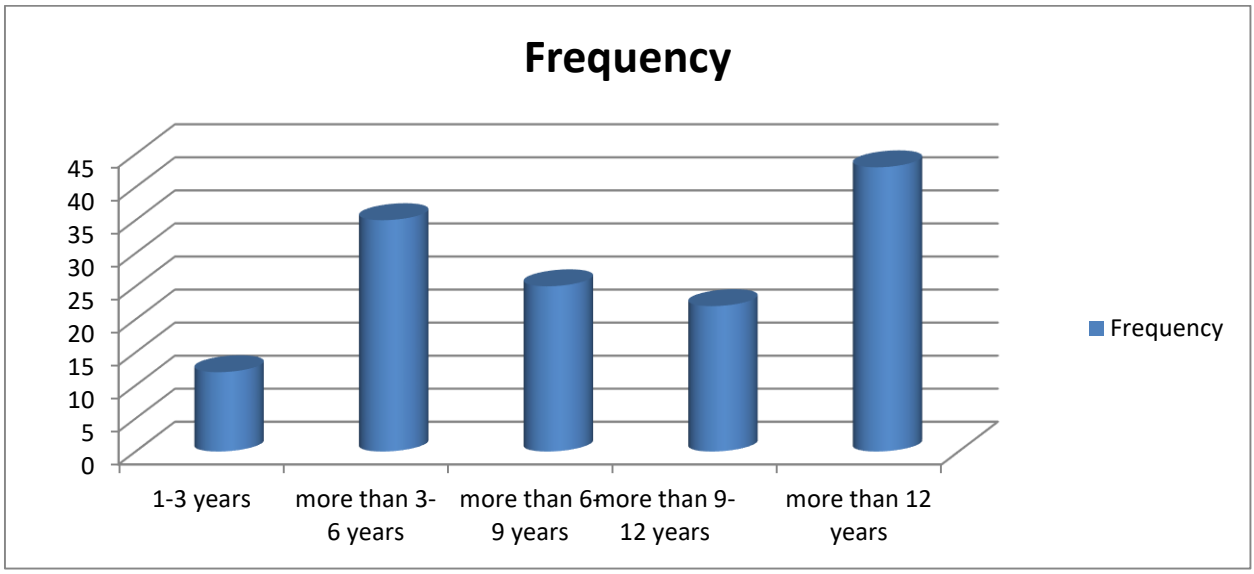

Figure 5.3 Contractor years of experience-Bar chart

4- The contractor registered in Organization Council for Engineering Works Contractors (OCEWC):

Table 5.4 Contractor registration in OCEWC

Items	Frequency	Percent %
Yes	131	95.6
No	6	4.4
Total	137	100%

Source: Prepared by the researcher, 2019

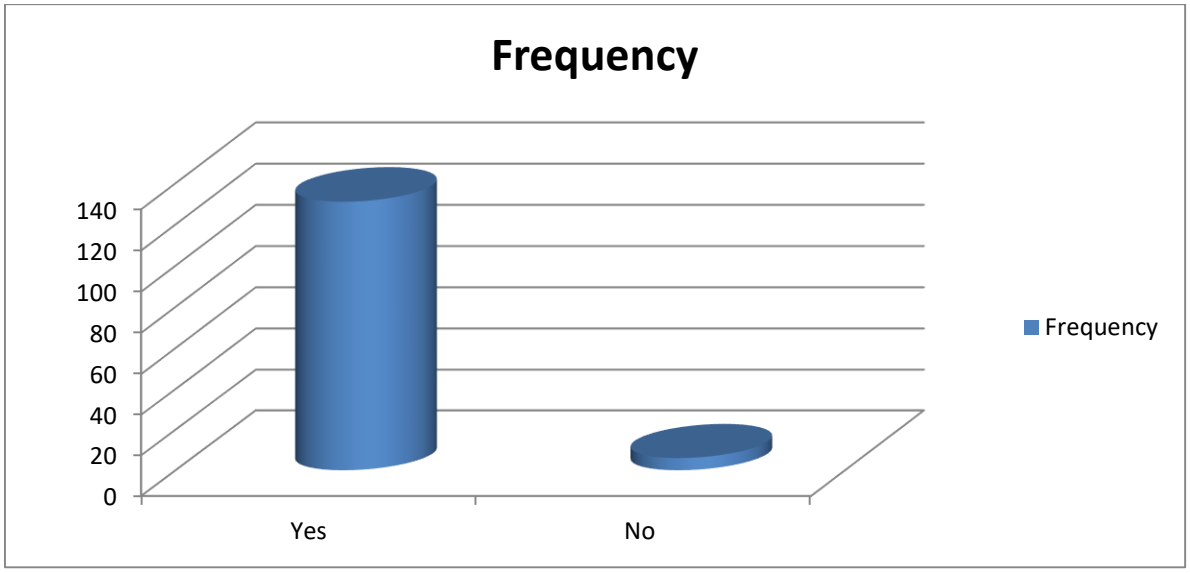

Figure 5.4 Contractor registrations in OCEWC

5- **The number of projects executed by the contractor in the year 2015-2018 and its classification according to the ownership:**

Table 5.5 Projects ownership

Items	Frequency	Percent %
Public sector owned	43	31.4
Private sector owned	75	54.7
Public/private sector owned	19	14
Total	137	100%

Source: Prepared by the researcher, 2019

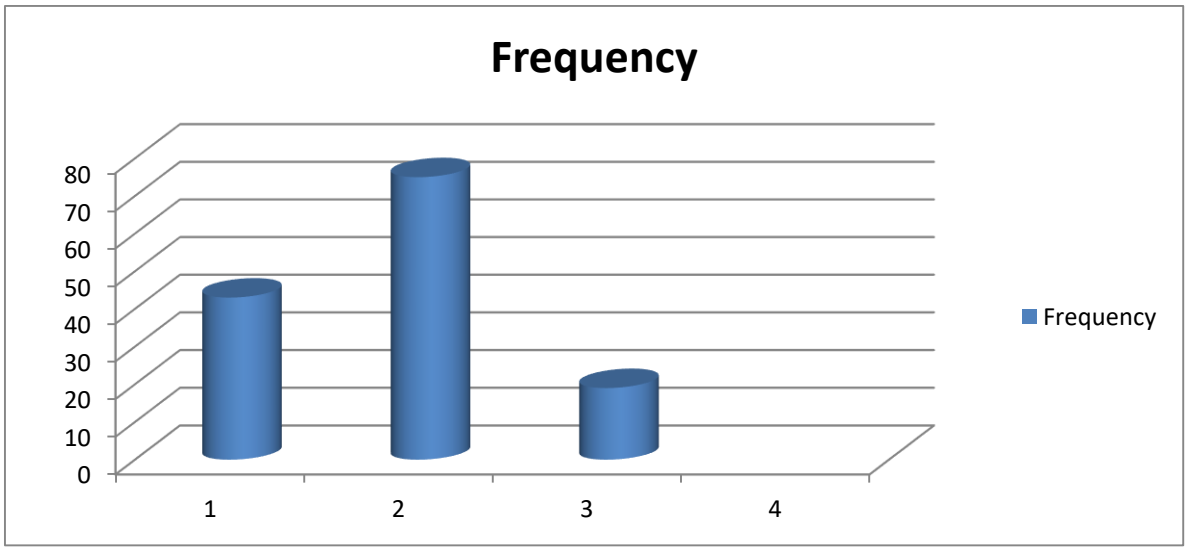

Figure 5.5 Projects ownership -Bar chart

6- Largest project executed by contractor in the year 2015- 2018 :

Table 5.6 Executed projects cost

Items	Frequency	Percent %
From 1-5 million SDG	41	29.9
More than 5-10	32	23.4
More than10-15	18	13.1
More than 15-20	11	8
More than 20	35	25.5
Total	137	100%

Source: Prepared by the researcher, 2019

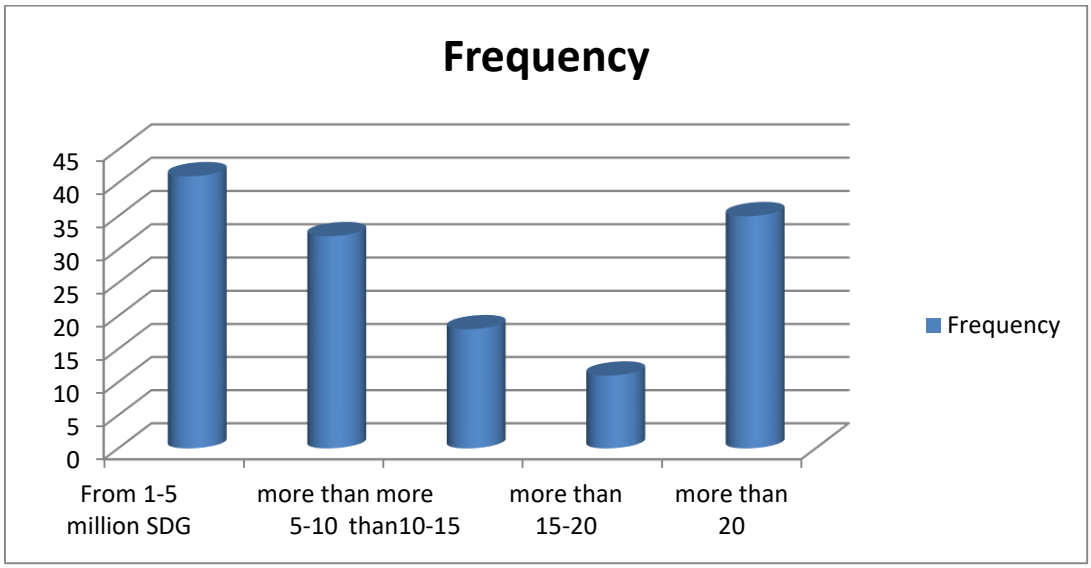

Figure 5.6 Executed projects

7 -Type of contract referred to in question (6):

Table 5.7 Types of contracts for executed projects

Items	Frequency	Percent %
Measurement contract	32	23.4
Schedule of rates	43	31.4
Design & Build Turn key	62	45.2
Total	137	100%

Source: Prepared by the researcher, 2019

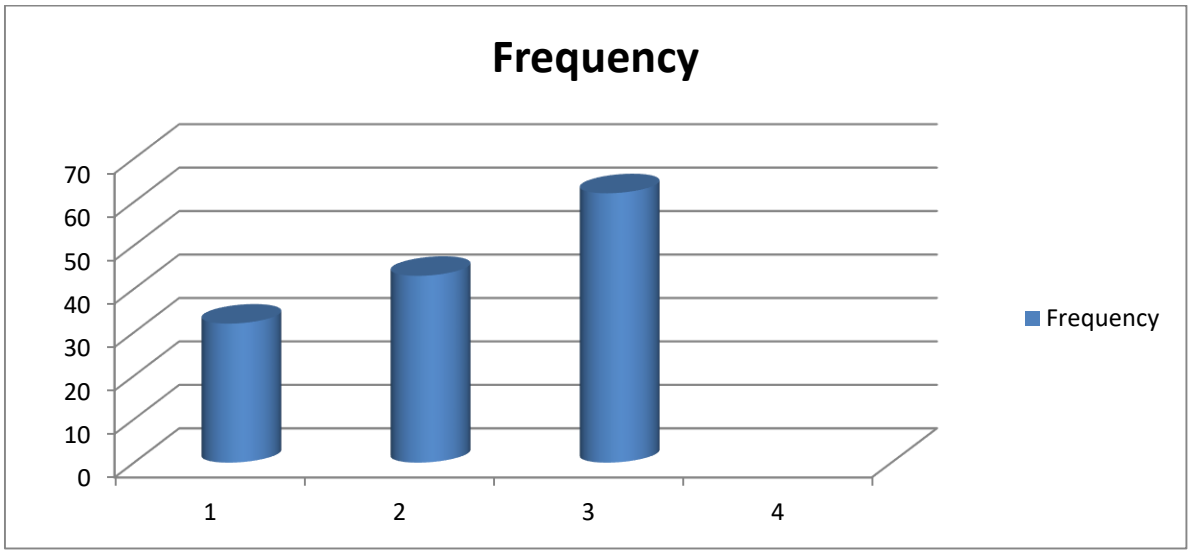

Figure 5.7 Types of contracts for executed projects-Bar chart

-

8 - Documents attached with the contract referred to in question (6):

Table 5.8 Attached documents to the signed contracts

Items	Frequency	Percent %
Detailed Drawings	15	10.9
General and special specification	23	16.8
Bills of Quantities	39	28.5
General and special condition of contract	60	43.8
Total	137	100%

Source: Prepared by the researcher, 2019

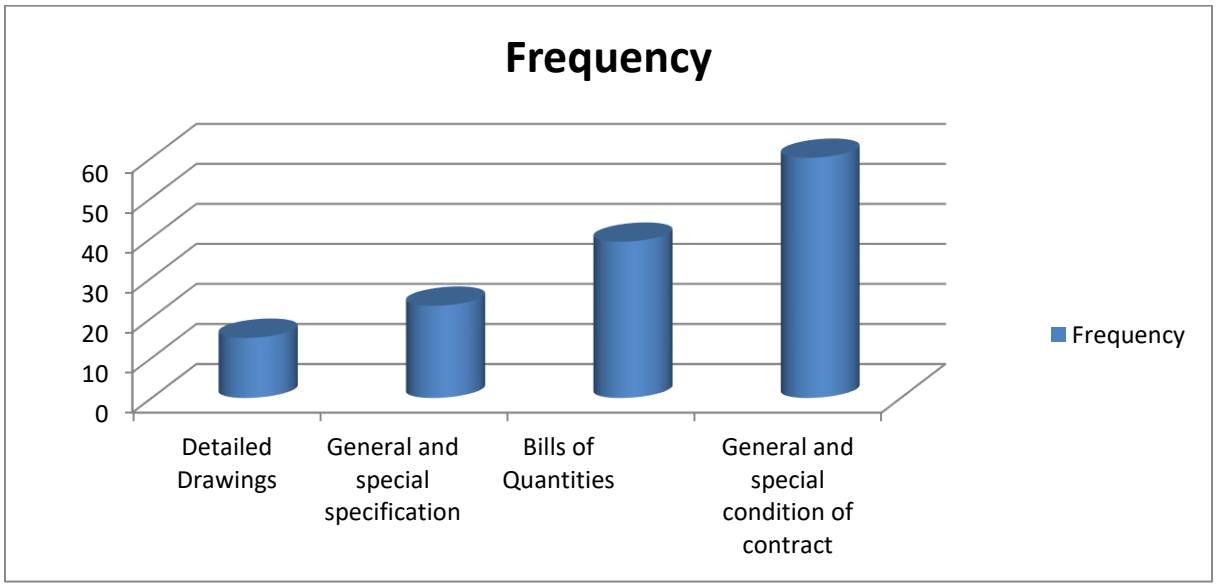

Figure 5.8 Attached documents to the signed contracts-Bar chart

9 - Overhead percentage (out of contract cost) referred to in question (6):

Table 5.9 Overheads percentage for the signed contracts

Items	Frequency	Percent %
Less than 15%	37	27
More than 15-20 %	43	31.4
More than 20-25 %	18	13.1
More than 25-30 %	12	8.8
More than 30%	27	19.7
Total	137	100%

Source: Prepared by the researcher, 2019

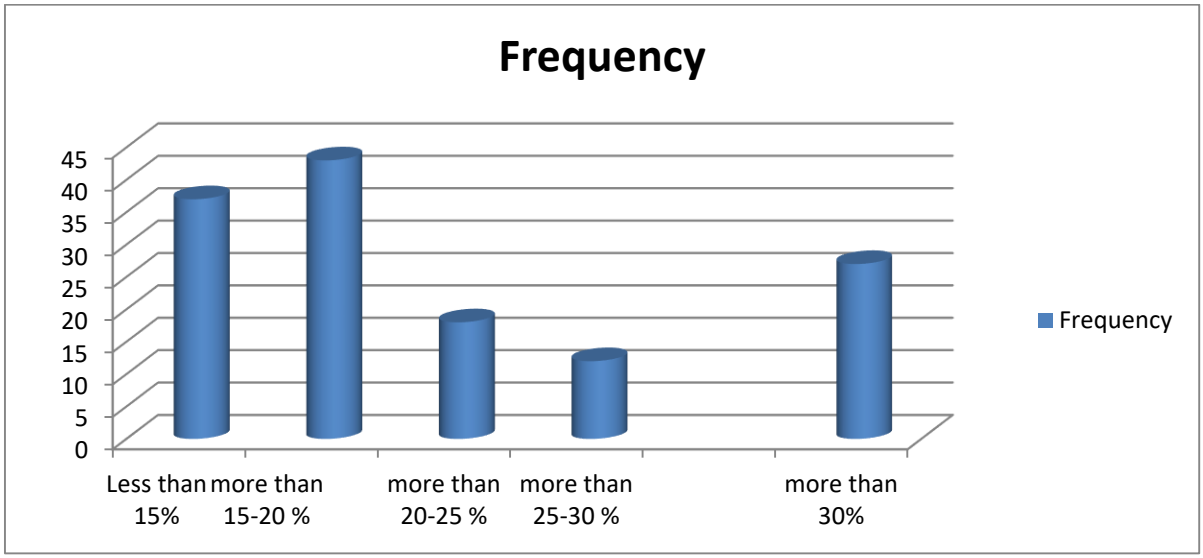

Figure 5.9 Overheads percentage for the signed contracts-Bar chart

5-4 Tendering stage

5.4.1: Frequency Distribution

As seen from **Table 5.10** below, that (83.6) % of the participants agree very much that (some factors affecting the overhead cost considered by the contractor at the tendering stage from bidding until the bidding analysis and selection of success bidder and signing the contract), while (7.3) % of the participants disagree, and those who did not show specific answers are accounted to (9.1) %.

