CEM 520 CONSTRUCTION CONTRACTING & ADMINISTRATION

TERM PROJECT

THE FACTORS GOVERNING HOUSING CONSTRUCTION COSTS IN SAUDI ARABIA

PREPARED BY

Abdelrahman Al-Gwaiz ID#230205

Kamal Al Dihan ID#230253

Faisal Al Ankary ID#998936

ABSTRACT

When it comes to housing construction, there is no question as to whether costs should be reduced. But when the question moves over to how these reductions are best achieved, opinions rarely align. This owes to the complicated nature of construction endeavors. This study looks into the myriad of factors influencing housing costs in Saudi Arabia with the aim of identifying the chief influencing factors among them. Once identified, these factors will be used to put forth recommendations for reducing housing construction costs in Saudi Arabia.

ACKNOWLEDGEMENT

This paper is intended as a summary of a report prepared by Fawaz Al-Muwaisheir in June, 2006 entitled *Factors Affecting Affordable Housing Construction in Saudi Arabia*. In the process of summarization, certain liberties were taken with the original report's terminology, analysis, reasoning, conclusions, and recommendations. These liberties are indented to bestow the authors' imprint on this paper. Nevertheless, this paper remains faithful to the original report's overall objective, data, and research methods.

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INTRODUCTION

Maslow's hierarchy of human needs likens human needs to a multileveled pyramid. The higher the level, the more developed human needs become. At the bottom of the pyramid are physiological needs, among which is shelter. A residential house covers shelter and, depending on its quality, beyond. The higher the quality of a house, the further it pushes its occupant up the pyramid bringing higher "levels," or development, into reach. Quality housing, however, does not come cheap. What this line of reasoning suggests is that housing costs are tied to social development. The overall cause of reducing housing costs, therefore, surpasses mere profit to assume a much more profound impetus.

With such issues at stake, we are more than fortunate to have the all-powerful profit incentive working for us. When it comes to the construction industry, however, cost reduction is by no means straightforward. The myriad of factors involved in construction projects present innumerable fronts where cost reduction may be pursued. Choosing the most effective front is an elusive decision which could have substantial cost implications, which brings us to the objective of this paper.

Objective

The objective of this study is to identify the cost factors that govern the cost of housing construction in Saudi Arabia. From there, the implications of these factors will be analyzed and recommendations for reducing housing construction costs will be made based on this analysis.

LITERATURE REVIEW

As stated above, this study will attempt to uncover the main factors influencing housing construction costs in Saudi Arabia. But first, a list of common construction cost factors has to be compiled to fuel this study. For this, we refer to field literature for commonly cited cost factors. These factors will be listed under five categories: environmental, operational, contractual, estimation, and financial factors. The categories and the factors under them follow:

Environmental Factors

Projects are subject to the environmental conditions they are carried out in. The following are common environmental factors that might influence a project's cost:

Weather Effects[1]. Structures must be made to withstand the prevailing elements. Achieving this might cost more in some climates than others. The pertaining climactic conditions, therefore, are factors to be reckoned with when costing a project.

Construction Demand. Like all markets, construction is subject to the law of supply and demand. The degree of competition will duly modify a contractor's profit margins and with it costing calculations.

Culture Shock[2]. Whenever diverse nationalities converge on a common effort, a certain degree of efficiency is lost to differing languages, cultures and the like. This factor owes to such effects.

Site Location and Conditions[3]. The location of a site will have a direct logistical cost on a construction project while the condition of the site will determine the cost of preparing the site for construction.

Local Competition. The quality and quantity of local competition will no doubt influence an individual contractor's operations and, in turn, its costing of projects.

Local Economy[4]. As a main driver of construction demand and a market for construction materials and services, the local economy and the state it is in cannot be ignored when costing projects.

Local Skills (Education/Training). The skill and competency of locals, whether directly or indirectly related to the project, will bear on the project and its implementation one way or another. This influence will eventually work its way into the project's costs.

Foreign Firm Domination. Local contractors sometimes find themselves in a market that is dominated by a foreign firm. The overwhelming influence of such firms usually raises the bar for everyone else.

Local Laws and Regulations[5]. Through zoning laws, building codes, and other laws and regulations, local authorities have the ability to shape construction

[1] (Hinze, 1989)
[2] (Al-Khaldi, 1990)
[3] (Ubaid, 1991)
[4] (Bernanke, 2006)
[5] (Feldman, 2002; Fischel, 1990)

projects in their jurisdictions. Such influence will certainly make its imprint on the costs of projects conducted in that jurisdiction.

