

COMPARISON BETWEEN LUMP SUM AND UNIT PRICE CONTRACTS IN CONSTRUCTION OF RESIDENTIAL PROJECTS IN KURDISTAN REGION OF IRAQ - CASE STUDY

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ABSTRACT

Contract management is generally thought to be a significant supporter of project success, and it would increase the probability of success. In residential projects, project cost management is essential. As there are different cost-control approaches depending on the type of contract. The major distinction between Lump-sum and Unit-Price basis contracts is critical. This study focused on showing the strengths and weaknesses of two main contract types which are Lump sum (fixed price) and unit price contracts from the Expert's point of view, people concerned in the field of project management and construction industry. Case studies include residential projects that were successfully implemented in the last five years in the Iraq-Kurdistan region. The study was done by comparing both types of contracts in various fields. (Cost management, time management, facing challenges). The strengths and weaknesses of each contract type were determined based on the view of 30 expert people who responded to a questionnaire survey. The results clearly show that the Lump sum contract type has strong points in clear project cost and clear profits (60% of experts agreed) amount. Also, it is simpler in management (63.3% of experts agreed) and can achieve a higher completion rate in a shorter period compared to projects executed by unit price contract (56.7% of experts agreed) While having inflexibility with design changes and errors (66.7% of experts agreed) and a less transparent and impartial bidding process (60% of experts agreed) can be viewed as a weak point of the lump sum contract. However, the Unit Price contract type has strong points in flexibility with design changes and errors (66.7% of experts agreed), while has less clear project cost and less clear profits amount (60% of experts agreed). Since Contract type is the critical element for the project owners and beneficiaries

KEYWORDS: Profit range, contract types, completion rate, Cash flow management. design changes, and errors.

1. INTRODUCTION

Currently, cost control is the most important factor in building projects with various construction costs and financial situations throughout the world. Now, the global economy has entered a recession, and project cost control has become extremely important. It

has become a key issue for developers and construction firms in managing construction projects. In addition to the expanding economic growth builders. Construction organizations with a broad vision have begun to use cost management strategies that are established by the kind of contract. Depending on the kind of contract, there are many strategies for managing

construction costs (Nazilli and Postavaru 2012). Here the Contract is defined as the agreement of how the owner will pay the contractor for work performed, the types of construction contracts and general condition clauses have a significant impact on the chance and magnitude of project success (C. William Ibbs1 & others 2015). In general, we have 8 types of contracts in construction projects but the most notable difference is between Lump sum (Fixed Price) and Unit Price contracts. For cost control, the other forms of contracts use similar comparative approaches. Each form of contract has pros and con points that must be considered by both the project owner and contractor when deciding how to minimize risks. The lump-sum contract is one in which the contractor is paid a fixed amount for the whole scope of work specified in the contract, also known as a cost-reimbursable contract, is one in which the owner reimburses the contractor for all costs that are reasonably incurred and directly related to the amount of work done for the project, in addition to a certain fee (fixed fee or percentage fee) and/or an incentive fee (Morrow 2011). The contractor guarantees to complete the job as described in the contract agreements for the fixed price regardless of how the real cost may change; conversely, the owner agrees to pay the contractor this fixed price whatever of how the actual cost may rise or fall. It is the contractor's responsibility to continue carrying out the work according to the specifications that have been determined. If neglect is not adequately kept and maintained. High precision is necessary for reading drawings and computing BOQ in projects employing a Lump Sum contract, so that mistakes in estimating volumes caused by inaccuracies in reading drawings may be eliminated. Additional issues discovered in the project employ a lump sum contract mechanism, particularly mistakes in material price estimation (Suprpto, Bakker et al. 2016). Reduced contract administration expenses and efforts connected to