Table 5.10 Frequency Distribution of the First Hypothesis:

No	Statement	St.Agree	Agree	Neutral	Disagree	St. Disagree
1	Incomplete and inaccuracy of detailed drawings affect the overhead cost of the project	61.3	35	2.9	0.7	0
2	Overhead percentage increases because of nonexistence of the general and special specification	46.7	40.1	8	5.1	0
3	Overhead percentage increases because of inaccuracy in the bills of	65.7	26.3	3.6	4.4	0

	quantities					
4	Inappropriate choice of general and special conditions of a contract affect the overhead percentage of the project	36.5	46	14.6	2.2	0.7
5	Nonexistence of many items(site planning, site offices, health and safety measures at site) affects in increasing the overheads	56.9	35.8	4.4	1.5	1.5
6	Long time taken between call for bidding and the bid analysis affects the increasing the overheads cost	40.9	27	15.3	13.9	2.9
7	Nonexistence of a clear mechanism of bid analysis affects in increasing overheads cost	28.5	23.4	24.8	19	4.4

8	Inaccuracy in project cost estimate by the contractor affects in increasing the overheads cost	51.1	35.8	4.4	5.1	3.6
9	Nonexistence of overhead index causes the variation of bid prices	43.1	42.3	9.5	2.9	2.2
10	Overhead percentage increase because of unclear payment terms	37.2	32.1	16.8	12.4	1.5
11	Overheads cost differs according to project type and the methods of its administration	56.2	38.7	3.6	1.5	0
12	Good planning decreases the overheads cost	76.6	21.2	0.7	0.7	0.7
Total		50%	33.6%	9.1%	5.8%	1.5%

Source: prepared by the researcher, 2019

5.4.2: Descriptive Statistics:

Arithmetic mean and standard deviation for each phrase in the first axis were calculated. We compare the arithmetic mean for a phrase with the middle premise of the study. We approve the phrase if the arithmetic mean is greater

than the middle premise of the term (3), and we realized disapproval if the arithmetic mean less than the middle premise.

Table 5.11 Shows the standard deviation of the phrases and arranges them according to their answers.

Table 5.11 Descriptive statistics of the first hypothesis

No	Statement	Average	S.Deviation	Relative	Disagree of Approve	Arrangement
1	Incomplete and inaccuracy of detailed drawings affect the overhead cost of the project	4.56	0.591	%91.2	Very high	2
2	Overhead percentage increases because of nonexistence of the general and special specification	4.28	0.822	%85.6	Very high	6
3	Overhead percentage increases because of in accuracy in the bills of quantities	4.53	0.767	%90.6	Very high	3
4	Inappropriate choice of general and special conditions of a contract affects the overhead percentage for the project	4.15	0.803	%83.0	Very high	9
5	Nonexistence of many items(site planning, site offices, health and safety measures at site) affects the increase the overheads	4.45	0.776	%89.0	Very high	5

6	Long time taken between the call for bidding and the bid analysis affect the increasing the overheads cost	3.89	1.17	%77.8	High	11
7	Nonexistence of clear mechanism of bid analysis affects in increasing overheads	3.52	1.21	%70.4	High	12
8	Inaccuracy in project cost estimate by the contractor affects in increasing the	4.26	1.01	%85.2	Very high	7
9	Nonexistence of overhead index causes the variation of bid prices	4.21	0.894	%84.2	Very high	8
10	Overhead percentage increase because of unclear payment terms	3.91	1.08	%78.2	High	10
11	Overheads cost differs according to project type and the methods of its administration	4.50	0.646	%90.0	Very high	4
12	Good planning decreases the overheads cost	4.72	0.590	%94.4	Very high	1
Total		4.25	0.863	85%	Very high	

Source: Prepared by the researcher, 2018

From the **Table 5.11**, we can recognize the follows:-

1-All the statements of the first section are averaged over the middle premise (3). The average of all phrases (4.25) with a standard deviation (0.863) and relative importance (85%).This shows that the majority of respondents agree with very high proportion of all phrases that measure (**some factors affecting the overhead cost considered by the contractor at the**

tendering stage from bidding until the bidding analysis and selection of success bidder and signing the contract).

2-The most important phrase is the phrase (**Good planning decreases the overheads cost)**, where the average of respondent's answers is (4.72) with a standard deviation (0.590) and relative importance (94.4%).

3- The less term of approval is the phrase (**Nonexistence of clear mechanism of bid analysis affect in increasing overheads**), with an average (3.52) and a standard deviation (1.21) and relative importance (70.4%).

5.4.3: The Chi – Squared–Test:

To test the presence of statistically significant differences between the number of approvers, neutrals, and non–approvers to the results of the above test (The Chi – Squared. test) was used to de note the differences.

The following **Table 5.12** illustrates phrases that measure the axis of the (first hypothesis).

Table 5.12 The Chi – Squared. Test of the first hypothesis

No	Statement	Chi-square	DF	Tabular value	Result
1	1/Incomplete and in accuracy of detailed drawings affect the	136.7	3	7.81	Acceptance
2	2/Overhead percentage increases because of	75.8	3	7.81	Acceptance
3	3/Overhead percentage increases because of in	139.1	3	7.81	Acceptance
4	4/Inappropriate choice of general and special conditions of a contract	114.1	4	9.48	Acceptance

5	Nonexistence of many items(site planning, site offices, health and safety	179.2	4	9.48	Acceptance
6	Long time taken between call bidding and the bid analysis affects the	52.2	4	9.48	Acceptance
7	Inaccuracy of clear mechanism of bid analysis	24.1	4	9.48	Acceptance
8	Non accuracy in project cost estimate by the contractor affect in	133.4	4	9.48	Acceptance
9	Nonexistence of overhead index causes the variation	119.8	4	9.48	Acceptance
10	Overhead percentage increase because of	58.5	4	9.48	Acceptance
11	Overheads cost differs according to project type and the methods of its	118.9	3	9.48	Acceptance
12	Good planning decreases the overheads cost	196.1	4	9.48	Acceptance
Total		112.3	4	9.48	Acceptance

Source: Prepared by the researcher, 2019

From the table 5.12,we can recognize the following:-

1. The Chi – Squared value for the phrase (136.7) is greater than Tabular value (7.81). Thus, it indicates that there are significant differences between the averages of the phrase (4.52) and central premise of the study (3) and in favor very high degree of approvers on the phrase (**Incomplete and in accuracy of detailed drawings affect the overhead cost for the project**).

2. The Chi – Squared value for the phrase (75.8) is greater than the Tabular value (7.81). Thus, it indicates that there are significant differences between

the average of the phrase (4.28) and central premise of the study (3) and in favor very high degree of approvers on the phrase **(Overhead percentage increases because of nonexistence of general and special specification**).

3. The Chi – Squared value for the phrase (139.1) is greater than the Tabular value (7.81).Thus, it indicates that there are significant differences between the average of the phrase (4.53) and central premise of the study (3) and in favor very high degree of approvers on the phrase (**Overhead percentage increases because of in accuracy in the bills of quantities**).

4. The Chi–Squared value for the phrase (52.2) is greater than the Tabular value(9.48).Thus, it indicates that there are significant differences between the average of the phrase(4.15) and central premise of the study (3) and in favor very high degree of approvers on the phrase (**Not good choice of general and special conditions of contract affect the overhead percentage for the project**).

5. The Chi–Squared value for the phrase (179.2) is greater than the Tabular value (9.48).Thus, it indicates that there are significant differences between the average of the phrase (4.21) and central premise of the study (3) and in favor very high degree of approvers on the phrase (**Nonexistence of many items(site planning, site offices, health and safety measures at sit) affect in increasing the overheads)**.

6. The Chi–Squared value for the phrase (52.2) is greater than the Tabular value (9.48).Thus, it indicates that there are significant differences between the average of the phrase (3.89) and central premise of the study (3) and in favor high degree of approver son the phrase(**Long time taken between bid adverting an bid analysis affect in increasing the overheads cost**).

7. The Chi–Squared value for the phrase (24.1) is greater than the Tabular value (9.48). Thus, it indicates that there are significant differences between the average of the phrase (3.52) and central premise of the study (3) and in favor high degree of approver son the phrase (**Nonexistence of clear**

mechanism of bid analysis affect in increasing overheads cost).

8. The Chi–Squared value for the phrase (133.4) is greater than the Tabular value (9.48). Thus, it indicates that there are significant differences between the average of the phrase (4.26) and central premise of the study (3) and in favor very high degree of approvers on the phrase (**Non accuracy in project cost estimate by the contractor affect in increasing the overheads cost**).

9. The Chi–Squared value for the phrase (77.3) is greater than the Tabular value (7.38). Thus, it indicates that the rear significant differences between the average of the phrase (3.87) and central premise of the study (3) and in favor high degree of approvers on the phrase (**Nonexistence of overhead index causes the variation of bid prices**).

10. The Chi–Squared value for the phrase (58.5) is greater than the Tabular value (9.48). Thus, it indicates that the rear significant differences between the average of the phrase (3.91) and central premise of the study (3) and in favor high degree of approvers on the phrase (Overhead percentage increase because of unclear payment terms).

11. The Chi–Squared value for the phrase (118.9) is greater than the Tabular value (7.81). Thus, it indicates that there are significant differences between the average of the phrase (4.50) and central premise of the study (3) and in favor very high degree of approvers on the phrase (**Overheads cost differs according the project type and the methods of its administration**).

12. The Chi–Squared value for the phrase (196.1) is greater than the Tabular value (9.48). Thus, it indicates that there are significant differences between the average of the phrase (4.72) and central premise of the study (3) and in favor very high degree of approvers on the phrase (**Good planning decreases the overheads cost**).

13. The Chi–Squared value for total phrases (112.3) is greater than the Tabular value (9.48). Thus, it indicates that there are significant differences between the average of the phrase (4.25) and central premise of the study (3)

and in favor very high degree of approver son the (**first hypothesis**).

We conclude that the first hypothesis of the study, which stipulates **Table 5.12**, is an acceptable hypothesis of all phrases?

5.5: Construction stage:

5.5.1: frequency Distribution:

As can be seen from **Table 5.13** below, that (89.9) % of the participants agree very much that (**There are some factors affecting the overhead percentage during the construction stage, that the contractor put in consideration**), while (3.5) % of the participants disagree. And those who did not show specific answers have accounted (6.6) %.

Table 5.13 Frequency Distribution of the second Hypothesis:

No	Statement	St. Agree	Agree	Neutral	Disagree	St. Disagree
1	Overheads cost for the projects is affected according to the type of the contract signed	37.2	43.8	13.1	5.1	0.7
2	Delay of site handing over causes increase in overhead cost	52.6	38	6.6	2.9	0
3	Change of materials prices increases the overhead percentage	79.6	17.5	0.7	2.2	0
4	Overhead percentage increases because of instability of labor cost	67.2	28.5	3.6	0.7	0
5	Overhead percentage increases because of	48.2	31.4	14.6	3.6	2.2

	the increasing in government fees					
6	Overhead percentage increases because of the unpunctuality of payment by the employer	46	40.9	8	4.4	0.7
7	Overhead percentage increases because of the lack of supervision by the consultant	46.7	39.4	7.3	5.8	0.7
8	Overhead percentage increases because of the change in specifications	56.2	38	3.6	2.2	0
9	Overhead percentage increases because of variation in quantities	48.2	40.1	3.6	8	0
10	Overhead percentage increases because of the extension of time for project execution	59.1	36.5	1.5	2.9	0
11	Choosing improper equipment's affect the overhead percentage	68.6	27	2.9	1.5	0
12	Negligence of insurance and safety measures causes	42.3	50.4	7.3	0	0

	increase in overhead percentage					
13	ineffective communication between the project parties affect the overhead percentage	46	39.4	13.1	1.5	0
Total		53.7%	36.2%	6.6%	3.2%	0.3

Source: prepared by the researcher, 2019

5.5.2: Descriptive Statistics:

The arithmetic mean and standard deviation for each phrase in the first axis were calculated. We compare the arithmetic mean for a phrase with the middle premise of the study. We approve the phrase if the arithmetic mean is greater than the middle premise of the term (3), and we realized disapproval if the arithmetic mean less than the middle premise.

Table 5.14 Shows the standard deviation of the phrases and arranges them according to their answers.

Table 5.14 Descriptive statistics of the second hypothesis

No	Statement	Average	S.D	Relative	Disagree of Approval	Arrangement
1	Overheads cost for the projects is affected according to the type of the	4.12	0.875	%82.4	Very high	13

2	Delay of site handing over causes increase in overhead cost	4.40	0.742	%88.0	Very high	6
3	Change of materials prices increases the overhead percentage	4.74	0.581	%94.8	Very high	1
4	Overhead percentage increases because of the instability of	4.61	0.633	%92.2	Very high	3
5	Overhead percentage increases because of the increases in	4.20	0.969	%84.0	Very high	12
6	Overhead percentage increases because of the unpunctuality of payment by the employer	4.27	0.844	%85.4	Very high	10
7	Overhead percentage increases because of the lack of supervision by the	4.25	0.883	%85.0	Very high	11
8	Overhead percentage increases because of the change in	4.48	0.676	%89.6	Very high	5
9	Overhead percentage increases because of variation in quantities	4.28	0.874	%85.6	Very high	9

10	Overhead percentage increases because of the extension of time for project execution	4.52	0.676	%90.4	Very high	4
11	Choosing of un improper equipment's affect the overhead	4.62	0.688	%92.4	Very high	2
12	Negligence of insurance and safety measures causes increase in overhead	4.35	0.613	%87.0	Very high	7
13	ineffective communication between the project parties affect the overhead percentage	4.30	0.751	%86.0	Very high	8
Total		4.40	0.754	87.9%	Very high	

Source: Prepared by the researcher, 2018

From the **Table 5.14**, we can recognize the follows:-

1-All the statements of the second axis are averaged over the middle premise (3). The average of all phrases (4.40) with a standard deviation (0.754) and relative importance (%87.9).This shows that the majority of respondents agree with a high proportion of all phrases that measure the (**Second Hypothesis**).

2-The most important phrase is the phrase (**Change of materials prices increases the overhead percentage**), where the average of respondent's

answers is (4.74) with a standard deviation (0.581) and relative importance (%94.8).

3- The less term of approval is the phrase (**Overheads cost for the projects affected according to the type of the contract signed**), with an average (4.12) and a standard deviation (0.875) and relative importance (%82.4).

5.5.3: **The Chi – Squared–Test:**

To test the presence of statistically significant differences between the number of approvers, neutrals, and non–approvers to the results of the above test was used (The Chi – Squared. test)to denote the differences. The following table illustrates phrases that measure the axis of the (first hypothesis).

Table 5.15 The Chi – Squared. of the first hypothesis

No	Statement	Chi-square	DF	Tabular value	Result
1	Overheads cost for the projects is affected according to the type of the contract signed	102.9	4	9.48	Acceptance
2	Delay of site handing over causes increase in overhead cost	96.1	3	7.81	Acceptance
3	Change of materials prices increases the overhead	127.1	3	7.81	Acceptance
4	Overhead percentage increases because of the instability of	155.2	3	7.81	Acceptance
5	Overhead percentage increases because of the increases in government fees	105.2	4	9.48	Acceptance
6	Overhead percentage increase because of the unpunctuality of payment by the employer	128.1	4	9.48	Acceptance

7	Overhead percentage increases because of the lack of supervision by the consultant	124.9	4	9.48	Acceptance
8	Overhead percentage increases because of the change in specifications	116.1	3	7.81	Acceptance
9	Overhead percentage increases because of variation in quantities	82.7	3	7.81	Acceptance
10	Overhead percentage increases because of the extension of time for project execution	128.1	3	7.81	Acceptance
11	Choosing of improper equipment's affect the overhead	161.5	3	7.81	Acceptance
12	Negligence of insurance and safety measures causes increase in overhead percentage	43.1	2	5.37	Acceptance
13	Ineffective communication between the project parties affect the overhead percentage	73.5	3	7.81	Acceptance
Total		87.9	4	9.48	Acceptance

Source: Prepared by the researcher, 2019

From the Table 5.15, we can recognize the following:-

1. The Chi – Squared value for the phrase (102.9) is greater than Tabular value (9.48). Thus, it indicates that there are significant differences between the averages of the phrase (4.12) and central premise of the study (3) and in favor very high degree of approvers on the phrase (**Overheads cost for the projects affected according to the type of the contract signed**).