Labor Nationality. In the Saudi construction market, much can be assumed in way of quality and cost of labor based on nationality. Therefore, the nationality of a project's labor force is a factor to be considered in project costing.

Operational Factors

Operations, obviously, are the heart of any construction project. No serious project costing can take place without paying close attention to cost implications of operations. In this respect, we list the following common operational factors:

Project Planning and Scheduling Proper planning and scheduling are imperative if an operation, let alone one as complicated as construction, is to proceed smoothly, or even reach conclusion for that matter. The way plans and schedules are drafted and followed through can make the difference between success and failure on a project, regardless of any other factor.

Project Coordination[6]. A well run construction project is the result of an intricate interaction of a large group of players. Such a feat would be impossible if not for close, constant coordination between the involved parties. The extent and effectiveness of such coordination weights heavily on any the project and its costs.

Construction Design[7]. As *the* guiding operational document, construction designs can hardly be underestimated in their contribution to the success of a project. Therefore, the quality and suitability of such designs are not to be taken lightly.

Materials and Workmanship[8]. Naturally, construction materials and the way they are used determine the quality of the end product. Laxity in this area can lead to disastrous predicaments.

On-Site Control[9]. On-site control is established through a set of management tools, such as records, documents, financial receipts, and a management hierarchy among others. Collectively, these tools are used to keep a project on track and measure its progress.

[6] (Puddicombe, 1997)
[7] (Al-Abrieq, 2005)
[8] (Feldman, 2002)
[9] (Al-Juwairah, 1997)

Work Experience[10]. Experience acts a resource that is summoned during unexpected situations. The more the experience, the more likely these situations will be successfully navigated.

On-Site Disputes[10]. Disagreements among construction parties may rise to the level of impacting schedules and operations. If unchecked for too long, such disputes could unravel a whole project.

Contractual Factors

All construction operations are based on contracts that bind various parties to certain obligations that collectively constitute the project. The following are prominent contractual items.

Management of Contract[11]. Despite the binding nature of contracts, signatories may need to be reminded of their obligations and checked on from time to time. Without an enforcer, or manager, following up on the performance of the contract, the project may drift into trouble.

Type of Contract Used[12]. Numerous contract types have been developed to satisfy endless project possibilities. Selecting a suitable contract type is vital choice for any project.

Overtime/Expedition Stipulations[7]. Projects do not purposefully plan for overtime, job expeditions or similar remedial recourses. However, contractual stipulations to such recourses must be seriously considered if such recourses are to be viable options. Overlooking such matters could lead a project into unpleasant territory when it is most vulnerable.

Design Changes[7]. Most design changes, regardless of their justification, are breaks in the flow of a project. Such breaks usually add to the cost of a project.

Duration of Contract[13]. Irrespective of the work to be done, contracts of extended duration usually have a cost premium. This premium is mostly attributed to lost opportunities and the inherent risk of longer timeframes.

Qualified Labor Availability[10]. Locating qualified construction labor and legally contracting with it can be an issue, especially in the case of Saudi Arabia.

Estimation Factors

[10] (Lowe & Skitmore, 2001)
[11] (Naoum, 1987)
[12] (Fisk, 1982)
[13] (Navon, 2003)

Estimates are the foundation of project. The soundness of estimates made at the outset of a project continues to echo throughout a project's lifetime. Below are important estimates that give shape to any project.

Material Cost Estimation. Material comprises a large part of most project budgets. Estimates in this area can be decisive for a project.

Labor Cost Estimation. Materials are useless unless labor is available to work them. Estimating the type and size of this labor will determine whether the required work gets done and how well it is done.

Equipment Cost Estimation[10]. Labor use equipment to work the materials into the desired structure. The bridging role played by equipment adds to the importance of accurately estimating the costs involved in supplying and operating such equipment.

Equipment Maintenance Estimation[10]. Equipment is useless to a project unless it functions properly. Therefore, it is important to factor-in maintenance costs when estimating a project's equipment costs.

Interest Rate Estimation. When a project involves substantial funds, a considerable part of these funds will be lost to interest rates. Forecasting these interest rates, therefore, becomes essential in estimating and accounting for project costs.

Productivity Expectations. When planning and scheduling a project, a certain pace of progress, or productivity, is assumed for each activity involved. Unreal productivity expectations may lead to an unworkable plan and a derailed project.

Supplier Expectations[14]. When considering the materials and services required in the course of a project, expectations are made of the supplying firms. Because these expectations may include details important to the project (such as prices, performance, and support), it may be worthwhile to account for them.