quantity verification and measurement are one benefit of using fixed prices (Mohamed Khalafalla & others in 2018). To get accurate and clear conclusions in the estimation of fixed-price DB building projects, cashflow risk analysis becomes a necessary step in addition to the other risk analysis methods (Ahmet Oztas*, Onder Okmen. 2003). In a unit price contract, the contractor agrees to be paid a specific amount per unit of each item, such as excavation per cubic meter. The real total amount paid is based on the actual measured units built on the project multiplied by the agreed-upon unit price. Each item's unit cost typically comprises all labor, materials, project overhead, business overhead, and profit. Variable costs are sometimes paid separately (Gordon 1994). The contractor must first finance supplies and labor using the capital owned. Of course, if the contractor is a main project contractor, this will not be an issue. Another consideration is about project subcontractors, the company's continuity may be impacted (Saeman and Gofar 2022). Otherwise, while payment to the contractor is based on actual quantities of work, unit-price contracts are distributed based on estimated quantities. For many different kinds of reasons, estimated and actual quantities frequently don't match exactly. This discrepancy directly affects the contractor's profitability and increases hazards for both owners and contractors (Khaled Hesham Hyari1; Nasim Shatarat2 2017). Types of contracts were a main topic in different studies by different researchers in Kurdistan, AMIN (2021) explores the legitimacy and power of the Kurdistan Regional Government and its people to invest in and complete oil and gas contracts in line with the constitutional framework, legislation, decisions, international, Iraqi, and Kurdish accords, and treaties to solve this problem. Mohammed (2023) evaluated the procurement management system of residential complex projects in Erbil Governorate. Jaskowiak (2012) evaluated the performance of

Firm Fixed Price FFP and Cost-Plus Fixed Fee CPFF contract types in the contingency environment and determined which internal and external factors had the greatest effect on contract success. Several factors have a constant impact on how well the project went. Both the project delivery mechanism and the type of facility are on the list of factors that explained the largest percentage of variation in performance models (Mark Konchar1 and Victor Sanvido,2. 2014). Additionally, the analyst should use absolute error rates rather than average error rates when measuring the efficacy of a unit price estimation system. The average error rate takes into account adequate errors; hence it fails to properly represent the degree of quantity estimating techniques (Douglas D. Gransberg, P.E & others 2013).

1.1 Problem statement:

Many residential projects start working with good financial capabilities, but the method of agreement with the **contractors** to implement the project or without accounts for the method of disbursing the money causes Administrative and legal problems to occur between the employer and the contractors, these issues result in the project being stopped or delayed. Failure to take into account the financial and administrative capabilities of the project owner during the conclusion of the construction contract with contractors is a main research problem, which leads to inefficiency in the time work schedule

1.2 Objective:

This study aimed to **demonstrate** the strength and weaknesses of two types of contracts such as Lump sum contracts and Unit Price contracts through a questionnaire survey that results in selecting the right contract type based on the project owner's capabilities.

2. Material and Methods:

This study employed a qualitative methodology. which is applied by employing a survey technique questionnaires that attempt to

obtain views from respondents on activities that might represent a cost, time, quality, and **risks** so that the resultant description method is in the form of respondents' opinions (Wali and Othman 2019). This study adopted a questionnaire survey method, and case study as the strategy for data collection. The following stages were performed to carry out this research:

2.1 Defining the formulation of the problem and research objectives, producing a literature review (library study).

2.2 Establishing a research technique (data collecting) by creating Questionnaires. The researcher used an online questionnaire made by google forms. "Google Forms is a tool that allows collecting information from users via a personalized survey or quiz" (Wali and Othman 2019). The questionnaire form consists of three sections, the first section was related to the respondent's profiles in the construction industry, the respondent's degree, and the working field. The second section of the questionnaire consists of ten Likert scale questions, where the respondents were asked to answer five statements to show their opinion regarding Residential projects that worked by Lump sum contract. In the third section, the respondents were asked similar second-section questions but to show their opinion regarding Residential projects that worked by Unit-price contract. The researcher sends the questionnaire link to a group of engineers in Kurdistan, and out of 37 questionnaires distributed only 30 completed questionnaires were received.