2. The Chi – Squared value for the phrase (96.1) is greater than the Tabular value (7.81). Thus, it indicates that there are significant differences between the average of the phrase (4.40) and central premise of the study (3) and in favor very high degree of approvers on the phrase (**Delay of site handing over causes increase in overhead cost**).

3. The Chi – Squared value for the phrase (127.1) is greater than the Tabular value (7.81).Thus, it indicates that there are significant differences between the average of the phrase (4.74) and central premise of the study (3) and in favor very high degree of approvers on the phrase (**Change of materials prices increases the overhead percentage**).

4. The Chi–Squared value for the phrase (155.2) is greater than the Tabular value (7.81). Thus, it indicates that there are significant differences between the average of the phrase (4.61) and central premise of the study (3) and in favor very high degree of approvers on the phrase (**Overhead percentage increases because of changes in labor cost**).

5. The Chi–Squared value for the phrase (105.2) is greater than the Tabular value (9.48). Thus, it indicates that there are significant differences between the average of the phrase (4.20) and central premise of the study (3) and in favor very high degree of approvers on the phrase (**Overhead percentage increases because of increasing of government fees**).

6. The Chi–Squared value for the phrase (128.1) is greater than the Tabular value (9.48). Thus, it indicates that there are significant differences between the average of the phrase (4.27) and central premise of the study (3) and in favor very high degree of approvers on the phrase (**Overhead percentage increase because of non-punctual of payment by the employer**).

7. The Chi–Squared value for the phrase (124.9) is greater than the Tabular value (9.48). Thus, it indicates that there are significant differences between the average of the phrase (4.25) and central premise of the study (3) and in favor very high degree of approvers on the phrase (**Overhead percentage**

increases because of non-punctual of supervision by the Engineer).

8. The Chi–Squared value for the phrase (116.1) is greater than the Tabular value (7.81). Thus, it indicates that there are significant differences between the average of the phrase (4.48) and central premise of the study (3) and in favor very high degree of approvers on the phrase (**Overhead percentage increases because of change in specification**).

9. The Chi–Squared value for the phrase (82.7) is greater than the Tabular value (7.81). Thus, it indicates that there are significant differences between the average of the phrase (4.28) and central premise of the study (3) and in favor very high degree of approvers on the phrase (**Overhead percentage increases because of variation in quantities**).

10. The Chi–Squared value for the phrase (128.1) is greater than the Tabular value (7.38). Thus, it indicates that there are significant differences between the average of the phrase (4.52) and central premise of the study (3) and in favor very high degree of approvers on the phrase (**Overhead percentage increases because of extension of time for project execution**).

11. The Chi–Squared value for the phrase (161.5) is greater than the Tabular value (7.81). Thus, it indicates that there are significant differences between the average of the phrase (4.61) and central premise of the study (3) and in favor high degree of approvers on the phrase (**Choice of un qualified labor or un proper equipment's affect the overhead percentage**).

12. The Chi–Squared value for the phrase (43.1) is greater than the Tabular value (5.37). Thus, it indicates that there are significant differences between the average of the phrase (4.35) and central premise of the study (3) and in favor very high degree of approvers on the phrase (**Negligence of insurance and safety measures causes increase in overhead percentage**).

13. The Chi–Squared value for the phrase (73.5) is greater than the Tabular value (7.81). Thus, it indicates that there are significant differences between the average of the phrase (4.30) and central premise of the study (3) and in

favor very high degree of approvers on the phrase (**Non effective communication between the project parties affect the overhead percentage**).

14. The Chi–Squared value for total phrases (87.9) is greater than the Tabular value (9.48). Thus, it indicates that there are significant differences between the average of the phrase (4.40) and central premise of the study (3) and in favor very high degree of approvers on the (**second hypothesis**).

We conclude that the second hypothesis of the study, which stipulates **Table 5.15,** is an acceptable hypothesis of all phrases.

5.6: Commissioning and maintenance stage:

5.6.1: frequency Distribution:

As can be seen from **Table 5.16** below, that (85.5) % of the participants agree very much that (**There are some factors affecting the overhead costs considered by the contractor after execution and handing over stage**), while (9) % of the participants disagree and those who did not show specific answers have accounted (5.5) %.

Table 5.16 Frequency Distribution of the third Hypothesis

No	Statement	St. Agree	Agree	Neutral	Disagree	St. disagree
1	Overhead percentage increases because of delay preliminary handing over	48.2	44.5	4.4	0.7	2.2
2	Overhead percentage increases because of the cost of defects of liability and commissioning	40.9	43.1	9.5	6.6	0

	guarantee					
3	Overhead percentage increases because of unclear taxes	40.1	43.1	11.7	4.4	0.7
4	Overhead percentage increases because of the extension of time for project execution	60.6	36.5	2.2	0.7	0
5	Your firm cares to documents the project expenses and overheads cost after its execution	47.4	39.4	10.2	2.2	0.7
6	There is no definite index for overhead cost percentage	24.1	35	14.6	21.2	5.1
7	Absence of overhead index(percentage) is the main reason of the variation in bid prices	35.8	48.2	8	7.3	0.7
8	Absence of knowledge of the overhead percentage causes huge loses for contracting companies pushing some of them out of the construction market	62	35	1.5	1.5	0
Total		44.9%	40.6%	5.5%	1.2%	7.8%

Source: prepared by the researcher, 2019

5.6.2: Descriptive Statistics:

Where we calculate the arithmetic mean and standard deviation for each phrase in the first axis. We compare the arithmetic mean for a phrase with the middle premise of the study. We approve the phrase if the arithmetic mean is greater than the middle premise of the term (3), and we realized disapproval if the arithmetic mean less than the middle premise.

Table5.17 Shows the standard deviation of the phrases and arranges them according to their answers.

Table 5.17 Descriptive statistics of the third hypothesis

No	Statement	Average	S.D	Relative	Disagree of Approval	Arrangement
1	Overhead percentage increases because of delay in preliminary handing over	4.36	0.792	%87.2	Very high	3
2	Overhead percentage increases because of the cost of defects of liability and commissioning	4.18	0.859	%83.6	Very high	6
3	Overhead percentage increases because of unclear taxes	4.19	0.856	%83.8	Very high	5
4	Overhead percentage increases because of the extension of the time for project execution	4.56	0.616	%91.2	Very high	2

5	Your firm cares to documents the project expenses and overheads cost after its execution	4.30	0.800	%86.0	Very high	4
6	There is no definite index for overhead cost percentage	3.52	1.21	%70.4	Very high	8
7	Absence of overhead index(percentage) is the main reason of the variation in bid prices	4.11	0.888	%82.2	Very high	7
8	Absence of knowledge of the overhead percentage causes huge loses for contracting companies pushing some of them out of the construction market	4.58	0.602	%91.6	Very high	1
Total		4.22	0.827	%84.5.	Very high	

Source: Prepared by the researcher, 2019

From the Table 5.17, we can recognize the follows:-

1-All the statements of the third axis are averaged over the middle premise (3). The average of all phrases (4.22) with a standard deviation (0.827) and relative importance (%84.5).This shows that the majority of respondents agree with a high proportion of all phrases that measure the (**third Hypothesis**).

2-The most important phrase is the phrase (**Not knowing the overhead**

percentage causes big defaults for contractors and let some of them to be quitted out of the market), where the average of respondent's answers is (4.58) with a standard deviation (0.602) and relative importance (%91.6).

3- The less term of approval is the phrase (**There is no definite index for overhead cost percentage**), with an average (3.52) and a standard deviation (1.21) and relative importance (%70.4).

5.6.3: The Chi – Squared–Test:

To test the presence of statistically significant differences between the number of approvers, neutrals, and non–approvers to the results of the above test was used (The Chi – Squared. test) to de note the differences. The following table illustrates phrases that measure the axis of the (third hypothesis).

Table 5.18 The Chi – Squared. Test of the third hypothesis

No	Statement	Chi-square	DF	Tabular value	Result
1	Overhead percentage increases because of delay in preliminary handing over	159.4	4	9.48	Acceptance
2	Overhead percentage increases because of the cost of defects of liability and commissioning guarantee	63.5	3	7.81	Acceptance
3	Overhead percentage increases because of unclear taxes	111.1	4	9.48	Acceptance
4	Overhead percentage increases because of the extension of the time for project execution	137.4	3	7.81	Acceptance

5	Your firm cares to documents the project expenses and overheads cost after its execution	131.1	4	9.48	Acceptance
6	There is no definite index for overhead cost percentage	33.9	4	9.48	Acceptance
7	Absence of overhead index(percentage) is the main reason of the variation in bid prices	117.7	4	9.48	Acceptance
8	Absence of knowledge of the overhead percentage causes huge loses for contracting companies pushing some of them out of the construction market	141.4	3	7.81	Acceptance
Total		111.9	4	9.48	Acceptan

Source: Prepared by the researcher, 2019

From the table 5.18, we can recognize the following:-

1. The Chi – Squared value for the phrase (159.9) is greater than Tabular value (9.48). Thus, it indicates that there are significant differences between the averages of the phrase (4.36) and central premise of the study (3) and in favor very high degree of approvers on the phrase (**Overhead percentage increases because of delay of handing over**).

2. The Chi – Squared value for the phrase (63.5) is greater than the Tabular value (7.81). Thus, it indicates that there are significant differences between the average of the phrase (4.18) and central premise of the study (3) and in favor very high degree of approvers on the phrase (**Overhead percentage increases**

because of the cost of defect of liability and commissioning guarantee).

3. The Chi – Squared value for the phrase (111.1) is greater than the Tabular value (9.48). Thus, it indicates that there are significant differences between the average of the phrase (4.19) and central premise of the study (3) and in favor very high degree of approver's on the phrase **(Overhead percentage increases because of unclear cost of taxes**).

4. The Chi–Squared value for the phrase (137.4) is greater than the Tabular value (7.81). Thus, it indicates that there are significant differences between the average of the phrase (4.56) and central premise of the study (3) and in favor very high degree of approvers on the phrase (**Overhead percentage increases because of extension of time for project execution**).

5. The Chi–Squared value for the phrase (131.1) is greater than the Tabular value (9.48). Thus, it indicates that there are significant differences between the average of the phrase (4.30) and central premise of the study (3) and in favor very high degree of approvers on the phrase (**Your firm take care for the project accounts documentation and overheads cost after project execution**).

6. The Chi–Squared value for the phrase (33.9) is greater than the Tabular value (9.48). Thus, it indicates that there are significant differences between the average of the phrase (3.52) and central premise of the study (3) and in favor high degree of approvers on the phrase (**There is no definite index for overhead cost percentage).**

7. The Chi–Squared value for the phrase (117.7) is greater than the Tabular value (9.48). Thus, it indicates that there are significant differences between the average of the phrase (4.11) and central premise of the study (3) and in favor very high degree of approvers on the phrase (**Absence of overhead index (percentage) is the main reason of variation in bid prices**).

8. The Chi–Squared value for the phrase (141.4) is greater than the Tabular value (7.81). Thus, it indicates that there are significant differences between

the average of the phrase (4.58) and central premise of the study (3) and in favor very high degree of approvers on the phrase **(Not knowing the overhead percentage causes big defaults for contractors and let some of them to be quitted out of the market**).

9. The Chi–Squared value for total phrases (111.9) is greater than the Tabular value (9.48). Thus, it indicates that there are significant differences between the average of the phrase (4.22) and central premise of the study (3) and in favor very high degree of approvers on the (**third hypothesis**).

We conclude that the third hypothesis of the study, which stipulates **Table 5.18,** is an acceptable hypothesis of all phrases?

5.7 Factor analysis

A-Preliminary test

Before extracting the factors, two basic assumptions of factor analysis, namely multivariate normality and sampling adequacy, should be tested.

The Kaiser-Meyer-Olkin (KMO) test which is available in the software can measure whether the distribution of values is adequate for conducting factor analysis. **Table 5.19** shows KMO and Bartlett's Test.

Table.5.19 MO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.803
Bartlett's Test of Sphericity	Approx. Chi-Square	2150.409
	Df	528
	Sig.	.000

From above table, it shows value of Kaiser-Meyer-Olkin test is (0.803) acceptable. Where the minimum for that value is 0.60. that means measure of sampling Adequacy is good and significant (0.000).

B- Descriptive Statistics:

Table 5.20 shows the descriptive statistics including relative important index, mean and standard deviation for the list of variables affecting project Overheads expenditure used in the questionnaire.

Table 5.20 Descriptive Statistics

No	Item	Relative Important Index	Mean	Std. Deviation
1	Incomplete and in accuracy of detailed drawings affect the overhead cost for the project.	%84	4.22	0.561
2	Overhead percentage increases because of nonexistence of general and special specification.	%90	4.50	0.517
3	Overhead percentage increases because of in accuracy in the bills of quantities	%88	4.42	0.680
4	Not good choice of general and special conditions of contract affect the overhead percentage for the project	%84	4.18	0.632
5	Nonexistence of many items(site planning, site offices, health and safety measures at sit) affect in increasing the overheads	%82	4.10	0.680
6	Long time taken between bid adverting an bid analysis affect in increasing the overheads cost	%82	4.11	0.707
7	Nonexistence of clear mechanism of bid analysis affect in increasing overheads cost	%81	4.04	0.772
8	Non accuracy in project cost estimate by the contractor affect in increasing the overheads cost	%82	4.12	0.715
9	Nonexistence of overhead index causes the variation of bid prices	%81	4.05	0.703
10	Overhead percentage increase because of unclear payment terms	%82	4.11	0.662
11	Overheads cost differs according the project type and	%84	4.20	0.698

	the methods of its administration			
12	Good planning decreases the overheads cost	%82	4.08	0.642
13	Overheads cost for the projects affected according to the type of the contract signed	%82	4.09	0.676
14	Delay of site handing over causes increase in overhead cost	%85	4.24	0.645
15	Change of materials prices increases the overhead percentage	%83	4.16	0.657
16	Overhead percentage increases because of changes in labor cost	%82	4.12	0.733
17	Overhead percentage increases because of increasing of government fees	%83	4.13	0.615
18	Overhead percentage increase because of non-punctual of payment by the employer	.%84	4.21	0.593
19	Overhead percentage increases because of non-punctual of supervision by the Engineer	%78	3.88	0.659
20	Overhead percentage increases because of change in specification	%82	4.08	0.579
21	Overhead percentage increases because of variation in quantities	%81	4.07	0.695
22	Overhead percentage increases because of extension of time for project execution	%79	3.95	0.669
23	Choice of un qualified labor or un proper equipments affect the overhead percentage	%78	3.92	0.689
24	Negligence of insurance and safety measures causes increase in overhead percentage	%78	3.88	0.743
25	Non effective communication between the project parties affect the overhead percentage	%77	3.85	0.698
26	Overhead percentage increases because of delay of handing over	%78	3.90	0.692

27	Overhead percentage increases because of the cost of defect of liability and commissioning guarantee	%79	3.96	0.741
28	Overhead percentage increases because of unclear cost of taxes	%80	3.99	0.616
29	Overhead percentage increases because of extension of time for project execution	%78	3.92	0.764
30	Your firm take care for the project accounts documentation and overheads cost after project execution	%79	3.93	0.728
31	There is no definite index for overhead cost percentage	%80	3.98	0.676
32	Absence of overhead index(percentage) is the main reason of variation in bid prices	%80	3.98	0.777
33	Not knowing the overhead percentage causes big defaults for contractors and let some of them to be quitted out of the market	%78	3.92	0.711

C-Interpretation of components

Number of components were extracted by principal component analysis. The number of components extracted was based on their respective eigenvalues as a general rule applied in most factor analysis procedures, the criterion for factor extraction is eigenvalue.