Historical Cost Data Availability[15]. Hardly any estimation work can be carried out without historical data to base future costs on. The quality and availability of such data is imperative in preparing sound cost estimates.

[14] (Yogesh, 2005)
[15] (Hendrickson, 1998)

Financial Factors

Financing provides the underlying incentive permeating through all projects: money. What follows are important financial factors to consider when dealing with construction projects.

Financing. Financing decisions are some of the gravest decisions a project owner can make. While many considerations enter into such decisions, the stakes involved almost always are debt or bankruptcy.

Inflation[16]. Inflation is the main culprit in price fluctuations. Failing to account for this cost factor could wreak havoc with a project's procurement activities.

Currency Exchange Rates. Fluctuating currency exchange rates often play a role in the choice of the national origin of the materials and services acquired. Such effects are especially felt in states that heavily depend on foreign imports to satisfy their technical requirements, such as Saudi Arabia.

RESEARCH METHODOLOGY

With regard to identifying the most influential housing cost factors, this study relies on a survey of the opinion of Saudi construction professionals. In the survey, these professionals are asked to rate the influence of each of the factors developed in the previous section (the Literature Review) on a six level scale. To qualify for the survey, respondents must be contractors, consultants, or real-estate developers with a minimum of ten years experience. The questionnaire follows:

[16] (Duisenberg, 1997)

Organization Information	Questionnaire
Please fill out the following regarding your organization:	*Please rate the influence of the following construction cost factors on a scale of 1 to 5 (5 being the most influential):*
1. Company name (optional):	
2. Company nationality:	
3. Main office address:	
4. Size (number of employees):	
5. Number of Branches:	
6. Region(s) of Operation:	
7. Title of Respondent:	
8. Which of the following best describes your organization? ( ) Consultant ( ) Contractor ( ) Developer	
9. What is the average size of your projects? (Million S.R.) ( ) Under 5 ( ) 5 to 15 ( ) 15 to 50 ( ) 50 to 200 ( ) Over 200	
10. How many years have you been in business? (Years) ( ) Under 1 ( ) 1 to 5 ( ) 5 to 10 ( ) 10 to 15 ( ) Over 15	

	Factors	Rating					
		0	1	2	3	4	5
Environmental	Weather Effects						
	Construction Demand						
	Culture Shock						
	Site Location & Conditions						
	Local Competition						
	Local Economy						
	Local Skills (Education/Training)						
	Foreign Firm Domination						
	Local Laws & Regulations						
	Labor Nationality						
Operational	Project Planning & Scheduling						
	Project Coordination						
	Construction Design						
	Materials & Workmanship						
	On-Site Control						
	Work Experience						
	On-Site Disputes						
Contractual	Management of Contract						
	Type of Contract Used						
	Overtime/Expedition Stipulations						
	Design Changes						
	Duration of Contract						
	Qualified Labor Availability						
Estimation	Material Cost Estimation						
	Labor Cost Estimation						
	Equipment Cost Estimation						
	Equipment Maintenance Estimation						
	Interest Rate Estimation						
	Productivity Expectations						
	Supplier Expectations						
	Historical Cost Data Avail.						
Finan.	Financing						
	Inflation						
	Currency Exchange Rates						

Figure-1

In the above figure, the questionnaire is split down the middle into two sections. The one to the left; titled Organizational Information, gathers details about the respondent's organization. The intention of this section is mainly to filter out unqualified respondents. The section to the right contains the questionnaire itself where the entire set of factors developed in the Literature Review is listed. Each factor is provided with six checkboxes to capture the respondent's rating of a factor's cost influence on a 0 to 5 scale.

After the data is collected, an index is created for each factor to prepare it for analysis. The index is simply the average score of respondents for each factor. The formula for index follows:

$$\text{Index} = [(A*5) + (B*4) +(C*3) + (D*2) + (E*1)]/N$$

where,

A is the number of 5 ratings
B is the number of 4 ratings
C is the number of 3 ratings
D is the number of 2 ratings
E is the number of 1 ratings, and
N is the total number of respondents.

Once calculated, these indexes will be used to list housing cost factors in descending order of influence on cost as seen by Saudi construction professionals.