2.3 Data analysis using the SPSS application to determine which contract type is more powerful than another in terms of expected costs, profits, management, flexibility with design changes, errors, and time production rate variability.

2.4 Case studies by comparing data between two residential projects executed in the same economic, environmental, and political circumstances.

2.5 Conclusion results and recommendations for future projects and studies.

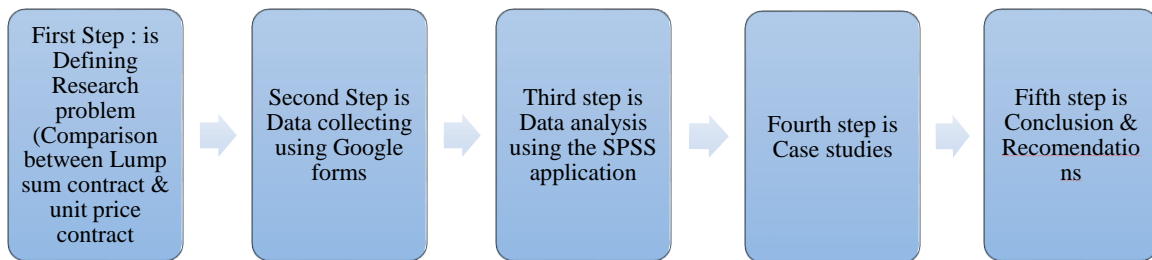


Fig. (1):- Sequence of research method

3. RESULTS AND DISCUSSION

It is clear that Project **management** should choose appropriate strategies for cost control based on his financial and managerial capabilities, culture, and organizational level, as well as the project team structure. After making a questionnaire survey among experts in construction management fields based on their

experience of more than 10 years working on individual projects, we received the view of 30 respondents. The respondents were varied professionals from supervisor engineers, site engineers, Academics, Consultant engineers, and Project managers in ratios shown in Figure 2. The researchers analyzed the results of the questionnaire by the SPSS program and conclude the following results:

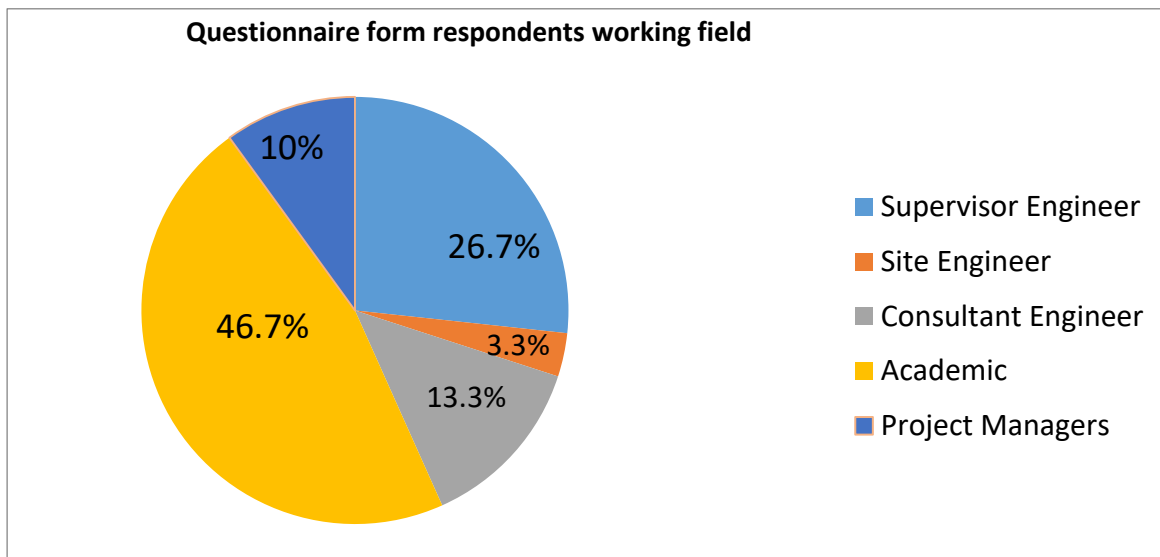


Fig. (2):- Respondents working filed

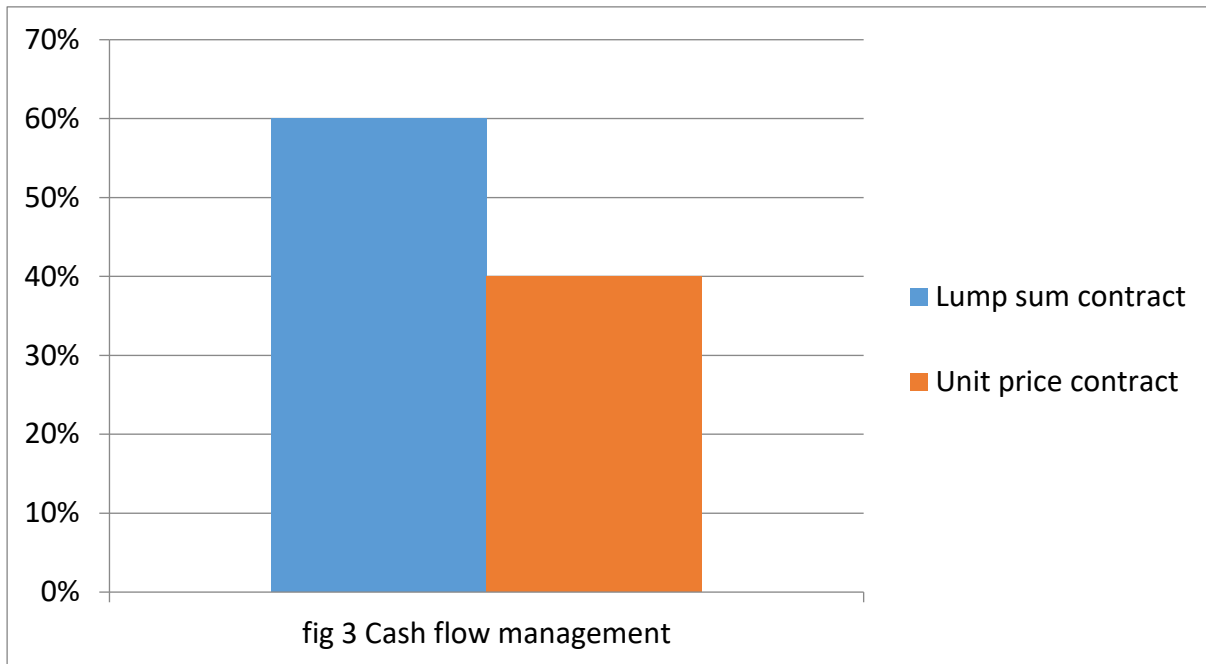
3.1.1 Cash flow management (Contractor responsibility) :

According to the **results** of the analyzed

questionnaire survey.18 number out of 30 respondents (at the rate of 60%) thought that project costs, profits, expenses, and Cash flow

management are more clear in residential projects implemented by lump sum contract than

in residential projects implemented by unit price as illustrated in Fig 3 :