To interpret the meaning of a factor, the salient variables in each factor were identified and used as the indicators for explanation. These salient variables were selected by two criteria. First, their loading values should be significantly high (minimum 0.4) and second, they should only be loaded on the extracted factor. **Table 5.21** shows structure of the principal factor extraction on the 33 factors affecting project overheads expenditure**.**

Table 5.21 structure of principal factors

Item	Factor	Variables included in the factor	Factor loading	Eigen value	Variance explained %	Cumulative variance %
1	Project time&duration	Long time taken between the call for bidding and the bid analysis affect the increasing the overheads cost	0.974	2.049	40.978	40.978
		Nonexistence of clear mechanism of bid analysis affects in increasing overheads cost	0.805			
		Overhead percentage increases because of the extension of time for project execution	0.703			
		Delay of site handing over causes increase in overhead cost	0.468			
		Overhead percentage increases because of delay in preliminary handing over	0.443			
2	Project cost estimate	Inaccuracy in project cost estimate by the contractor affects in increasing the overheads cost	0.705	2.377	53.730	53.730
		Overheads cost differs according to project type and the methods of its administration	0.711			
		Nonexistence of many items(site planning, site offices, health and safety measures at site) affects the increase the overheads	0.662			
3	Changes& variations	Change of materials prices increases the overhead percentage	0.834	1.612	59.423	59.423
		Overhead percentage increases because of the instability of labor cost	0.812			
		Overhead percentage increases because of the change in specifications	0.734			

		Overhead percentage increases because of variation in quantities	0.720			
4	Payments	Overhead percentage increase because of unclear payment terms	0.888	2.989	59.789	59.789
		Overhead percentage increases because of the unpunctuality of payment by the employer	0.724			
		Overhead percentage increases because of the cost of defects of liability and commissioning guarantee	0.721			
5	Project documents	Incomplete and inaccuracy of detailed drawings affect the overhead cost of the project	0.789	1.620	66.991	60.930
		Overhead percentage increases because of nonexistence of the general and special specification	0.711			
		Overhead percentage increases because of in accuracy in the bills of quantities	0.690			
		Inappropriate choice of general and special conditions of a contract affects the overhead percentage for the project	0.688			
		Overheads cost for the projects is affected according to the type of the contract signed	0.636			
		Overhead percentage increases because of the lack of supervision by the consultant	0.661			
		Your firm cares to documents the project expenses and overheads cost after its execution	0.651			
6	Absence of overhead	There is no definite index for overhead cost percentage	0.765	2.052	68.393	68.393
		Absence of overhead index(percentage) is the main reason of the variation in bid	0.711			

	index	prices				
		Nonexistence of overhead index causes the variation of bid prices	0.666			
		Absence of knowledge of the overhead percentage causes huge loses for contracting companies pushing some of them out of the construction market	0.662			
		There is no definite index for overhead cost percentage	0.562			
7	Government fees	Overhead percentage increases because of the increases in government fees	0.899	3.524	70.472	70.472
		Overhead percentage increases because of unclear taxes	0.850			
		Negligence of insurance and safety measures causes increase in overhead percentage	0.848			
8	Project planning	Good planning decreases the overheads cost	0.850	1.135	80.589	80.589
		ineffective communication between the project parties affect the overhead percentage	0.655			
		Choosing of un improper equipment's affect the overhead percentage	0.445			

Table 5.21variables for each extracted factor are higher than 0.5, reflecting a substantial degree of contribution of each variable to its extracted factor.

Table 5.21 shows the extract factors with Eigen root values greater than the integer one.

The eight extracted factors are interpreted as follows according to the descending order of variance explained by each factor:

Factor 1: Project time and duration This factor accounts for an amount of total variance (40.978).this factors contains 5 variables :Long time taken between the call for bidding and the bid analysis affect the increasing the overheads cost, nonexistence of clear mechanism of bid analysis affects in increasing overheads cost, overhead percentage increases because of the extension of time for project execution, delay of site handing over causes increase in overhead cost and overhead percentage increases because of delay in preliminary handing over.

Factor 2: Project cost estimates. This factor accounts for an amount of total variance (53.730) this factors contains 3 variables: Inaccuracy in project cost estimate by the contractor affects in increasing the overheads cost, overheads cost differs according to project type and the methods of its administration and nonexistence of many items (site planning, site offices, health and safety measures at site) affects the increase the overheads.

Factor 3: Changes& variations. This factor accounts for an amount of total variance (59.423), this factors contains 4 variables: Change of materials prices increases the overhead percentage, overhead percentage increases because of the instability of labor cost, overhead percentage increases because of the change in specifications and overhead percentage increases because of variation in quantities.

Factor 4: Payments. This factor accounts for an amount of total variance (59.789), this factors contains 3 variables: Overhead percentage increase because of unclear payment terms, overhead percentage increases because of the unpunctuality of payment by the employer and overhead percentage increases because of the cost of defects of liability and commissioning guarantee.

Factor 5: Project documents. This factor accounts for an amount of total variance (66.991), this factors contains 7 variables: Incomplete and inaccuracy of detailed drawings affect the overhead cost of the project, overhead percentage increases because of in accuracy in the bills of quantities, inappropriate choice of general and special conditions of a contract affects the overhead percentage for the project, overheads cost for the projects is affected according to the type of the contract signed, overhead percentage increases because of the lack of supervision by the consultant and your firm cares to documents the project expenses and overheads cost after its execution .

Factor 6: Absence of overhead index. This factor accounts for an amount of total variance (68.393) this factors contains 5 variables: There is no definite index for overhead cost percentage, absence of overhead index(percentage) is the main reason of the variation in bid prices, nonexistence of overhead index causes the variation of bid prices, absence of knowledge of the overhead percentage causes huge loses for contracting companies pushing some of them out of the construction market and there is no definite index for overhead cost percentage.

Factor 7: Government fees: This factor accounts for an amount of total variance (70.472), this factors contains 3variables: Overhead percentage increases because of the increases in government fees, overhead percentage increases because of unclear taxes and negligence of insurance and safety measures causes increase in overhead percentage.

Factor 8: Project planning: This factor accounts for an amount of total variance (80.589), this factors contains 3variables: Good planning decreases the overheads cost, ineffective communication between the project parties affect the overhead percentage and choosing of un improper equipment's affect the overhead percentage.

D- Discussion

The results provide a clearer interpretation as to the critical components that are more related to project overheads cost.

The results show that Project planning affect the project overheads cost, good planning and choosing proper equipment's decreases the overheads whereas effective communication from tendering stage to the final handing over stage assists in controlling the project and hence reducing the overheads cost. Planning was classified as a highest factor affecting the overheads cost whereas the project time and duration was classified the lowest from eight factors chosen.

The results show that the contractors must consider the impact of principal factors on each project overhead item individually.

E-Conclusions

In this study, project overheads cost is presented. From the questionnaire survey conducted with 137 registered contractors, factors affecting project overheads were identified by exploratory factor analysis. Eight factors were extracted from 33 variables developed from the questionnaire. Addressing the objectives, the eight empirically found critical factors affecting project overheads in ascending order are: Project planning, government fees, absence of overhead index, project documents, payments, changes and variations, project cost estimates and project time and duration.

The results show the importance of knowing the ranking of the factors affecting the overheads cost and the awareness of knowing the impact of the overheads cost for the project overall construction cost.

Classification of overheads items under different principal factors allows estimators and quantity surveyors to make more precise adjustments to their project overhead estimates for improved accuracy.

Contractors can take appropriate actions to control the effect of these identified factors affecting the overheads cost in order to achieve better budgetary control.

Further studies can be conducted to investigate the relationships between the principal factors and project overhead costs to develop appropriate estimating strategies.

5.8-Case Study data calculations

The case study respondent (Appendix G) can be summarized as follows:

A-General Information

1- Project Name: Aldalng hospital
2- Project Location: South Kordofan State- Aldalang city
3- Method of project acquisition (tender, direct assignment): Tender
4- Overheads (General overheads site overheads) =4,754,761SDG
5- Total project cost (Basic project cost + overheads) =15,512,204SDG
6- Contractual Project Cost = 17,902,219 SDG
7- Overheads percentage = Overheads/ Total project cost
   =4,754,761/ 15,512,204 =% 30.65
8- Profit = Contractual Project Cost- Total project cost
   =17,902,219-15.512, 204=2,390,015SDG
9- Profit Percentage = Profit/ Project Cost
   =2,390,015/15,512,204
   =15.4%

B-General overheads:

The general overheads for the company head quarter is calculated for one year (expect the site overheads), this includes:

B-1 Administration overheads for one year:

The administration overheads for one year can be calculated as shown in **Table 5.22** below:

Table 5.22 Administration overheads for one year

Item	Specification	Cost SDG
1	Office (Rent, furnishing, Supplies, Maintenance, Utilities, cleaning)	950,370
2	Wages& Salaries	4,894,536
3	Publications and Subscriptions	50,479
4	Car and Truck Expenses	643,620
5	Travel expenses	125,350
6	Training	120,000
7	Running expense& Social Contributions	290,450
8	Others (Bank Fees, Dues and Memberships, Legal and Professional	208,306
Total		7,283,111

Source: prepared by the researcher, 2019

B-2 General overheads at the company head quarter for one year:

The general overheads for one year can be calculated as shown in **Tabl1 5.23** below:

Table 5.23 General overheads at the company head quarter for one year

Item	Specification	Cost SDG
1	Taxes	3,764,952
2	Zakat	1,180,611
3	Depreciation	439,982
4	Insurance	192,045
Total		5,577,590

Source: prepared by the researcher, 2019

B-General overheads-Summary Total:

The general overheads summary total can be calculated as shown in **Table 5.24** below:

Table 5.24 General overheads-Summary Total

Item	Specification	Cost SDG
1	Administration overheads	7,283,111
2	General overheads	5,577,590
Total		12,860,701

Source: prepared by the researcher, 2019

Number of projects executed in the year =6 projects

Share of the project cost from the general overheads =

Total of general overheads / NO. of projects executed in the year

=12,860,701 /6 = 2,143,450 SDG

C-site (project) overheads:

The site(project) overheads be calculated as shown in **Table 5.25** below:

Table5.25 Site (project) overheads

Item	Specification	Cost SDG
A	**Tendering Stage**	
1	Tender documents fees	20,000
2	Site Inspection & tender costing	7,500
3	Duty stamp	2,129
4	Bid Bond 2%	48,170
	Sub-Total	77,799
B	**Construction Stage**	
1	Mobilization	16,740
2	Performance Bond 10%	107,600

3	Advance payment guarantee 30%	300,000
4	Temporary works	75,000
5	Water	5,000
6	Electricity	12,300
7	Right of way & facilities	27,500
8	Safety, environment& health	3,000
9	Site planning & survey	6,000
10	Site office &Executing Staff: A-Office (Supplies, utilities, cleaning, running expense, others) B- Executive staff: (All wages and salaries, Car and Truck Expenses)	1,665,475
11	Projects Reports	5,000
12	Insurance	11,120
13	Government charges	1,000
14	Testing & Quality control	2,500
15	Works rejected	----
16	Materials Rejected & losses	-----
17	Accidents at site & strikes and labor dispute	12,903
18	Variations	-----
19	Payments delays	10,000
20	Increase in prices	20,000
21	Change of Laws	-----
22	Environmental and weather changes	------
23	Suspension of work	15,000
24	Depreciation	25,309
25	Liquidated Damages	------
26	Drawings	6,500
27	Delay of handing over	-----

28	Site clearance	5,065
29	Disputes	-------
30	Risks &Force major	-------
	Sub-Total	2,410,012
C	**Maintenance &Commissioning Stage**	
1	Maintenance & commissioning letter of Guarantee	70,000
2	Defects of liability	45,000
3	Demobilizations`	8,500
	Sub-Total	123,500
	Summary Total	
A	Tendering Stage	77,799
B	Construction Stage	2,410,012
C	Maintenance &Commissioning Stage	123,500
	Grand Total	2,611,311

Source: prepared by the researcher, 2019

D-Overheads-Summary Total:

The overheads summary total can be calculated as shown in **Table 5.26** below:

Table 5.26 Overheads-Summary Total

Item	**Specification**	**Cost SDG**
B	General overheads	2,143,311
C	Site(project) overheads	2,611,311
	Total	4,754,761

Source: prepared by the researcher, 2019

From the case study, we recognize the following:-

1- General overheads and administration overheads was calculated for one year for the company to cover the general overheads for all the projects executed during the year with a total amount of 12,860,701 SDG.

2- The average general overheads was taken equally for the projects 6 was found to be 2,143,450 SDG.

3-The total site overheads =2, 611, 311 SDG
4-The total overheads =4, 754,761SDG
5-The basic project cost =15,512,204 SDG.
6-hence the overheads percentage = Total overheads/ basic project price

=4,754,761/15,512,204

= 30.65 **%**

7-The project cost components ratios can be illustrated by the **Figure 5.10**

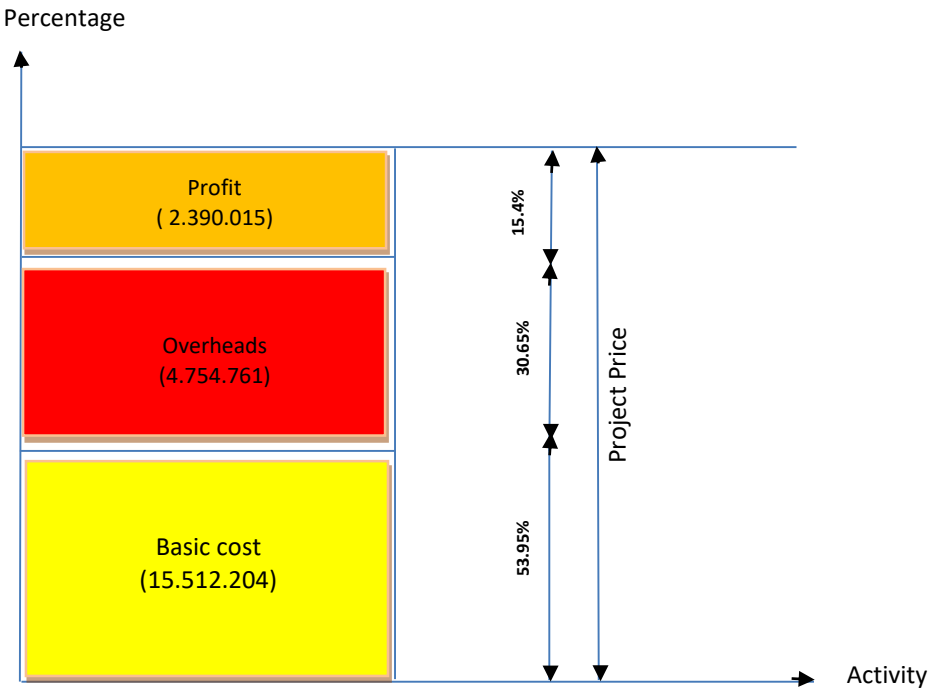

Figure 5.10 shows project cost components rations Source: prepared by the researcher, 2019

8-There are 9 items (at construction stage) not occurred and hence not calculated (at the case study) as shown in **Table 5.27**

Table 5.27 Overhead Items not calculated

NO	Description	ITEM NO
1	Works rejected	15
2	Materials rejected & losses	16
3	Variations	18
4	Change of laws	21
5	Environmental and whether changes	22
6	Liquidated damages	25
7	Delay of handing over	27
8	Disputes	29
9	Risk and force major	30

Source: prepared by the researcher, 2019

We conclude that the main hypothesis of the study, which stipulates: that the overheads percentage is not less than 35% is an acceptable hypothesis.

5.9 Case study components Analysis

A-Tender stage:

Table 5.28 Overheads at tendering stage

Item	Specification	Cost SDG	%
1	Tender documents fees	20,000	25.71%
2	Site Inspection & tender costing	7,500	9.64%
3	Duty stamp	2,129	2.74%
4	Bid Bond 2%	48,170	61.92%
	Sub-Total	77,799	100.00

Source: Prepared by the researcher, 2019

Freguency distribution:

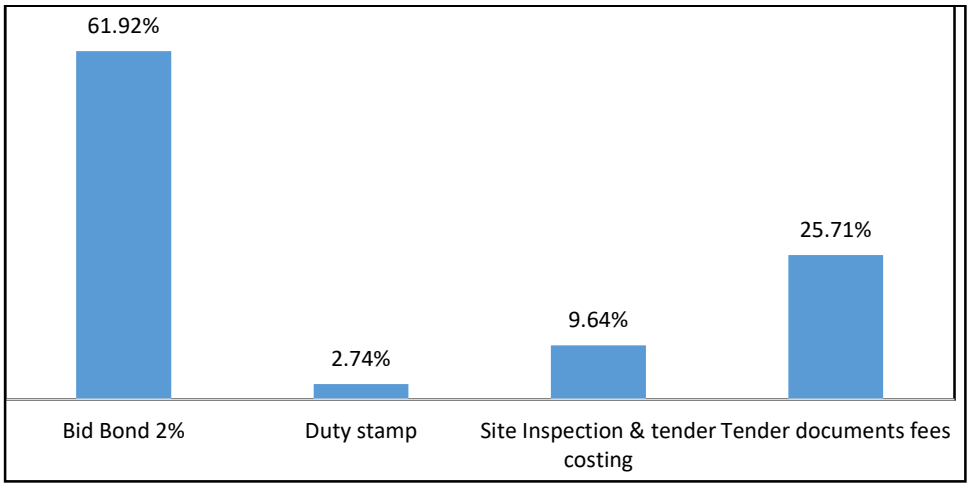

Figure 5.11 Overheads percentage at tendering stage

The result of frequency analysis **Figure 5.11** shows the bid bond guarantee(2%) represents (61.92%) ,which is the highest overhead percentag at tendering stage,of while the tender documents fees repesnts(25.71%) represents the second highest overheads percentage of the total cost of the study sample .