RESULTS & ANALYSIS

A total of 35 respondents answered the questionnaire. 16 of them were contractors, 14 were consultants, and 5 were developers. Applying the aforementioned indexing process for the entire group of respondents we end up with the following ranking:

Table-1

Rank	Cost Factor	Rating
1	Qualified Labor Availability	4.12
2	Materials & Workmanship	3.91
3	Construction Design	3.79
4	Design Changes	3.76
5	On-Site Control	3.68
6	Project Coordination	3.65
7	Duration of Contract	3.62
8	Material Cost Estimation	3.59
9	On-Site Disputes	3.53
10	Work Experience	3.50

11	Local Competition	3.47
12	Local Laws & Regulations	3.41
12	Project Planning & Scheduling	3.41
13	Labor Cost Estimation	3.35
13	Financing	3.35
14	Labor Nationality	3.18
15	Overtime/Expedition Stipulations	3.15
16	Local Economy	3.12
16	Equipment Cost Estimation	3.12
17	Interest Rate Estimation	3.06
18	Supplier Expectations	2.97
19	Weather Effects	2.88
19	Inflation	2.88
20	Local Skills (Education/Training)	2.82
21	Type of Contract Used	2.76
22	Site Location & Conditions	2.71
23	Equipment Maintenance Estimation	2.68
24	Management of Contract	2.65
25	Construction Demand	2.56
26	Culture Shock	2.53
26	Productivity Expectations	2.53
27	Historical Cost Data Avail.	2.50
28	Currency Exchange Rates	2.21
29	Foreign Firm Domination	1.94

The following chart illustrates this ranking:

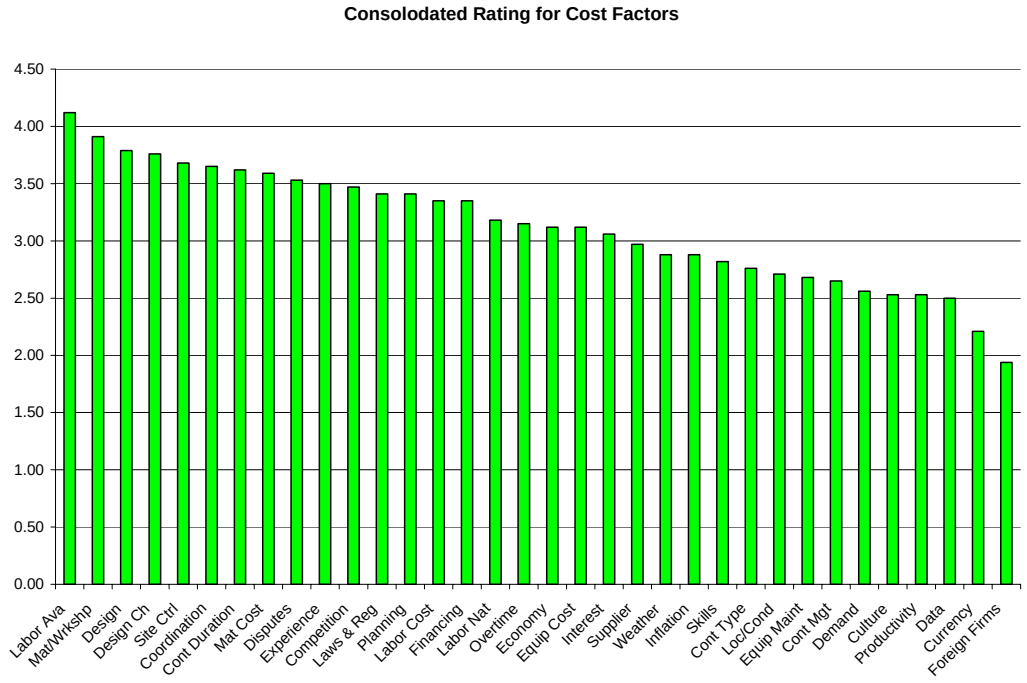

Figure-2

At this point, one is tempted to adopt these results as representative of the of the Saudi construction industry. However, we must keep in mind that the index used to reach these results is a simple average that is applied to qualitative, rather than quantitative, parameters (cost factors). Also, the proportions of the respondent groups in the dataset are not representative of the survey target, the Saudi construction industry[17]. Furthermore, there is no reason to assume that the respondent groups considered are of the same persuasion or authority regarding the subject matter. These reasons alone cast a long shadow on the results above and compel us to (at least) repeat the indexing process for each respondent group alone, which yields the following rankings:

Consultants' Ranking:

Table-2

Rank	Cost Factor	Rating
1	Design Changes	3.71
1	Duration of Contract	3.71
2	Qualified Labor Availability	3.64
3	Construction Design	3.57
3	On-Site Control	3.57
3	Material Cost Estimation	3.57
3	Labor Cost Estimation	3.57
4	Project Planning & Scheduling	3.43
4	Project Coordination	3.43
4	Financing	3.43
5	Equipment Cost Estimation	3.29
6	Work Experience	3.14
6	On-Site Disputes	3.14
6	Overtime/Expedition Stipulations	3.14
7	Local Skills (Education/Training)	2.93
8	Local Competition	2.86
8	Supplier Expectations	2.86
9	Weather Effects	2.71
9	Local Economy	2.71
9	Interest Rate Estimation	2.71
9	Inflation	2.71
10	Local Laws & Regulations	2.57
10	Labor Nationality	2.57
10	Management of Contract	2.57
10	Type of Contract Used	2.57
10	Equipment Maintenance Estimation	2.57
11	Productivity Expectations	2.43
12	Foreign Firm Domination	2.14
12	Historical Cost Data Avail.	2.14
13	Currency Exchange Rates	2.00
14	Construction Demand	1.86

[17] The original report did not comment on the proportions of the respondent groups (16 contractors, 14 consultants, and 5 developers) in the survey.

14	Culture Shock	1.86
14	Site Location & Conditions	1.86
N/A	Materials & Workmanship	N/A

Contractors' Ranking:

Table-3

Rank	Cost Factor	Rating
1	Local Laws & Regulations	4.63
2	Project Planning & Scheduling	4.25
3	Construction Design	4.00
4	Work Experience	3.94
5	Equipment Cost Estimation	3.88
5	Local Competition	3.88
5	Interest Rate Estimation	3.88
6	Overtime/Expedition Stipulations	3.81
7	On-Site Disputes	3.75
7	Local Skills (Education/Training)	3.75
7	Inflation	3.75
8	Labor Nationality	3.69
9	Project Coordination	3.50
10	On-Site Control	3.38
10	Financing	3.38
10	Productivity Expectations	3.38
11	Design Changes	3.25
11	Construction Demand	3.25
12	Qualified Labor Availability	3.19
13	Local Economy	3.13
13	Management of Contract	3.13
13	Type of Contract Used	3.13
14	Materials & Workmanship	3.00
14	Historical Cost Data Avail.	3.00
15	Duration of Contract	2.88
15	Weather Effects	2.88
15	Currency Exchange Rates	2.88
15	Culture Shock	2.88
16	Equipment Maintenance Estimation	2.75
16	Foreign Firm Domination	2.75
17	Supplier Expectations	2.63
18	Material Cost Estimation	2.56
19	Site Location & Conditions	2.25
20	Labor Cost Estimation	2.13

Developers' Ranking:

Table-4

Rank	Cost Factor	Rating
1	On-Site Disputes	4.40
2	Work Experience	4.20
3	Project Coordination	4.00

4	Overtime/Expedition Stipulations	3.80
4	Local Skills (Education/Training)	3.80
4	Interest Rate Estimation	3.80
5	On-Site Control	3.60
5	Financing	3.60
5	Equipment Cost Estimation	3.60
5	Local Competition	3.60
5	Local Economy	3.60
5	Construction Demand	3.60
6	Labor Nationality	3.40
6	Management of Contract	3.40
6	Culture Shock	3.40
7	Construction Design	3.20
7	Material Cost Estimation	3.20
7	Supplier Expectations	3.20
7	Weather Effects	3.20
7	Local Laws & Regulations	3.20
8	Inflation	3.00
8	Productivity Expectations	3.00
8	Historical Cost Data Avail.	3.00
9	Duration of Contract	2.80
9	Project Planning & Scheduling	2.80
9	Site Location & Conditions	2.80
10	Qualified Labor Availability	2.60
10	Labor Cost Estimation	2.60
10	Type of Contract Used	2.60
10	Equipment Maintenance Estimation	2.60
11	Materials & Workmanship	2.40
11	Design Changes	2.40
11	Foreign Firm Domination	2.40
11	Currency Exchange Rates	2.40

What is immediately evident from these rankings is that the respondent groups disagree on the leading cost factor. In fact, there are no common factors among the leading three each group as the following table shows:

Table-5

Consultants	Contractors	Developers
1. Design Changes	1. Local Laws & Regulations	1. On-Site Disputes
1. Duration of Contract	2. Project Planning & Scheduling	2. Work Experience
2. Qualified Labor Availability	3. Construction Design	3. Project Coordination

The other thing we notice about the segregated rankings (Table-5) is that none of the leading factors in each group, or their runner-ups for that matter, seem to have made in into the top three factors of the consolidated ranking (Table-1). This casts further doubt on the consolidated ranking's value.