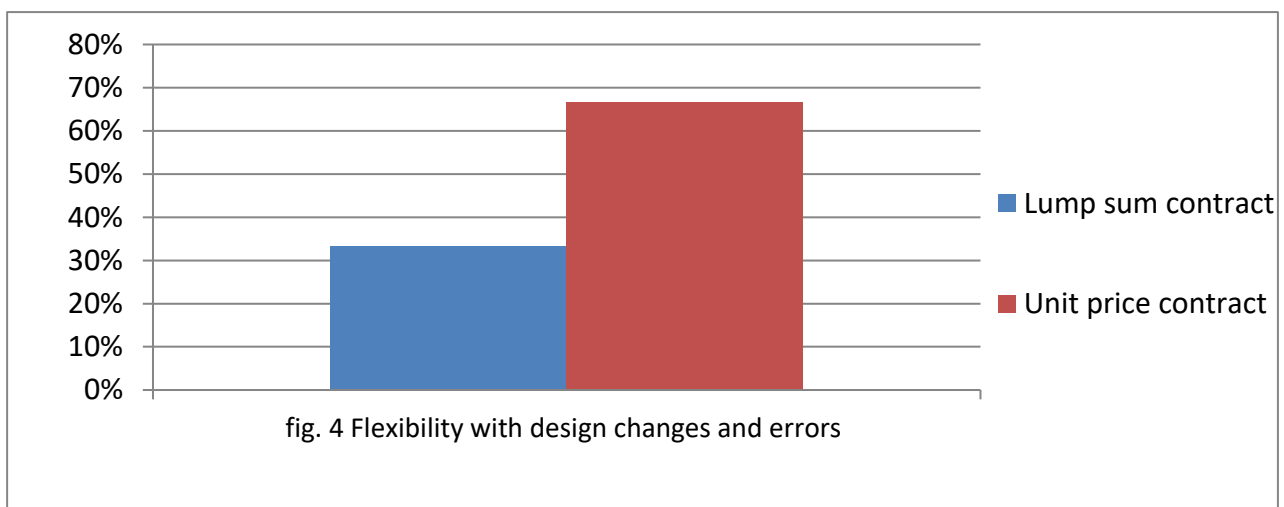


But this does not mean that projects working with lump sum contracts are making more profit or expense less cost. It is clear that a percentage of the owner's profit goes to contractors when they decide to implement their project by lump sum contract.

3.1.2 Flexibility with design changes and errors (Owner responsibility):

The analyzed result of the questionnaire

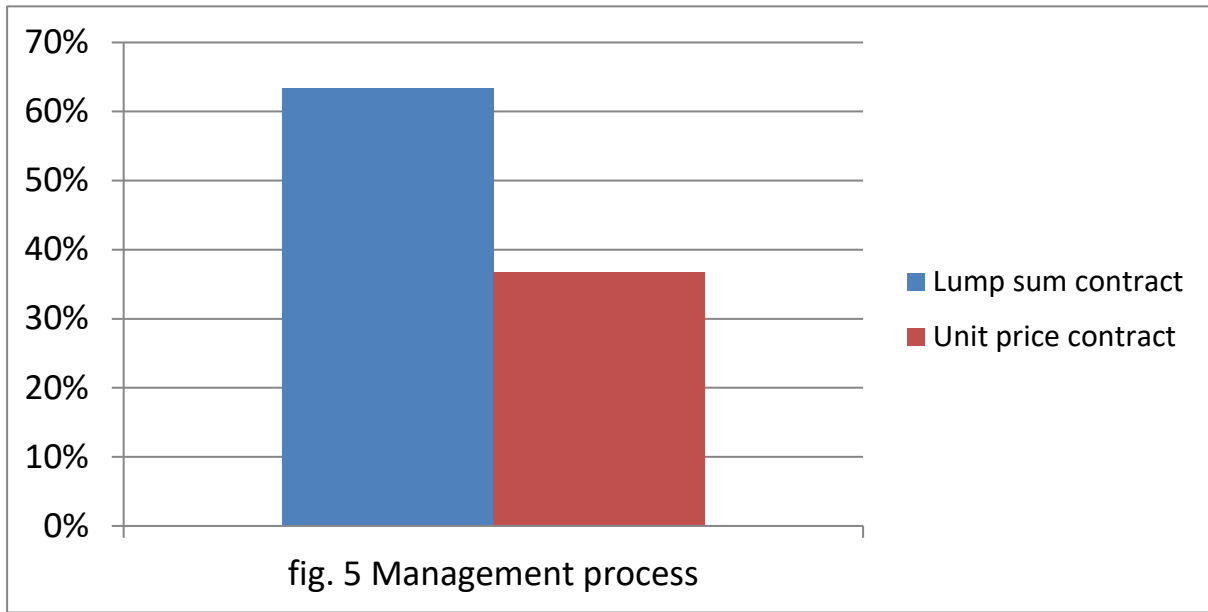
survey shows that 20 number out of 30 respondents (at the rate of 66.7%) thought that Projects implemented with unit price contracts are more flexible with design changes and errors than others implemented with lump sum contracts. In a unit price contract, the owner bears full responsibility for the design, implementation, and management of the project. as illustrated in Fig 4:



3.2 Management Process (Owner responsibility):

According to the **results** of the analyzed questionnaire survey.19 number out of 30 respondents (at the rate of 63.3%) thought that the management process in projects implemented with lump sum contracts is simpler

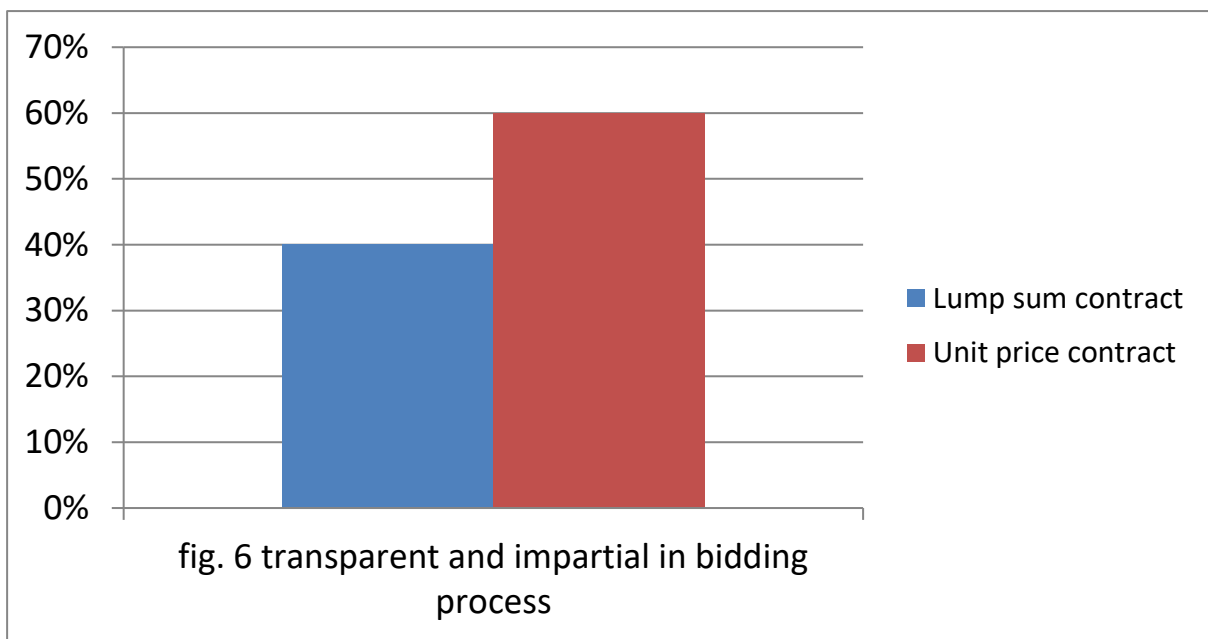
than others implemented with unit price contracts. Since in lump sum contract, the project management organization needs less number of engineers and staff as compared with others. as illustrated in Fig 5:



3.2.1 Transparent and impartial bidding process(Contractor responsibility) :

According to survey results, 18 number out of 30 respondents (at a rate of 60%) clarify that

projects **implemented** with unit price contracts are more transparent and impartial in the bidding process than others implemented with lump sum contracts. as illustrated in Fig 6 :