B-Construction stage:

1-Mobilization

Table 5.29 Mobilization cost

	Mobilization	**Cost SDG**	%
1	Mobilization	16,740	66.32%
2	Demobilizations`	8,500	33.68%
	Sub-Total	25,240	100.00%

Source: Prepared by the researcher, 2019

Frequency distribution:

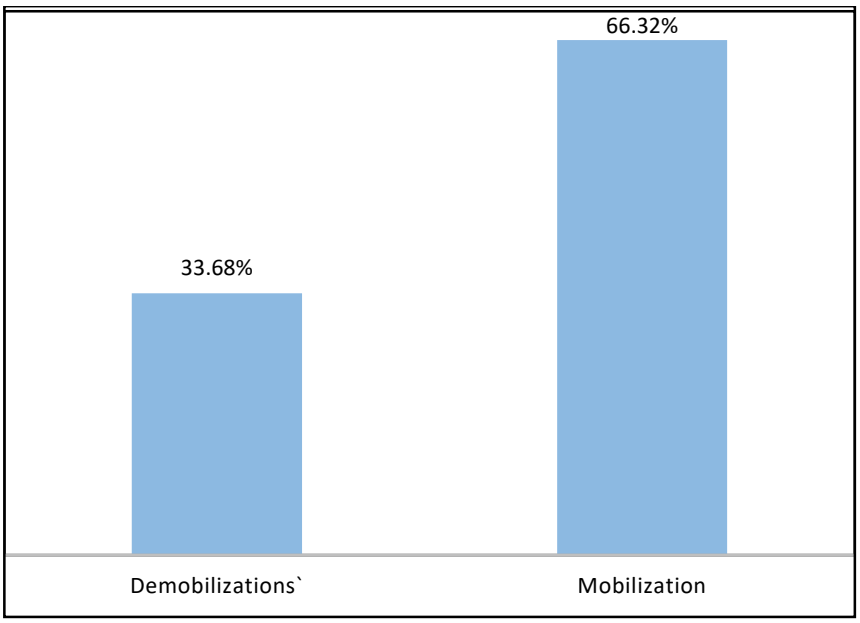

Figure 5.12 Mobilization components percentage

2-Bonds &Guarantees

Table 5.30 Bonds and guarantees cost

	Bonds &Guarantees	**Cost SDG**	%
1	Performance Bond 10%	107,600	22.53%
2	Advance payment guarantee 30%	300,000	62.81%
3	Maintenance & commissioning letter of Guarantee	70,000	14.66%
	Sub-Total	477,600	100.00%

Source: Prepared by the researcher, 2019

Frequency distribution

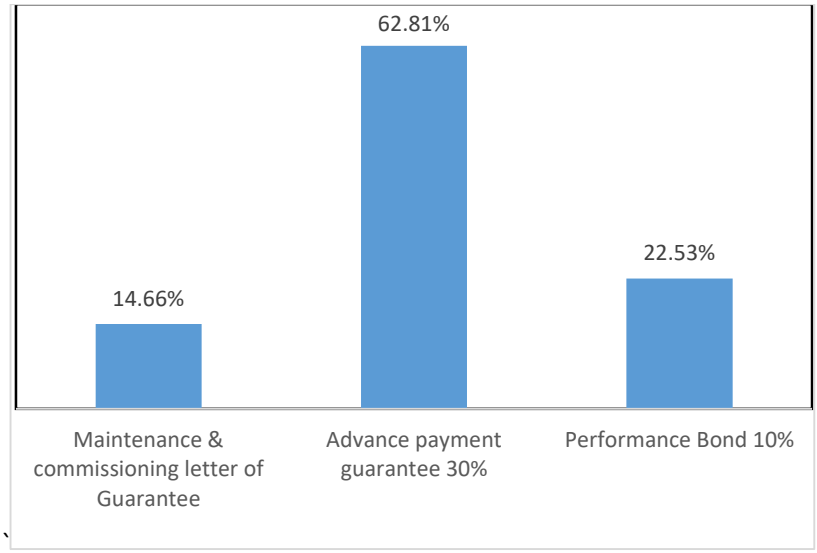

Figure 5.13 Bonds &Guarantees percentage

3-Temporary Services:

Table 5.31 Temporary services cost

	Temporary Services:	**Cost SDG**	%
1	Temporary works (fence ,offices)	75,000	55.03%
2	Water	5,000	3.67%
3	Electricity	12,300	9.02%
4	Right of way & facilities	27,500	20.18%
5	Safety, environment& health	3,000	2.20%
6	Site planning & survey	6,000	4.40%
7	Projects Reports	5,000	3.67%
8	Testing & Quality control	2,500	1.83%
	Sub-Total	136,300	100.00%

Source: Prepared by the researcher, 2019

Frequency distribution :

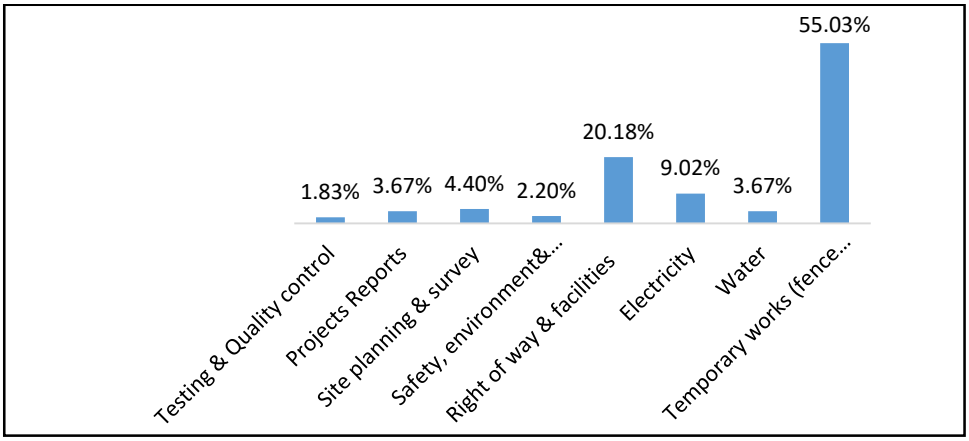

Figure 5.14 Temporary Services items percentage

4-Government Charges

Table 5.32 Government charges cost

	ernment Charges :	**Cost SDG**	%
1	Insurance	11,120	22.09%
2	Government charges	1,000	1.99%
3	Accidents at site & strikes and labor dispute	12,903	25.64%
4	Depreciation	25,309	50.28%
	Sub-Total	50,332	100.00%

Source: Prepared by the researcher, 2019

Frequency distribution:

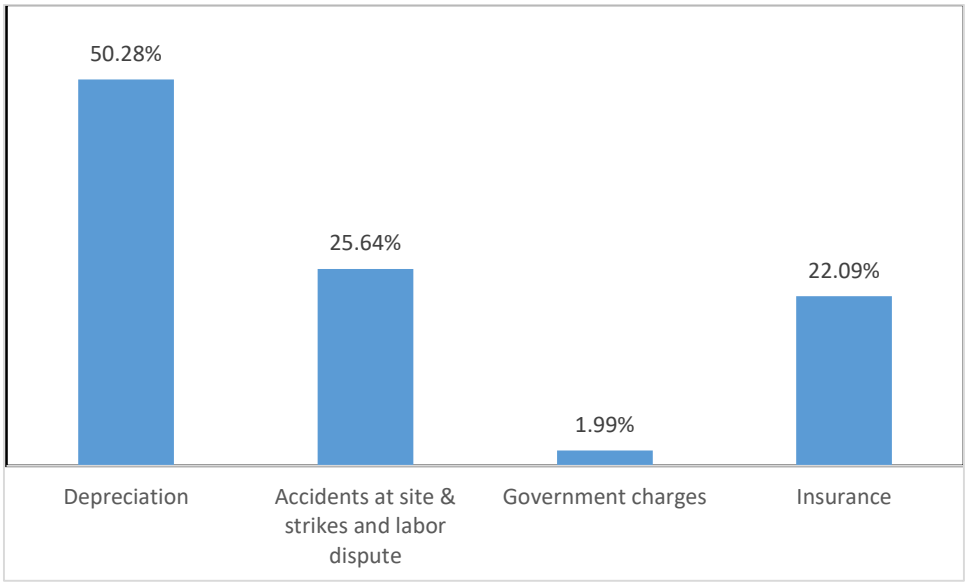

Figure5.15 Government Charges components percentage

5−Payments:

Table 5.33 payments items cost

	Payments:	**Cost SDG**	%
1	Suspension of work	15,000	12.30%
2	Increase in prices	65,000	53.28%
3	Works rejected	20,000	16.39%
4	Materials Rejected & losses	10,000	8.20%
5	Variations(quantities)	12,000	9.84%
	Sub-Total	122,000	100.00%

Source: Prepared by the researcher, 2019

Frequency distribution:

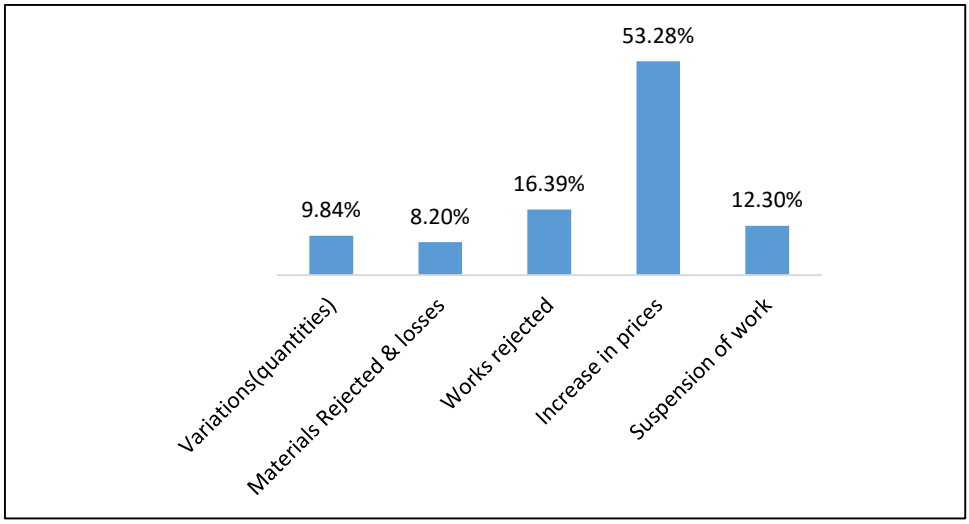

Figure 5.16 Payments items percentage

6-Handing Over:

Table 5.34 handing over items cost

	Handing Over:	**Cost SDG**	%
1	Drawings	6,500	11.49%
2	Site clearance	5,065	8.95%
3	Defects of liability	45,000	79.55%
	Sub-Total	56,565	100.00%

Source: Prepared by the researcher, 2019

Frequency distribution:

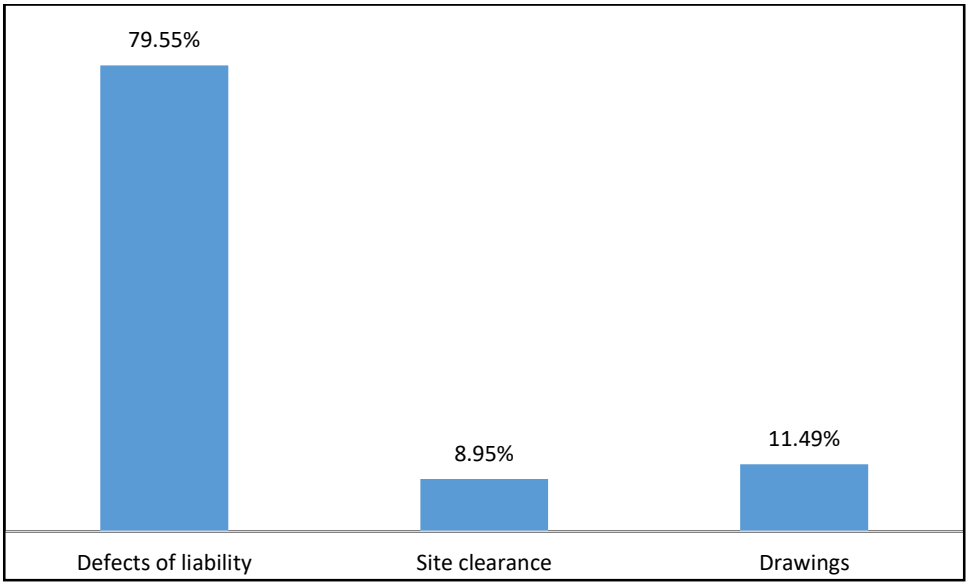

Figure 5.17 Handing over items percentage

7- Construction stage-overheads components comparison:

Table 5.35 overheads components cost

	Statement	**Cost SDG**	%
1	Mobilization	25,240	3%
2	Bonds &Guarantees	477,600	55%
3	Temporary Services	136,300	16%
4	Government Charges	50,332	6%
5	Payments	122,000	14%
6	Handing Over	56,565	7%
	Total	868,037	100%

Source: Prepared by the researcher, 2019

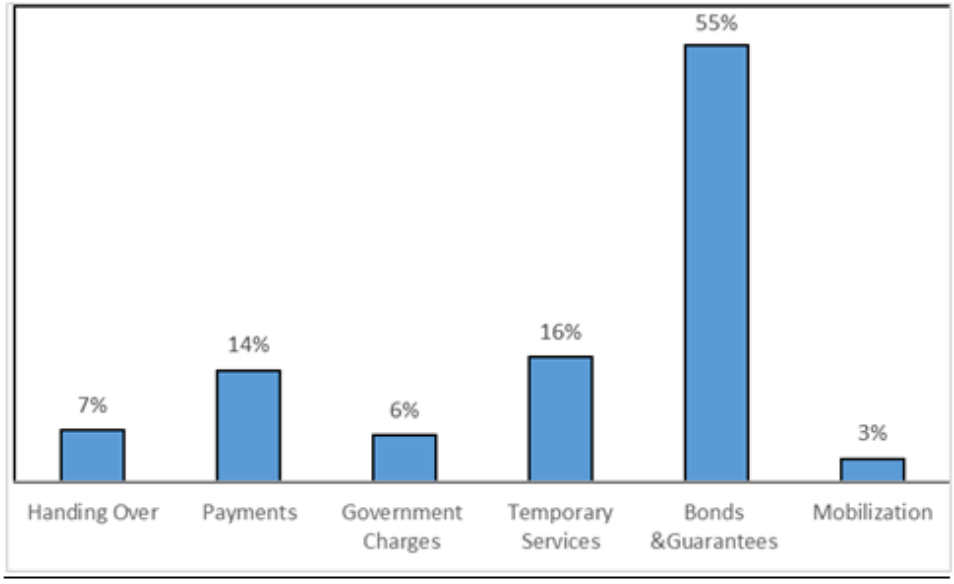

Figure 5.18 overheads components cost

From **Figure 5.18**, we can recognize the following:

1-Bonds and guarantees represent 55% which is the highest overheads percentage in construction stage provided that **Figure 5.13** shoows that the advance payment guarantee represents (%62.81), the performance bond guarantee represents(%22.53) and the ccommissioning and defects of liability guarantee represnts (%14.66) at the construction stage.of the total cost of the study sample .

2- Temporary services represent 16% which is the second highest percentage in construction stage, Figure **5. 14** shows that (fences & office) represents 55% of the all item.

3- Payments services represent 14%, **Figure 5.16** shows that the increase in prices represents (%53.28) while works rejected represents (16.39%) of the cost of the study samples.

4-Handing over represens 7% ,**Figure 5.17** shows that defects of liability cost represents (%79.55) of the total cost of Handing Over cost .

5-Government charges represens 6% , **Figure 5.15** shows that depreciation represents (%50.28) while accidents at sites & strikes and labor disputes represents (%25.64) of the total cost of the study samble

6-Mobilization represents 3% , **Figure 5.12** shows that the mobilization represents (%66.32) while demobilization represents (%33.68)

5.10 Overheads index comparison (Sudan with other countries):

Table 5.36 overheads index comparison

NO	Country	Overhead Index percentage	Remarks
1	Sudan	30.65 %	Site overheads and company overheads
2	Egypt	20 %	Site overheads only
3	Palestine-Gaza strip	11.5%	Site overheads and company overheads
4	India	15 %	Site overheads and company overheads
5	United States of America(USA)	25%	Site overheads and company overheads

Source: Prepared by the researcher, 2019

As per the previous case studies and according **Table 5.36** overheads index comparison, we can recognize the followings:

A-SUDAN:

1-Bonds and guarantees is the highest overheads percentage in construction stage.

2-Many items are not directly mentioned in Bill of quantities e.g. (mobilization, Temporary works, Safety, environment& health) and hence they are considered as overheads items and they subsequently increase the overheads percentage.

3-Delayed payments affect the overheads in two ways. First, it forces a contractor to look for external financial support which means additional overheads costs. Second, delayed payments means delays in the materials purchasing and hence more costs and more overheads.

4-The contractors are not classified under the certain building categories, so contractors of different grades compete in the same tender, hence great discrepancies was obviously seen because of different overheads costs.

B-Egypt:

1. The analysis of the collected data illustrated that project's duration, total contract value, projects type, special site preparation needs and project's location are identified as the top five factors that affect the value of the percentage of site overhead costs for building construction projects in Egypt.

2**.** Nature of the client, type of the contract and contractor joint venture are the lowest affecting factors in the percentage of site overhead costs for building construction projects in Egypt.

C-Palestine-Gaza strip

1- The staff wages was the highest overhead component, while the insurance and taxes fees were the second highest.

2-It is advisable that the concerned parties and those responsible at the taxation department minimize the payable taxes to motivate the contractors to minimize their overhead costs, which would then give them a great chance to absorb more labor and execute more projects.

3-The overhead costs were affected by several factors such as project complexity and location, supervision restrictions, contractors' cash availability, and others.

4-Separating between job site overhead and the general and administration overhead is considered one of the main important issues under the management and controlling process.