Clearly, the groups are of widely different opinions. To confirm this, we correlate the entire rankings of these groups (i.e. correlate tables 2, 3, and 4):

Table-6

Correlation	Consultants	Contractors	Developers
Consultants	1.00	0.22	0.26
Contractors	0.22	1.00	0.49
Developers	0.26	0.49	1.00

The correlation is obviously weak. In light of this, we must conclude that the subgroups' viewpoints on the subject matter are substantively different and that the wisdom averaging these diverse viewpoints is questionable.

These findings all seem to indicate that the study would be better served by considering the segregated rankings rather than the consolidated one the study started with. Such an approach is more likely to lead to more meaningful observations and recommendations.

A Different Perspective

So far, the results have been analyzed from the respondent's perspective; i.e., the factors were ranked by respondent subgroup. However, the analysis to follow will be in reverse: the respondent's ratings will be viewed by cost factor. Such an approach will show how different respondents fare against each other for each cost factor. The following bar charts illustrating this approach offer a substantial amount of observations, but our analysis will settle for those that standout out. The first chart shows the respondents' rating by environmental factor:

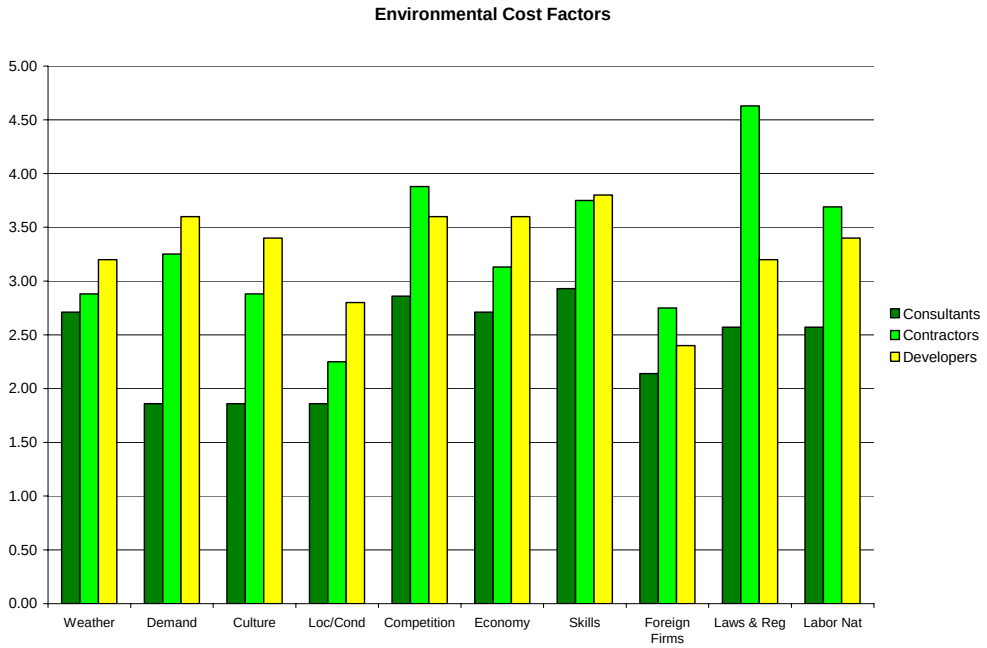

Figure-3

In the preceding chart, the following observations can be made:

- From their consistently lower ratings, consultants seem to be less concerned about environmental cost factors than the other two respondent groups. This may reflect the infrequent firsthand contact consultants have with any of these factors.

- The rating discrepancy between contractors and the other two groups in the *Local Laws and Regulations* factor indicates that contractors disproportionately feel the weight of this factor. So heavy is this weight that the factor scores the highest among environmental ratings. Contractors do indeed shoulder a large part of the work, and laws and regulations might unduly obstruct such work. If this is the case, contractors would do well to challenge unreasonable laws. On the other hand, contractor lack of awareness or disinterest in these laws could be the culprit.

- *Local Competition*, again registered by contractors, appears to be the second highest scoring environmental factor at 3.88. What is interesting about this particular factor is that it is synonymous with reducing costs rather than increasing them. So the question is: when selecting this factor, are contractors drawing attention to the benefits of competitive forces in their industry or decrying the affect of these forces on their profit margins? Either way, competition seems to be a significant cost saving factor.