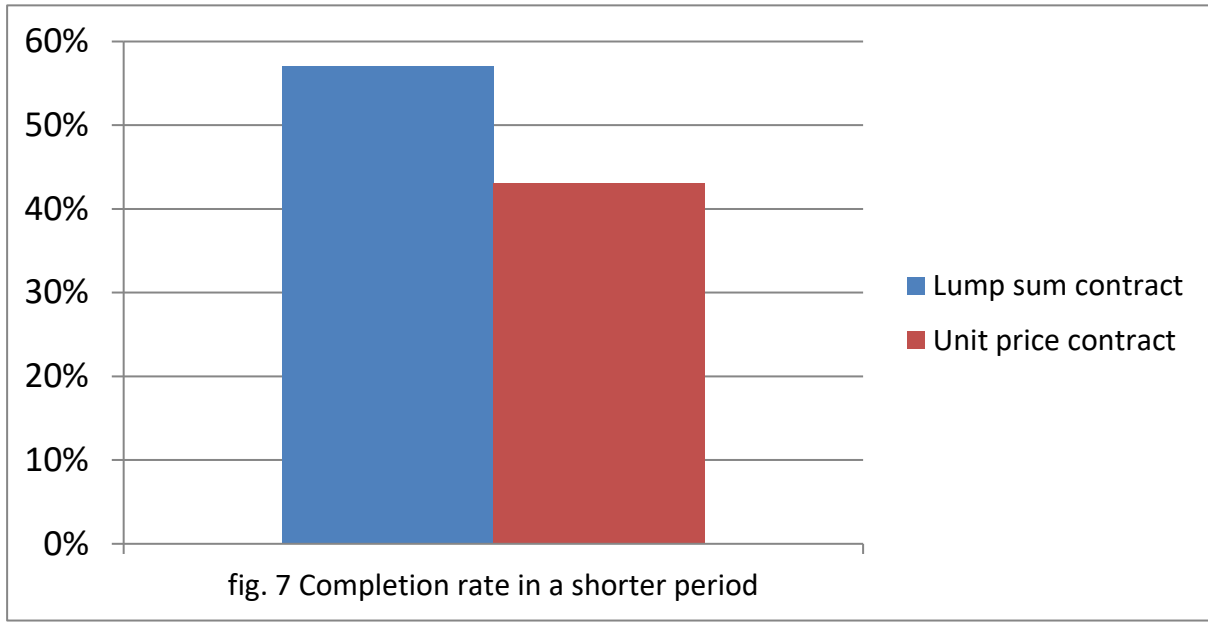


3.2.2 Comp

3.2.3 Completion rate in a shorter period(Owner responsibility):

The analyzed result of the questionnaire survey also shows that 17 number out of 30 respondents (at the rate of 56.7%) thought that projects implemented with lump sum contracts

can complete in a shorter period than others implemented with unit price contracts. Of course, if the owner does not have financial problems because working on several items at the same time needs a higher budget from the project owner. as illustrated in Fig. 7:



3.2.4 Case Study:

The researchers took data from two residential projects implemented under different types of contract conditions (Lump sum contract and Unit price contract) and completed successfully by two major companies have Competent in residential projects and had a perfect background in previous construction projects :

3.2.5 Case study 1: Residential project implemented under Lump sum contract conditions:

This project consists of 50 villas (400m² area) on two floors, 10 villas (225m² area) on two floors, 160 houses (200m² area) on two floors, 90 houses (200m² area) on one floor, Two apartments on 12 floors in about 1500m² building areas and all necessary service buildings. Data information’s shown in Table 1 :