D- India

1- Delay in payment indirectly affects the overhead costs.

2-The project has to be completed on time without any delay, so the overhead costs can be controlled. If delay cannot be controlled then the overhead costs also cannot be controlled.

3-Unnecessary costs can be eliminated and the engineers those who are working on overhead costs should be aware while working out the cost.

4-The site overhead costs are mainly affected by the type and size of project.

4-United States of America (USA)

1-When the industry is in a lull, competition for the limited construction dollars increases. Many contractors attempt to maintain their same volume of work, but doing so may decrease profitability. One way to combat declining profits is to adjust general overhead costs (indirect expenses).

2-In the Great Recession the contractors controlling their cost by reducing their internal overhead expenses.

3-Office overhead had the fewest reductions while bonuses, contributions to retirement plans, and company functions had the highest reductions (about 23 percent of respondents reduced them by more than 75 percent).

4-That majority of firms reported cutting some level of overhead indicates that much of this cost may have been excess in the first place, but 25% of the overheads was important for executing each project and materialize it.

5.11 Summary

The researcher faced many difficulties particularly that most of respondent are so reluctant to give real help and there were few who contributed in the distribution and collection of the questionnaire and the case study but by more contacts and time, the researcher succeeded to overcome the difficulties and have enough data for the research.

Data analysis is presented in tables, figures, Pie charts.

Statistical analysis of the questionnaire for the different stages of the project shows that the hypotheses are acceptable.

A calculation for the case study gives good indication for the overhead percentage compatible with the hypothesis.

Comments and conclusions will be detailed in the next chapter.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

CHAPTER SIX
CONCLUSIONS AND RECOMMENDATIONS

6.1-Introduction

This chapter provides conclusions about the more effective factors affecting the overheads cost according to the questionnaire survey as well as the case study as per the hypotheses, which appeared statistically in this study according to the respondents' answers.

Furthermore, general recommendations suggest some solutions to get more reliable results.

Due to the importance of the issue (overheads cost) the researcher suggests more research should be conducted.

6.2-Contribution to knowledge

This research, as the researcher thought, contributes to the body of knowledge in different ways as described below:

- The result of the case study that shows the overhead percentage is 30.65% (although some items were not calculated), definitely this gives a real indication of the overhead percentage and hence the importance of the exact overheads percentage for the calculation of the accurate project cost.
- It ascertains that clear definition and classification of the overheads is the main approach of calculating the overhead index and hence the calculation of the accurate project cost.
- The classification of the overheads in details in light the contractors about many items affecting the construction cost and most of the contractors are not caring about, these overheads affect their construction cost causing a severe damage to their expecting profit and even their existence in the construction market.

- The contribution of this research is also to offer better understanding of the effect of the overheads to the contractors. It ascertains that one of the major components that affects ultimately the contracting sector to progress not only that but even assisting in the collapse of some contracting companies.
- The contributions are unique in the sense that neither the overheads has been classified and verified properly nor the overhead index has been calculate before .So more effort and participation from professional and researchers was needed in order to come out with the exact overhead index.

6.3 -General recommendation

Some recommendations are suggested by the author as follows:

A-Controlling the overheads cost is an important management concern .The contractor must examine all overhead costs thoroughly to determine which costs are identifiable to the jobs individually or the company as a whole.

B- Contractors are recommended to establish cost control plans to help reduce overheads costs. Such plans should contain cost objectives, implementation steps, monitoring, and corrective actions.

C-Construction companies should carefully examine the contract conditions overhead costs and perform all the necessary precautions to make sure that the project site overhead cost factors are properly anticipated and covered with in the total tender price.

D-Separating between job site overhead and the general and administration overhead is considered one of the main important issues under the management and controlling process.

E-It was highly recommended that the Organization Council for Engineering Works Contractors (OCEWC) should classify the contractors based on their capabilities in order to set them in different grades according to work category and contract maximum value, then a contractor of the same grade can bid for

the same project, and this will set a fair ground for competition and minimize the overheads and the discrepancies in tender prices.

F-To control and minimizes the overheads cost the following items should be included in the preliminary bill of quantities and priced by the contractor:

1- Mobilization.
2- Temporary works.
3- Water.
4- Electricity.
5- Right of way & facilities.
6- Safety, environment& health.
7- Site planning & survey.
8- Site office.
9- Insurance.
10- Defects of liability,

G-Variations: Variations occurred either because of inaccurate bills of quantities and specifications or because of variations in prices, for controlling and minimizing the variations we recommend the following:

- The consultant or the Engineer should do very much effort for preparing bills of quantities and detailed specification in order to secure any variations in quantities.
- Increasing the advance payment (it can be up to (70%) advance payment against a guarantee) in order to secure any increase in the prices and hence minimizing any extra overheads.

H- Payments: As far as the delay in payment results in increasing the overheads affects company overheads in different ways So it was recommended that the payment should be on time as scheduled per the signed contract.

I-Bonds and guarantees:

Bond and guarantees represent the highest overheads item in Sudan, because of the high cost of issuing these bonds (bank charges, evaluation and mortgages e.g.), for minimizing the charges of bonds and guarantees the researcher suggests the following:

1-Security bond (BID):

- Security (BID) guarantee should be issued by insurance companies.
- Furthermore this guarantee can be replaced just by a bank statement showing the contractor financial capability(e.g. Audited account for the last 3 years).

2- Performance bond and Advance payment guarantee:

- The performance bond remains the same but should be utilized in the advance payment guarantee.
- An advance payment of (20%) bond should be enough to secure the 30% advance payment i.e. 10% performance bond and 20% advance payment guarantee will be enough to submit 30% advance payment for the contractor (only definition for the performance bond is required to match this proposal) or otherwise in this stage the gap of the 10% guarantee will be replaced by a cheque from the contractor account.

3-Retention money:

- Replacing this guarantee by just a cheque from the contractor account to secure the required amount of money.
- Cancelling this bond since it has no significance.

4-D effects liability &Maintenance bond:

- Issuing this guarantee by insurance companies.
- Since a long relation was built between the employer and the contractor we recommend this guarantee will just be a cheque from the contractor account.

By adjusting bonds and guarantees as mentioned above can reduce the bonds and guarantees cost by 50%.

J-Companies should develop and test their overhead allocations periodically in order to maintain accuracy in their estimating process as well as increasing their knowledge and awareness about the overhead costs concept.

.6.4 - Recommendation for future studies

Overheads cost represents a considerable cost of any project, hence unless it is calculated precisely, the project cost will not be accurate. Thus the overheads are considered one of the main and most influencing elements of the cost estimates, the researcher proposes for subsequent studies to be carried focusing on construction costing with special attention to the overhead cost.

The researcher also suggests further studies to be made for calculating the overheads cost in Sudan and finding out the overhead percentage for calculating out the accurate project costs.

It is recommended that future researches addressing the overheads issue should be conducted focusing on case studies.

It was highly recommended to use factor analysis method to investigate the principal factors affecting project overheads and to generate the factors that might affect project overheads ranging from tendering stage to the final handing over stage.

Model design approach is also recommended for getting reliable results reaching acceptable overhead index.

Case studies would be appropriate to calculate the overhead percentage.

The researcher recommends further studies such as:

1. Overheads allocation in construction industry in Sudan.
2. Generation of Models calculating the overheads cost for building construction in Sudan.
3. Case study approach for finding overheads cost ratio in construction industry.
4. Indirect cost for projects-verification and calculation.

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Appendices

Appendix (A)

Questionnaire

Sudan University for Science &Technology

College of graduate studies

Contractor's Name:

Subject: **Questionnaire**

The researcher is doing this thesis for the purpose of the fulfillment of a Ph.D. in civil engineering –project management titled: overhead costs and its impact on construction cost.

The researcher intends to make use of your knowledge and experience in the engineering field and construction industry

We hope you will feed us with the information related to the overheads cost which means, in this research, all the cost incurred in the construction cost except for the cost of the materials, equipment's, labor and does not include the contractor profit margin, the researcher hopes to come out with an index for the overhead cost (overhead percentage).

For the importance of this research, we hope you give this study outmost care and attention in order to come out with reliable results that can be dependable on getting real overhead index for the construction costs.

The information introduced and given by your esteemed self will be highly confidential and will be used only for the purpose of this research and you have the right to get and use the results if you wish.

Best Regards,,,

The researcher

Eng. ElkhalwatiElsharifElnour

E-mail:Khalwatis@gmail.com

Tel. 0912305322April 2019-Khartoum

Axis One: General and personnel Information

Please fill in the spaces and put (√) in front of the proper choice:

1-registeration form:

A-Company ☐ B-Business Name ☐ C-Partnership ☐

2-Sector

A-Public Sector ☐ B-Private Sector ☐ C-Public/Private (mixed) ☐

3-Contractor years of experience in the construction field

A-1-3 years ☐ B-more than 3-6 years ☐ C-more than 6-9 years ☐

D-more than 9-12 years ☐ E-more than 12 years ☐

4- The contractor registered in Organization Council for Engineering Works Contractors (OCEWC)

Yes ☐ No ☐

5-The number of projects executed by the contractor in the year 2015-2018 and its classification according to the ownership:

Public sector owned ☐ Private sector owned ☐

Public/private sector owned ☐

6-Largest project executed by the contractor in the year 2015- 2018

From 1-5 million SDG ☐ more than 5-10 ☐

more than10-15 ☐ more than 15-20 ☐ more than 20 ☐

7-Type of contract referred to in question (6) above

A-measurement contract ☐ schedule of rates ☐

design & Build Turn key ☐

8-Documens attached with the contract referred to in question (6) above:

A-Detailed Drawings ☐ B- General and special specification ☐

C-Bills of Quantities ☐ D-General and special condition of contract ☐

9-Overhead percentage (out of contract cost) referred to in question (6) above

Less than 15% ☐ more than 15-20 % ☐ more than 20-25 % ☐

more than 25-30 more than 30% ☐

Axis 2: Tendering stage:

There are some factors affecting the overhead cost considered by the the contractor at the tendering stage from bidding until the bidding analysis and selection of the successful bidder and signing the contract

Please fill in an put (√) in front of the proper choice:

No	Question	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	Incomplete and in accuracy of detailed drawings affect the overhead cost of the project					
2	Overhead percentage increases because of nonexistence of the general and special specification					
3	Overhead percentage increases because of in accuracy in the bills of quantities					
4	Inappropriate choice of general and special conditions of a contract affects the overhead percentage for the project					
5	Nonexistence of many items(site planning, site offices, health and safety measures at site affects in the increase of the overheads					

6	Long time taken between call for bidding and bid analysis affects in the increasing the overheads cost					
7	Nonexistence of clear mechanism of bid analysis affects in increasing the overheads cost					
8	Inaccuracy in project cost estimate by the contractor affects in increasing the overheads cost					
9	Nonexistence of overhead index causes the variation of bid prices					
10	Overhead percentage increase because of unclear payment terms					
11	Overheads cost differs according to project type and the methods of its administration					
12	Good planning decreases the overheads cost					

Axis 3: Construction stage:

There are some factors affecting the overhead percentage during the construction stage, that the contractor put in consideration

Please fill in an put sign (√) in front of the proper choice:

No	Question	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	Overheads cost for the projects is affected according to the type of the contract signed					
2	Delay of site handing over causes increase in overhead cost					
3	Change of materials prices increases the overhead percentage					
4	Overhead percentage increases because of the instability of labor cost					
5	Overhead percentage increases because of the increase in government fees					
6	Overhead percentage increases because of the unpunctuality of payment by the employer					
7	Overhead percentage increases because of the lack of supervision by the consultant					

8	Overhead percentage increases because of the change in specifications					
9	Overhead percentage increases because of variation in quantities					
10	Overhead percentage increases because of the extension of time for project execution					
11	Choosing improper labor or inproper equipments affect the overhead percentage					
12	Negligence of insurance and safety measures causes increase in overhead percentage					
13	Ineffective communication between the project parties affect the overhead percentage					

Axis 4: After construction stage:

There are some factors affecting the overhead costs considered by the contractor after execution and handing over stage

Please fill in the spaces and put in the sign of (√)in front of the proper choice

No	Specification	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	Overhead percentage increases because of delay in the preliminary handing over					
2	Overhead percentage increases because of the cost of liability defects and commissioning guarantee					
3	Overhead percentage increases because of unclear of tax fees					
4	Overhead percentage increases because of the extension of time for project execution					
5	Your firm cares to document for the project overhead expenses and overheads costs after its execution					
6	There is no definite index for overhead cost percentage					
7	Absence of overhead index(percentage) is the main reason of the variation in bid prices					

8	Absence of the knowledge of the overhead percentage causes huge loses for the contracting companies and pushing some of them out of the construction market					

9-According to the experience of your firm, what are the three most important reasons leading to an increase in the overhead percentage:

A----------

B: ----------

C: ----------

Appendix (B)-Questionnaire Arabic

جامعة السودان للعلوم و التكنولوجيا

كلية الدراسات العليا

السيد المقاول/----------

السلام عليكم ورحمة الله وبركاته

الموضوع : إستبيان

يقوم الباحث بإعداد دراسة بغرض الحصول على الدكتوراة فى الهندسة المدنية –إدارة المشروعات تحت عنوان (المنصرفات وأثرها على شركات المقاولات بالسودان).

لقد رأينا أن نستفيد من خبرتكم وتجاربكم فى مجال العمل الهندسى وصناعة التشييد وعليه نرجو كريم تفضلكم بمدنا بمعلومات منصرفات التشييد و التى تعنى فى هذا البحث كل المنصرفات الداخلة فى تكلفة التشيد عدا تكلفة المواد والمعدات و العمالة كما لاتشمل أرباح المقاول ـــ آملين الوصول إلى نتائج وتوصيات بتحديد المعامل الحقيقى (النسبة المئوية المرجعية) للمنصرفات

نسبة لأهمية الدراسة نتمنى أن تنال الإستمارة وملئها عناية خاصة وذلك حتى نتمكن من الوصول إلى نتائج ذات مصداقية يمكن الإعتماد عليها فى الوصول إلى نتائج وتوصيات تعين فى إيجاد المعامل الحقيقى لمنصرفات التشييد

نعرفكم بأن البيانات المقدمة من قبلكم يتم التعامل معها بكل سرية ولاتستخدم إلا لأغراض هذه الدراسة ويمكنكم الحصول على نتائجها حسب رغبتكم

مع فائق شكرنا وتقديرنا

الباحث

م .م . الخلوتى الشريف النور الزاكى

تلفون : 0912305322

بريد إلكترونى

Khalwatis@gmail.com:

الخرطوم : أبريل 2019

المحور الأول: البيانات الشخصية و العامة

الرجاء ملء الأماكن الشاغرة ووضع علامة (√) أمام الخيار المناسب:

1- الصفة الإعتبارية المسجلة :

أ/شركة ☐ **ب/** إسم عمل ☐ **ج/** شراكة ☐

2- القطاع:

أ/ قطاع عام ☐ ب/ قطاع خاص ☐ ج/ عام/ خاص ☐

3- عدد سنوات خبرة المقاول فى مجال البناء و التشييد:

من 1-3 سنوات ☐ كثرمن 3-6 سنوات ☐ أكثر من 6-9 سنوات ☐

أكثر من 9-12 سنة ☐ أكثر من 12 سنة ☐

4- المقاول مسجل لدى مجلس تنظيم مقاولي الأعمال الهندسية ؟ نعم ☐ لا ☐

5- المشروعات التي نفذها المقاول (بالعدد) في الفترة :2016-2018 وتصنيفها حسب الجهات المملوكة لها كالآتي:

مملوكة للقطاع العام ☐ مملوكة للقطاع الخاص ☐ أخرى ☐

6- أكبر مشروع نفذه المقاول فى العام 2018 :

من 1- 5 مليون جنيه ☐ أكثر من 5- 10 ☐ كثر من 10- 15 ☐

أكثر من 15- 20 ☐ أكثر 20 مليون جنيه ☐

7- نوع العقد للمشروع المشار إليه فى (6) هو

عقد مقايسة ☐ عقد سعر الوحدة ☐ عقد تصميم وبناء ☐ عقد تسليم مفتاح ☐

8- المستندات المرفقة مع العقد المشار إليه فى (6) أعلاه تشمل :

أ/ الخرط التفصيلية ☐ ب/ المواصفات العامة و الخاصة ☐ ج/ جداول الكميات ☐

د/ الشروط العامة و الخاصة

9- نسبة منصرفات المشروع (من سعر العقد) المشار إليه فى(6) أعلاه =

أقل من 15% ☐ أكثر من (15-20) % ☐ أكثر من(20-25)% ☐

أكثر من (25-30)% ☐ أكثر من 30% ☐

المحور الثانى: فترة العطاء:

هنالك عناصر وأسباب توثر فى نسبة المنصرفات ويهتم المقاول بدراستها ووضعها فى الإعتبار من مرحلة التقديم للعطاء حتى مرحلة فرز العطاء وترسيته وتوقيع العقد مع المقاول الفائز

الرجاء ملءالأماكن الشاغرة ووضع علامة (√) أمام الخيار المناسب:

الرقم	البيان	موافق بشدة	موافق	محايد	غير موافق	غير موافق بشدة
.1	عدم جاهزية ودقة الخرط التفصيلية تؤثر على منصرفات المشروع					
.2	تزيد نسبة المنصرفات بسبب عدم وجود المواصفات العامة و الخاصة					
.3	تزيد نسبة المنصرفات بسبب عدم دقة جداول الكميات					
.4	يؤثرعدم الإختيار الجيد للشروط العامة و الخاصة يؤثر على نسبة منصرفات المشروع					
.5	يوثرعدم وجود كثير من البنود بجداول الكميات (تخطيط الموقع ,مكاتب بالموقع , الصحة ,الأمن والسلامة بالموقع) فى زيادة منصرفات المشروع					
.6	يؤثرطول الفترة بين إعلان العطاء وفرزة فى زيادة المنصرفات					
.7	تتسبب عدم وضوح ألية فرز العطاء فى زيادة منصرفات المشروع					
.8	تزيد نسبة المنصرفات بسبب عدم دقة حساب و التكلفة التقديرية بواسطة المقاول					

.9	عدم وجود مرجعية للمنصرفات يؤدي إلى المفارقة و التباين فى أسعار العطاءات					
.10	تزيد نسبة المنصرفات بسبب عدم وضوح طريقة الدفعيات					
.11	منصرفات المشروعات تختلف حسب نوع المشروع وإدارته					
.12	التخطيط الجيد للمشروع يقلل من نسبة المنصرفات عليه					

المحور الثالث: فترة التنفيذ:

هنالك عناصر وأسباب توثر فى هذه المرحلة في نسبة المنصرفات (أثناء تنفيذ المشروع) ويهتم المقاول بدراستها ووضعها فى الإعتبار

الرجاء ملءالأماكن الشاغرة ووضع علامة (√) أمام الخيار المناسب :

الرقم	البيان	موافق بشدة	موافق	محايد	غير موافق	غير موافق بشدة
.1	تتأثر نسبة المنصرفات على المشروع وفقاً لنوع العقد المبرم					
.2	يسبب التأخيرفى تسليم الموقع فى زيادة المنصرفات					
.3	عدم ثبات أسعار المواد يسبب زيادة المنصرفات					
.4	تزيد نسبة المنصرفات بسبب عدم ثبات أسعار العمالة(المصنعيات)					
.5	تزيد نسبة المنصرفات بسبب زيادة الرسوم المقررة بواسطة الدولة					
.6	تزيد نسبة المنصرفات بسبب عدم الإنضابط فى دفع الصرفيات بواسطة المالك					
.7	تزيد نسبة المنصرفات بسبب عدم إنضباط الإستشارى فى الإشراف					
.8	تزيد نسبة المنصرفات بسبب التغير فى المواصفات وأوامر التغيير الأخرى					
.9	تزيد نسبة المنصرفات بسبب التغير فى الكميات					

.10	تزيد نسبة المنصرفات بسبب زيادة وإمتداد فترة التنفيذ					
.11	إستخدام عمالة غير مؤهلة أو آليات غير مناسبة يؤثر على المنصرفات في المشروع					
.12	الإهمال في نظم التأمين والسلامة بالمشروع تعمل على زيادة المنصرفات					
.13	عدم فاعلية الإتصال والتواصل بين أطراف المشروع تؤثر على منصرفات المشروع					
.14	إخلال أي من أطراف المشروع بإلتزاماته يؤثر على المنصرفات في المشروع					

المحور الرابع: بعد التنفيذ:

هنالك عناصر وأسباب مختلفة توثر فى المنصرفات ويهتم المقاول بدراستها ووضعها فى الإعتبار عند الإنتهاء من المشروع وتسليمه إبتدائياً

الرجاء ملء الأماكن الشاغرة ووضع علامة (√) أمام الخيار المناسب

الرقم	البيان	موافق بشدة	موافق	محايد	غير موافق	غير موافق بشدة
.1	تزيد نسبة المنصرفات بسبب تأخير فترة الإستلام الإبتدائى					
.2	تزيد نسبة المنصرفات بسبب تكلفة ضمانات الصيانة وإصلاح العيوب					
.3	تزيد نسبة المنصرفات بسبب عدم تحديد قيمة واضحة للضرائب					
.4	تزيد نسبة المنصرفات بسبب عدم التنفيذ فى الفترة المحددة					
.5	تهتم مؤسستك بتوثيق حسابات للمشروع وحساب المنصرفات بعد التنفيذ					
.6	لايوجود معامل محدد للمنصرفات					
.7	عدم وجود عامل محدد (نسبة) تمثل المصروفات هو السبب الرئيسى فى التبيان فى أسعار العطاءات					
.8	يتسبب عدم معرفة المنصرفات في إحداث خسائر كبيرة للشركات مما يجعل بعضها يخرج من سوق العمل					

9. حسب خبرة مؤسستكم أذكر أهم 3 أسباب لزيادة نسبة المنصرفات :

أ. .....

ب. .....

ج. .....

Appendix (C)

RESPONDENT CONTRACTORS

الرقم	الإســـــــم
.1	شركة الأشقاء الهندسية المتقدمة
.2	شركة البدوي للهندسة والمقاولات
.3	شركة البشاري للهندسة والمقاولات
.4	شركة الديوان للإنشاءات والمقاولات المحدودة
.5	شركة الرضينا للإنشاءات المحدودة
.6	شركة الفيصل التجارية المحدودة
.7	شركة الفيضان للصناعة والتنمية
.8	شركة الكن المحدودة
.9	شركة المأوى للإستثمار
.10	شركة المرفأ العقارية
.11	شركة المركز الكويتي للأعمال المتقدمة المحدودة
.12	شركة النور إدريس للأنشطة المتعددة
.13	شركة إكسلانس
.14	شركة إيف
.15	شركة أرقودي للإستثمار
.16	شركة دريدة وأخوانه للأنشطة المتعددة المحدودة
.17	شركة رابح النور للهندسة والمقاولات
.18	شركة رابح النور للهندسة والمقاولات
.19	شركة ريليانش للمشاريع
.20	شركة شماز الهندسية
.21	شركة صادق العالمية
.22	شركة عبد المتعال حمدتو
.23	شركة عطا رسكو للمقاولات
.24	شركة عكاشة محمد سيد للمقاولات

.25	شركة فال
.26	شركة فوهونج للطرق والجسور والإنشاءات
.27	شركة قولدن بركس
.28	شركة مازنكو جي المحدودة
.29	شركة مونتاج التجارية
.30	شركة يونامكس
.31	اتوفيتف الهندسية
.32	الإسماعيلية للهندسة والمقاولات
.33	الدار الإستشارية الخرطوم
.34	الدرم محمد سليمان
.35	الريح عثمان للمقاولات
.36	الشريف الصديق
.37	الكنوز الهندسية
.38	المواهب للمقاولات
.39	أبو فروع للإسكان والتعمير
.40	أعمال الدفعة
.41	أعمال الزاكيات للهندسة الفنية
.42	أعمال الشايب عباس لتقنية الهندسة المدنية
.43	أعمال الشريف يعقوب للمقاولات
.44	أعمال الصاقرابي الهندسية
.45	أعمال الطيب مختار للمقاولات
.46	أعمال المرونة للهندسة التقنية
.47	أعمال المعز التجاني للمقاولات
.48	أعمال الهادي معلا للمقاولات
.49	أعمال الهواري للمقاولات
.50	أعمال إبراهيم أبوبكر للمقاولات
.51	أعمال أبوعبيدة للمقاولات

.52	أعمال أحمد أحمد كباشي الهندسية
.53	أعمال أحمد بابا للمقاولات
.54	أعمال أحمد محمد سيد للمقاولات
.55	أعمال آدم إدريس حسن
.56	أعمال آدم إدريس للمقاولات
.57	أعمال بتو الهندسية
.58	أعمال بتو للمقاولات
.59	أعمال برطسية للمقاولات
.60	أعمال برير محمد احمد للمقاولات
.61	أعمال بلال أبو النور للمقاولات
.62	أعمال جارا للمقاولات
.63	أعمال جبل حريز للخدمات الهندسية
.64	أعمال حمزة علي الطيب
.65	أعمال خالد محمد عبد الله للمقاولات
.66	أعمال خير الله مصطفى
.67	أعمال دفع الله محمد الهندسية
.68	أعمال سعد الأمين الهندسية
.69	أعمال سعد حسن عكاشة للمقاولات
.70	أعمال سليمان صالح للمقاولات
.71	أعمال صبري الهندسية التقنية
.72	أعمال صلاح محمد الهندسية
.73	أعمال عباس أحمد الزبير
.74	أعمال عبد الله الهدي للمقاولات
.75	أعمال عبد الله يورو للمقاولات
.76	أعمال عبد الوهاب للمقاولات
.77	أعمال عبد الناصر الفاضل عبد الله للهندسة التقنية
.78	أعمال عجين الهندسية التقنية

.79	أعمال عمر عبد الله حسن الهندسية
.80	أعمال عمرو محمد الامين للمقاولات
.81	أعمال فتحي سعيد أحمد للمقاولات
.82	أعمال فريند الهندسية
.83	أعمال قل فورد للهندسة والمقاولات
.84	أعمال ماهل آدم إبراهيم للمقاولات
.85	أعمال مبارك محمد أحمد عز الدين
.86	أعمال مبارك محمد للمقاولات
.87	أعمال مجاهد إبراهيم للهندسة التقنية
.88	أعمال محمد آدم إدريس للمقاولات
.89	أعمال محمد يوسف أحمد للمقاولات
.90	أعمال مصطفى أحمد محمد للمقاولات
.91	أعمال منتصر صالح للمقاولات
.92	أعمال مها عوض للهندسة والمقاولات
.93	أعمال موسى عبد الوهاب
.94	أعمال ميسا الهندسية
.95	أعمال نصر الدين محمد الصديق للمقاولات
.96	أعمال هيثم عباس
.97	أعمال وادي حامية للمقاولات
.98	آدم صيام الهندسية
.99	برق البناء للمقاولات
.100	بيفورمبيا للمقاولات
.101	بيق تيك الهندسية
.102	تارقت للمشروعات المتطورة
.103	جكو للمقاولات
.104	جولدن هاوس
.105	حاجكو للحلول المتكاملة

.106	حذيفة عباد للهندسة التقنية
.107	خالد محمد يلوج محمد
.108	د. مالك علي محمد دنقلا للانشاءات والمقاولات
.109	دائرة الأعمال المعدنية والمعمارية
.110	ديار الهندسية
.111	ريبايدة للمقاولات والانشاءات
.112	سارمز الهندسية
.113	سليمان سواسية للمقاولات
.114	سيد أحمد للمقاولات
.115	شاين هاوس للمقاولات
.116	شرفي للانشاءات والمقاولات
.117	عبد الرحمن عبد الرحيم العليابي
.118	علي حافظ للمقاولات
.119	عوض خليل للمقاولات
.120	فامكو للمقاولات
.121	قلفورد للهندسة والمقاولات
.122	قمبيل الهندسية المحدودة
.123	كلاب للمقاولات
.124	مالك دنقلا
.125	مجاهد فتح الرحمن للمقاولات
.126	محمد أحمد سعيد
.127	محمد كمال عمر
.128	منافذ للمقاولات
.129	منقد الهندسية
.130	نواهض الهندسية
.131	هنوا الهندسية
.132	هيدا لحفريات المياه

.133	واي تو آر للمقاولات
.134	يوسف رحمة للهندسة التقنية
.135	A.Z.O.U.Z. ENGINEERING
.136	GHللمقاولات
.137	QAPالهندسية

Appendix (D)

Case Study

Sudan University for Science &Technology

College of graduate studies

Contractor's Name:

Subject: Case Study

The researcher is doing this thesis for the purpose of the fulfillment of a Ph.D. in civil engineering –project management titled: overheads cost and their impact on construction cost.

The researcher intends to make use of your knowledge and experience in the field of engineering and construction industry

We hope you will provide us with the information related to the overheads cost which means, in this research, all the cost incurred in the construction cost except for the cost of materials, equipment's, labor and does not include the contractor's profit margin .The researcher intends to come out with an index for the overhead cost (overhead percentage).

Due to the importance of this research, we hope you pay this study your outmost attention in order to come out with reliable results for getting real overhead index for the construction costs.

The information introduced and given by you will be highly confidential and will be used for the purpose of this research only and you have the right to get and use the results if you wish.

Best Regards,,,

The researcher,,,

Eng. Elkhalwati Elsharif Elnour

E-mail:Khalwatis@gmail.com

Tel.0912305322April 2019-Khartoum

Case Study

Basic General Information

The case study for calculating the actual overhead cost according to the items, details in the given forms or any other related overheads you see(its importance) , for the purpose of this research the term(project) will mean the project in the year 2018 from the project pricing stage up to the executing and initial handing over stage ,this can be summarized as follows:

1-Proje

ct Name:

2-Project Location:

3-Method of project acquisition (tender, direct assignment)

4- Overheads (General overheads site overheads)

5-Total project cost (Basic project cost+overheads)

6-Contractual Project Cost (Total project cost Profit margin)

7- Overheads percentage = Overheads/ Total project cost

8-Profit = Contractual Project Cost- Total project cost

9- Profit Percentage = Profit/ Contractual Project Cost

1-Generl overheads:

The general overheads for the company head quarter will be calculated for one year (expect the site overheads), this includes:

1-1 Administration overheads for one year:

Item	Specification	Cost SDG
1	Office (Rent, furnishing, Supplies, Maintenance, Utilities, cleaning)	
2	Wages& Salaries	
3	Publications and Subscriptions	
4	Car and Truck Expenses	
5	Travel expenses	
6	Training	
7	Running expense& Social Contributions	
8	Others (Bank Fees, Dues and Memberships, Legal and Professional	
	Sub-Total	

1-2 General overheads at the company head quarter for one year:

Item	Specification	Cost SDG
1	Taxes	
2	Zakat	
3	Depreciation	
4	Insurance	
	Sub-Total	

General overheads-Summary Total

Item	Specification	Cost SDG
1	Administration overheads	
2	General overheads	
	Sub-Total	

- Share of the project cost from the general overheads:
- Total of general overheads per/ NO. of projects executed in the year =

2-site (project) overheads:

Item	Specification	Cost SDG
A	Tendering Stage	
1	Tender documents fees	
2	Site Inspection & tender costing	
3	Duty stamp	
4	Bid Bond 2%	
	Sub-Total	
B	**Construction Stage**	
1	Mobilization	
2	Performance Bond 10%	
3	Advance payment guarantee 30%	
4	Temporary works	
5	Water	
6	Electricity	
7	Right of way & facilities	
8	Safety, environment& health	
9	Site planning & survey	
10	Site office &Executing Staff: A-Office (Supplies, utilities, cleaning, running expense, others) B- Executive staff: (All wages and salaries, Car and Truck Expenses)	
11	Projects Reports	
12	Insurance	
13	Government charges	
14	Testing & Quality control	

15	Works rejected	
16	Materials Rejected & losses	
17	Accidents at site & strikes and labor dispute	
18	Variations	
19	Payments delays	
20	Increase in prices	
21	Change of Laws	
22	Environmental and weather changes	
23	Suspension of work	
24	Depreciation	
25	Liquidated Damages	
26	Drawings	
27	Delay of handing over	
28	Site clearance	
29	Disputes	
30	Risks&Force major	
	Sub-Total	
C	Maintenance&Commissioning Stage	
1	Maintenance & commissioning letter of Guarantee	
2	Defects of liability	
3	Demobilizations`	
	Sub-Total	
A	Tendering Stage	
B	Construction Stage	
C	Maintenance&Commissioning Stage	
	Sub- Total	

Total Overheads-Summary Total

Item	Specification	Cost SDG
1	General overheads	
2	Site(project) overheads	
	Grand total	

Overhead Percentage = Total overheads cost/Project Basic cost =

Appendix (E)

CASE STUDY-ARABIC

جامعة السودان للعلوم والتكنولوجيا

كلية الدراسات العليا

السيد المقاول/ .....

السلام عليكم ورحمة الله وبركاته

المضوع: دراسة حالة

يقوم الباحث بإعداد دراسة بغرض الحصول على الدكتوراة في الهندسة المدنية – إدارة المشروعات تحت عنوان (المنصرفات وأثرها على شركات المقاولات بالسودان).

لقد رأينا أن نستفيد من خبرتكم وتجاربكم في مجال العمل الهندسي وصناعة التشييد وعليه نرجو كريم تفضلكم بمدنا بمعلومات منصرفات التشييد والتي تعني في هذا البحث كل المنصرفات الداخلة في تكلفة التشييد عدا تكلفة المواد والمعدات والعمالة كما لا تشمل أرباح المقاول – آملين الوصول إلى نتائج وتوصيات بتحديد المعامل الحقيقي (النسبة المئوية المرجعية) للمنصرفات.

نسبة لأهمية الدراسة نتمنى أن تنال الإستمارة وملئها عناية خاصة وذلك حتى نتمكن من الوصول إلى نتائج ذات مصداقية يمكن الإعتماد عليها في الوصول إلى نتائج وتوصيات تعين في إيجاد المعامل الحقيقي لمنصرفات التشييد.