As for operational factors, the following chart is illustrative:

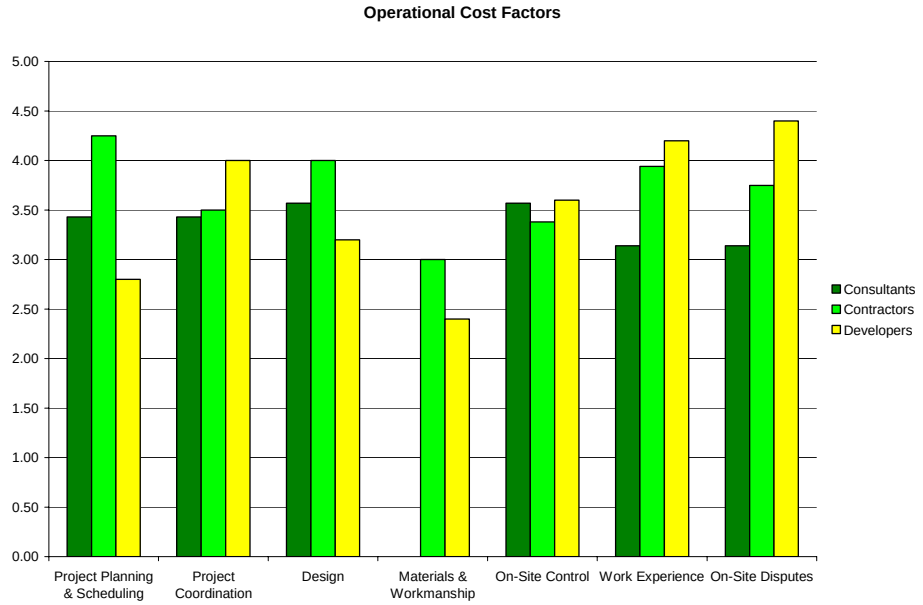

Figure-4

For the operational chart, the following is evident:

- The highest scoring operational cost factor is *On-Site Disputes* entered by developers. This is not surprising as it is usually the developers' funds that are held hostage to the disputes of other parties. In this case, developers might find it in their best interest to play a more active role in mediating such disputes.

- A close second is *Project Planning and Scheduling*, entered by contractors. Contractors lend credibility to this factor since they are they party working through these plans and schedules. There are two venues to tackle planning and scheduling problems. The first is in the initial planning stage, when these plans and schedules are laid out. Planners and schedulers may want to review their sources and methods during this stage and ensure that they are commensurate with the existing circumstances particular to the Saudi scene. The second venue is the operational one, where contractor management can empower the role of schedulers and planners.

Next is the contractual cost factor chart.

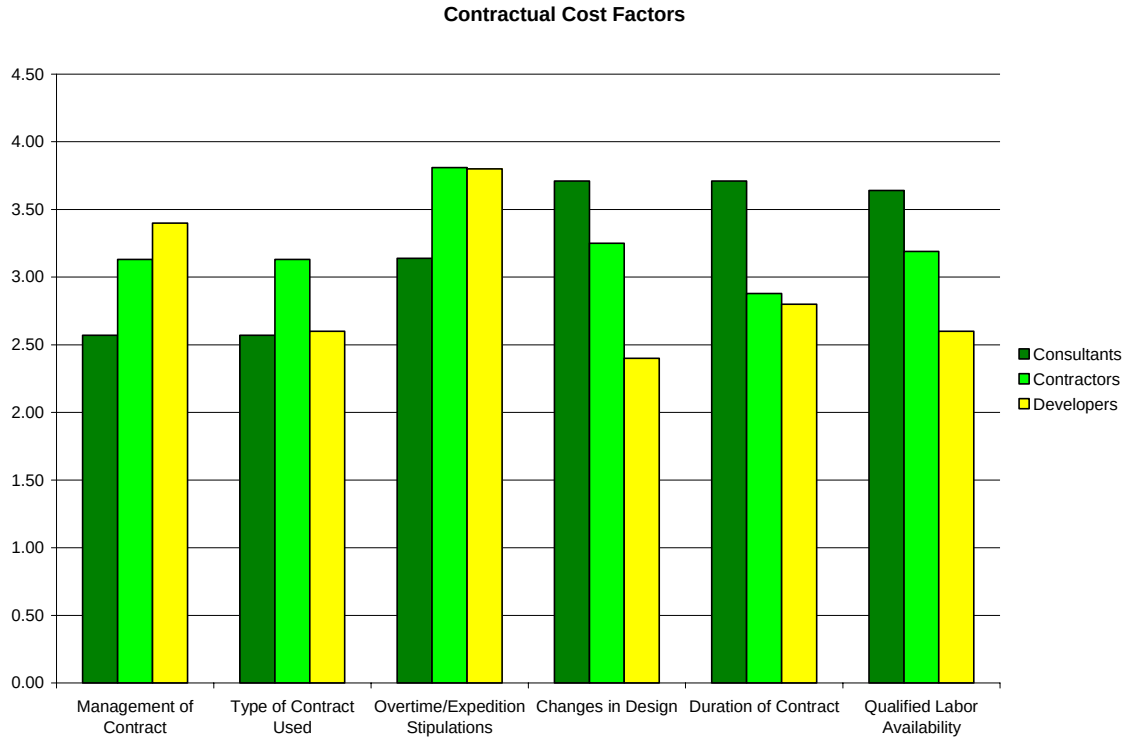

Figure-5

The two highest contractual ratings occur under the same factor: *Overtime/Expedition*. Moreover, these ratings are made by the two groups who