Table(1):-Data information of residential project implemented under Lump sum contract conditions

project name	Daru City	
Starting date	20/6/2021	
Duration	48 months	
Location	Iraq - Kurdistan region - Slemani	
planned budget :	Houses	
	roads and walkways	

	sewerage	\$46,800,000
	water network	
	Service buildings (schools, kindergarten, etc.)	
	Recycling	
	Supervision	
The total budget amount earned from the sale of houses		\$60,000,000
planned profit (\$60.000.000-\$46,800,000)		\$13,200,000
Planned profit Rate % (\$13,200,000 / \$60.000.000)		22 %
Number of engineers needs during working on the project		10
Actual cost :	Houses	\$48,600,000
	roads and walkways	
	Sewerage	
	water network	
	Service buildings (schools, kindergarten, etc.)	
	Recycling	
	Supervision	
Constraints and indirect costs	design changes	
	Environment	x
	Political	
	Site	x
	managerial problems	
	financial problems	x
Actual profit	=\$(\$60.000.000-\$48,600,000)	\$11,400,000
	Rate %((\$11,400,000/ \$60.000.000))	19 %
Time overrun	in days	0
	Rate %	0 %
Quality Acceptance		
A : Very Good B : Good C : Neutral D: Bad E: Very bad		
Quality Acceptance (Grade A to E)	in contractor opinion	A
	in researcher opinion	B

3.2.6 Case study 2: Residential project implemented under Unit price contract conditions

This project consists of 158 houses (200m2

area) on two floors, 338 houses (200m2 area) on one floor, 314 houses (180m2 area) on one floor, and all necessary service buildings. Data information's shown in Table 2:

Table (2):- Data information of residential project implemented under Unit price contract conditions

project name	Ban City			
Starting date	17/2/2019			
Duration	48 months			
Location	Iraq - Kurdistan region - Kalar			
planned budget :	Houses			
	roads and walkways			
	Sewerage			
	water network			
	Service buildings (schools, kindergarten, etc.)	\$43,128,522		
	recycling			
	supervision			
	The total budget amount earned from the sale of houses	\$53,479,367		
planned profit(\$53.479.367-\$43,128,522)	\$10,350,845			
Planned profit Rate %(\$10,350,845/\$53.479.367)	19 %			
Number of engineers needs during working on the project	20			
Actual cost :	Houses	\$44,293,776		
	roads and walkways			
	Sewerage			
	water network			
	Service buildings (schools, kindergarten, etc.)			
	Recycling			
	Supervision			
	Constraints and indirect costs	design changes	x	
Environment		x		
Political				
Site		x		
managerial problems				
financial problems		x		
Actual profit	in \$	\$8,977,740		
	Rate %(\$8,977,740/\$53.479.367)	17 %		
Time overrun	in days	0		
	Rate %	0 %		
Quality Acceptance				
A : Very Good	B : Good	C : Neutral	D: Bad	E: Very bad
Quality Acceptance (Grade A to E)		in contractor opinion		B
		in researcher opinion		B

4. CONCLUSION

After comparing the analyzed results from the questionnaire survey and case studies, the main distinctive points between the unit price

and lump sum contract are summarized in Table 3.

Table (3):-Unit Price Vs Lump sum contract comparison as concluded in this research

Item no.	Lump sum contract	Unit Price contract
1	Clear project cost.	Less clear project cost.
2	Clear profits amount.	Less clear profits amount.
3	Easy Cash flow management.	It needs more accurate cash flow management.
4	Less staff is needed to manage the project.	More staff needed to manage the project.
5	Easier to achieve a higher completion rate in a shorter period	Achieving a higher completion rate in a shorter period is difficult.
6	Inflexibility with design changes and errors.	Flexibility with design changes and errors.
7	Less transparent and impartial bidding process.	More transparent and impartial in the bidding process.
8	Probability of lower profit.	Probability of higher profit.

The low number of survey participants is considered one of the weak aspects of the study which is due to the fact that a small number of engineers have knowledge of contract management or a small number of engineers have worked in managing contracts for projects. Finally, it is recommended that every project owner before starting the project should study the capabilities of his budget, Managerial staff and engineers, Project design, and bill of quantity then decide to implement the project under Lump sum or Unit price contract conditions and If the company management style causes instability during building, the owner should reject all approaches and stick to his pure variance style.

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