نعرفكم بأن البيانات المقدمة من قبلكم يتم التعامل معها بكل سرية ولا تستخدم إلا لأغراض هذه الدراسة ويمكنكم الحصول على نتائجها حسب رغبتكم.

مع فائق شكرنا وتقديرنا،،،

الباحث

م.م. الخلوتي الشريف النور الزاكي

تلفون: 0912305322

بريد إلكتروني:

khalwatis@gmail.com

الخرطوم: أبريل 2019م

دراسة حالة

المعلومات العامة الأساسية

دراسة الحالة لحساب المنصرفات الحقيقية وفقاً للبنود الواردة في الكراسة أو أي بنود أخرى تراها لمشروع قمتم به ويعرف هذا المشروع ولأغراض الدراسة (المشروع) في العام (2018م) وذلك من بداية تسعير المشروع حتى مرحلة تنفيذه وتسليمه إبتدائياً... مع تلخيص ذلك كالآتي:

1. إسم المشروع: .....
2. موقع المشروع: .....
3. كيفية الحصول على المشروع (عطاء ، تكليف مباشر) .....
4. جملة المنصرفات (المنصرفات العامة + منصرفات المشروع) = ...
5. التكلفة الكلية للمشروع (التكلفة الأساسية + المنصرفات) = ...
6. التكلفة التعاقدية للمشروع (التكلفة الكلية للمشروع + الأرباح) = ...
7. نسبة المنصرفات = $\frac{\text{جملة المنصرفات}}{\text{التكلفة الكلية للمشروع}}$
8. جملة الأرباح = التكلفة التعاقدية – التكلفة الكلية
9. نسبة الأرباح = $\frac{\text{جملة الأرباح}}{\text{التكلفة الكلية}}$ = ...

1/ المنصرفات العامة:

يتم حساب مجموعة تكلفة المنصرفات الخاصة بإدارة الشركة لكل المشروعات لفترة عام (عدا منصرفات المشروع) ويشمل ذلك:

1-1/ المنصرفات الإدارية لفترة عام:

البند	البيان	الجلمة ج.س
.1	المكتب لإدارة الشركة (الإيجار ، التأسيس ، الأجهزة والمعدات ، الصيانة ، النظافة) الخدمات (ماء ، كهرباء ، تلفونات) التشغيل (ورق ، أحبار ، ...إلخ)	
.2	المرتبات والأجور (مرتبات وحوافز العاملين ، حوافز مجلس الإدارة ، الإجازات وحقوق العاملين ما بعد الخدمة)	
.3	المطبوعات (مطبوعات تعريفية ، مجلات دورية ، ...إلخ)	
.4	الترحيل والنقل (شراء عربات ، إيجار عربات ، التشغيل والوقود ، الصيانة)	
.5	السفر (السفر والمشاركة الخارجية)	
.6	التدريب (كورسات ، ورش عمل وسمنارات ، ...إلخ)	
.7	التسيير	
.8	أخرى (رسوم بنك ، إستشارات قانونية وفنية ، الإشتراك في عضوية مؤسسات ذات صلة)	
	الجملـــــة	

1-2/ المنصرفات العامة بإدارة الشركة لفترة عام:

البند	البيان	الجلمة ج.س
.1	الضرائب (الدخل الشخصي ، القيمة المضافة ، الرأسمالية)	
.2	الزكاة	
.3	الإهلاك (عربات ، معدات ، مكاتب وأجهزة)	
.4	التأمين (عربات ، معدات ، مكاتب ، أخرى)	
	الجملـــــة	

ملخص جملة المنصرفات العامة

البند	الوصف	الجملة ج.س
.1	المنصرفات الإدارية	
.2	المنصرفات العامة	
.3	أخرى	
	الجملـــــة	

- تكلفة ونصيب منصرفات المشروع من المنصرفات العامة =
- جملة المنصرفات العامة للعام ÷ عدد المشروعات المنفذة للعام =

2/ منصرفات المشروع:

البند	الوصف	الجملة ج.س
أ/	**مرحلة التقديم للعطاء:**	
.1	رسوم التقديم للعطاء	
.2	تكلفة إستطلاع الموقع وتسعير العطاء	
.3	الدمغة القانونية	
.4	الضمان الإبتدائي (2% قيمة العطاء)	
	الجملـــــــة	
ب/	**مرحلة التنفيذ:**	
.1	ترحيل المعدات والآليات Mobilization	
.2	ضمان حسن التنفيذ (10%)	
.3	ضمان المقدم (30%)	
.4	الأعمال المؤقتة (معسكر التنفيذ ، المكاتب ، الأسوار ، ...إلخ)	
.5	الماء بالموقع (التوصيلات الأولية ، دفع الفاتورة لفترة عام)	
.6	الكهرباء بالموقع (التوصيلات الأولية ، دفع الفاتورة لفترة عام)	
.7	التحويلات وتجهيز الطرق المؤدية للموقع	
.8	الأمن ، السلامة والبيئة (الحرس والتأمين ، المعدات ، الصحة والسلامة ، البيئة)	
.9	تخطيط الموقع وتثبيت الابعاد وأعمال المساحة	

.10	التنفيذ (تجهيز المكتب والتسيير المطلوب + المرتبات والأجور ، الترحيل ، ...إلخ)	
.11	التقارير (تقارير الأداء ، الصرفيات ، المكاتبات)	
.12	التأمين (عربات ، مكاتب ، معدات ، مواد)	
.13	منصرفات حكومية (رسوم ولائية ، نقابات ، أخرى)	
.14	الإختبارات والجودة	
.15	مواد مرفوضة (مواد تم رفضها ، سرقات ومواد مفقودة)	
.16	أعمال مرفوضة	
.17	تغيرات (المواصفات ، الكميات ، ...إلخ)	
.18	إصابات وحوادث بالموقع	
.19	تأخير الصرفيات	
.20	زيادة الأسعار (مواد ، مصنعية ، الضرائب ، رسوم حكومية ، ...إلخ)	
.21	تغير القوانين والتشريعات	
.22	التغير في الظروف الطبيعية والمناخية	
.23	توقيف العمل	
.24	الإهلاك (عربات ، معدات ، ...إلخ)	
.25	غرامة التغير (التعويض الإتفاقي)	
.26	الرسومات (رسومات الموقع ، أدلة التشغيل)	
.27	تأخير الإستلام الإبتدائي	
.28	نظافة الموقع	
.29	النزاع والتحكم	
.30	المخاطر والقوة القاهرة	
الجملـــــــــــة		
ج/	**فترة الصيانة وإصلاح العيوب:**	
.1	ضمان فترة الصيانة وإصلاح العيوب	
.2	تكلفة الصيانة لفترة التشغيل وإصلاح العيوب	
.3	إخلاء الموقع بعد إكمال الأعمال Demobilizations	
الجمـــــــلة		

أ. مرحلة التقديم للعطاء	
ب. مرحلة التنفيذ	
ج. فترة الصيانة وإصلاح العيوب	
الجملة	
د. أخرى	
التكلفـــــة الكليـــــة	

ملخص جملة المنصرفات

البند	الوصف	القيمة
1.	المنصرفات العامة	
2.	منصرفات المشروع	
	الجملـــة	

النسبة المئوية للمنصرفات

$$\text{النسبة المئوية للمنصرفات} = \frac{\text{جملة المنصرفات}}{\text{التكلفة الأساسية للمشروع}} = \text{..... \%}$$

النسبة المئوية للمنصرفات = ... %

Appendix (F)

CASE STUDY RESPONDENT

جامعة السودان للعلوم والتكنولوجيا

كلية الدراسات العليا

السيد المقاول/ .....

السلام عليكم ورحمة الله وبركاته

الموضوع: دراسة حالة

يقوم الباحث بإعداد دراسة بغرض الحصول على الدكتوراة في الهندسة المدنية – إدارة المشروعات تحت عنوان (المنصرفات وأثرها على شركات المقاولات بالسودان).

لقد رأينا أن نستفيد من خبرتكم وتجاربكم في مجال العمل الهندسي وصناعة التشييد وعليه نرجو كريم تفضلكم بمدنا بمعلومات منصرفات التشييد والتي تعني في هذا البحث كل المنصرفات الداخلة في تكلفة التشييد عدا تكلفة المواد والمعدات والعمالة كما لا تشمل أرباح المقاول – آملين الوصول إلى نتائج وتوصيات بتحديد المعامل الحقيقي (النسبة المئوية المرجعية) للمنصرفات.

نسبة لأهمية الدراسة نتمنى أن تنال الإستمارة وملئها عناية خاصة وذلك حتى نتمكن من الوصول إلى نتائج ذات مصداقية يمكن الإعتماد عليها في الوصول إلى نتائج وتوصيات تعين في إيجاد المعامل الحقيقي لمنصرفات التشييد.

نعرفكم بأن البيانات المقدمة من قبلكم يتم التعامل معها بكل سرية ولا تستخدم إلا لأغراض هذه الدراسة ويمكنكم الحصول على نتائجها حسب رغبتكم.

مع فائق شكرنا وتقديرنا،،،

الباحث

م.م. الخلوتي الشريف النور الزاكي

تلفون: 0912305322

بريد إلكتروني: khalwatis@gmail.com

الخرطوم: أبريل 2019م

دراسة حالة

المعلومات العامة الأساسية

دراسة الحالة لحساب المنصرفات الحقيقية وفقاً للبنود الواردة في الكراسة أو أي بنود أخرى تراها لمشروع قمتم به ويعرف هذا المشروع ولأغراض الدراسة (المشروع) في العام (2018م) وذلك من بداية تسعير المشروع حتى مرحلة تنفيذه وتسليمه إبتدائياً... مع تلخيص ذلك كالآتي:

1. إسم المشروع: ..... مدينة الدلنج الجامعية .....
2. موقع المشروع: ..... مدينة الدلنج - ولاية جنوب كردفان .....
3. كيفية الحصول على المشروع (عطاء ، تكليف مباشر) ..... عطاء .....
4. جملة المنصرفات (المنصرفات العامة + منصرفات المشروع) = ... 4,754,761 .....
5. التكلفة الكلية للمشروع (التكلفة الأساسية + المنصرفات) = ... 15,512,204 .....
6. التكلفة التعاقدية للمشروع (التكلفة الكلية للمشروع + الأرباح) = ... 17,902,219.26 جنيه .....
7. نسبة المنصرفات = $\frac{\text{جملة المنصرفات}}{\text{التكلفة الكلية للمشروع}}$ = $\frac{4,754,761}{15,512,204}$ = % 30.65
8. جملة الأرباح = التكلفة التعاقدية – التكلفة الكلية = 17,902,219.26 - 15,512,204 = 2,390,015.26
9. نسبة الأرباح = $\frac{\text{جملة الأرباح}}{\text{التكلفة الكلية}}$ = $\frac{2,390,015.26}{15,512,204}$ = % 15.4

شركة دانفوديو للمقاولات
ص ب: ٦٠٧٥
الخرطوم - السودان
والطرق والجسور المحدودة

1/ المنصرفات العامة:

يتم حساب مجموعة تكلفة المنصرفات الخاصة بإدارة الشركة لكل المشروعات لفترة عام (عدا منصرفات المشروع) ويشمل ذلك:

1-1/ المنصرفات الإدارية لفترة عام:

البند	البيان	الجلمة ج.س
.1	المكتب لإدارة الشركة (الإيجار ، التأسيس ، الأجهزة والمعدات ، الصيانة ، النظافة) الخدمات (ماء ، كهرباء ، تلفونات) التشغيل (ورق ، أحبار ، ...إلخ)	950,370
.2	المرتبات والأجور (مرتبات وحوافز العاملين ، حوافز مجلس الإدارة ، الإجازات وحقوق العاملين ما بعد الخدمة)	4,894,536
.3	المطبوعات (مطبوعات تعريفية ، مجلات دورية ، ...إلخ)	50,479
.4	الترحيل والنقل (شراء عربات ، إيجار عربات ، التشغيل والوقود ، الصيانة)	643,620
.5	السفر (السفر والمشاركة الخارجية)	125,350
.6	التدريب (كورسات ، ورش عمل وسمنارات ، ...إلخ)	120,000
.7	التسيير	290,450
.8	أخرى (رسوم بنك ، إستشارات قانونية وفنية ، الإشتراك في عضوية مؤسسات ذات صلة)	208,306
	الجملـــــــــــة	7,283,111

1-2/ المنصرفات العامة بإدارة الشركة لفترة عام:

البند	البيان	الجلمة ج.س
.1	الضرائب (الدخل الشخصي ، القيمة المضافة ، الرأسمالية)	3,764,952
.2	الزكاة	1,180,611
.3	الإهلاك (عربات ، معدات ، مكاتب وأجهزة)	439,982
.4	التأمين (عربات ، معدات ، مكاتب ، أخرى)	192,045
	الجملـــــــــــة	5,577,590

ملخص جملة المنصرفات العامة

البند	الوصف	الجملة ج.س
.1	المنصرفات الإدارية	7,283,111
.2	المنصرفات العامة	5,577,590
	الجملـــــــــــة	12,860,701

- تكلفة ونصيب منصرفات المشروع من المنصرفات العامة =
- جملة المنصرفات العامة للعام ÷ عدد المشروعات المنفذة للعام =

2/ منصرفات المشروع:

البند	الوصف	الجملة ج.س
أ/	**مرحلة التقديم للعطاء:**	
.1	رسوم التقديم للعطاء	20,000
.2	تكلفة إستطلاع الموقع وتسعير العطاء	7,500
.3	الدمغة القانونية	2,129
.4	الضمان الإبتدائي (2% قيمة العطاء)	48,170
	الجملـــــــــــة	77,799
ب/	**مرحلة التنفيذ:**	
.1	ترحيل المعدات والآليات Mobilization	16,740
.2	ضمان حسن التنفيذ (10%)	107,600
.3	ضمان المقدم (30%)	300,000
.4	الأعمال المؤقتة (معسكر التنفيذ ، المكاتب ، الأسوار ، ...إلخ)	75,000
.5	الماء بالموقع (التوصيلات الأولية ، دفع الفاتورة لفترة عام)	5,000
.6	الكهرباء بالموقع (التوصيلات الأولية ، دفع الفاتورة لفترة عام)	12,800
.7	التحويلات وتجهيز الطرق المؤدية للموقع	27,500

.8	الأمن ، السلامة والبيئة (الحرس والتأمين ، المعدات ، الصحة والسلامة ، البيئة)	3,000
.9	تخطيط الموقع وتثبيت الابعاد وأعمال المساحة	6,000
.10	التنفيذ (تجهيز المكتب والتسيير المطلوب + المرتبات والأجور ، الترحيل ، ...إلخ)	1,665,475
.11	التقارير (تقارير الأداء ، الصرفيات ، المكاتبات)	5,000
.12	التأمين (عربات ، مكاتب ، معدات ، مواد)	11,120
.13	منصرفات حكومية (رسوم ولائية ، نقابات ، أخرى)	1,000
.14	الإختبارات والجودة	2,500
.15	مواد مرفوضة (مواد تم رفضها ، سرقات ومواد مفقودة)	16,660
.16	أعمال مرفوضة	20,000
.17	تغيرات (المواصفات ، الكميات ، ...إلخ)	12,660
.18	إصابات وحوادث بالموقع	12,903
.19	تأخير الصرفيات	0
.20	زيادة الأسعار (مواد ، مصنعية ، الضرائب ، رسوم حكومية ، ...إلخ)	65,000
.21	تغير القوانين والتشريعات	0
.22	التغير في الظروف الطبيعية والمناخية	0
.23	توقيف العمل	15,000
.24	الإهلاك (عربات ، معدات ، ...إلخ)	25,309
.25	غرامة التغير (التعويض الإتفاقي)	0
.26	الرسومات (رسومات الموقع ، أدلة التشغيل)	6,500
.27	تأخير الإستلام الإبتدائي	0
.28	نظافة الموقع	5065
.29	النزاع والتحكم	0
.30	المخاطر والقوة القاهرة	0
الجملـــــــــــــــــــــــــة		2,314,012
ج/	**فترة الصيانة وإصلاح العيوب:**	
.1	ضمان فترة الصيانة وإصلاح العيوب	70,000
.2	تكلفة الصيانة لفترة التشغيل وإصلاح العيوب	45,006

8,500	3. إخلاء الموقع بعد إكمال الأعمال Demobilizations	
123,500	**الجمـــــــــــــــــلة**	
77,799	**أ. مرحلة التقديم للعطاء**	
2,410,012	**ب. مرحلة التنفيذ**	
123,500	**ج. فترة الصيانة وإصلاح العيوب**	
	الجملة	
2,611,311	**التكلفـــــــــــــــــة الكليـــــــــــــــــة**	

ملخص جملة المنصرفات

البند	الوصف	القيمة
.1	المنصرفات العامة	2,611,311
.2	منصرفات المشروع	2,143,450
الجملـــــــــــة		4,754,761

النسبة المئوية للمنصرفات

$$\% \ldots\ldots = \frac{\text{جملة المنصرفات}}{\text{التكلفة الأساسية للمشروع}} = \frac{4,754,761}{15,512,204}$$

النسبة المئوية للمنصرفات = 30.65 %