are most affected by the cost implications of overtime: the contractors performing the work in first place, and the developers funding it in close second.

There are two main implications of overtime work. First is the additional cost it imposes on a project. This is especially true since overtime is, in its nature, a measure intended to tackle unforeseeable, and therefore unbudgeted for, situations. In this respect, owners in particular should seriously consider overtime/expedition stipulations in the course of negotiating contracts and ensure that overtime and other similar recourses are available as viable options in the course of a project.

The second implication of overtime is the delay and resulting lack of productivity is causes. This throws us back to planning and scheduling problems discussed earlier. A more realistic and thorough approach to planning and scheduling would surely lessen the likelihood of overtime and its negative implications.

Estimation cost factors are presented in the following chart.

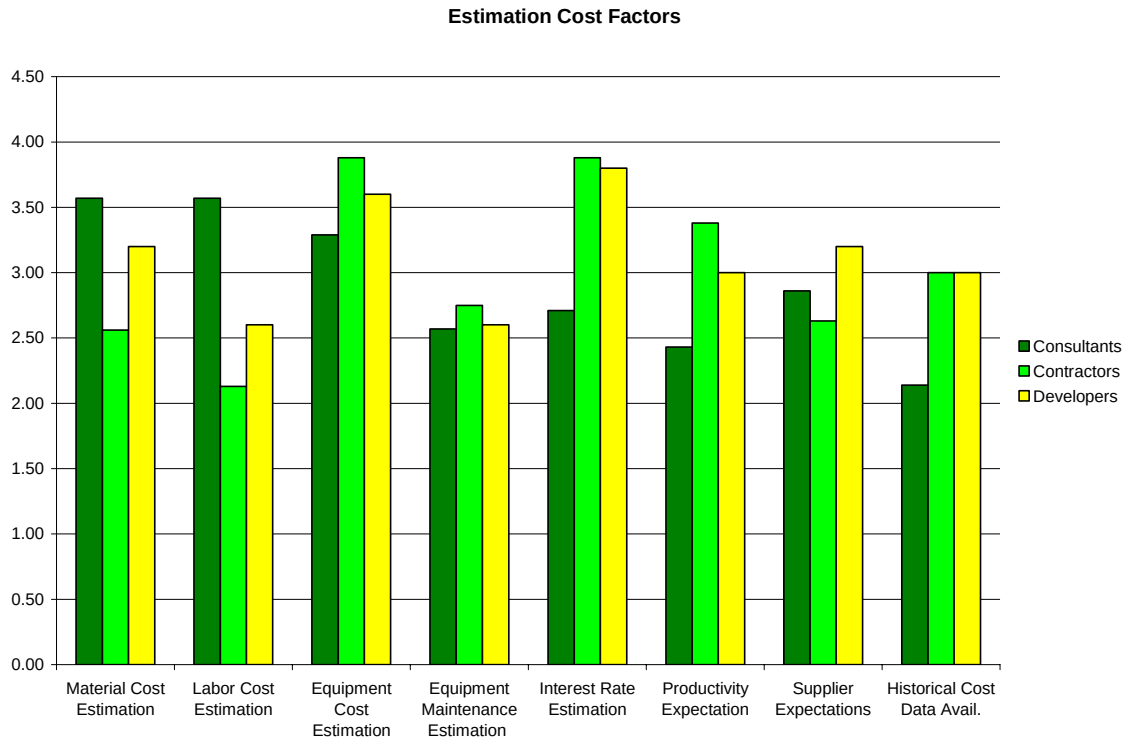

Figure-6

The highest estimation cost rating (3.88 out of 5) is shared by two different factors both entered by contractors. These factors are:

- *Equipment Cost Estimation*: It appears that contractors are wary of construction equipment estimates. This is unfortunate since such equipment is the vital link between a project's labor and materials.

Estimators would do better by checking their estimating methods and saving the project from unpleasant surprises.

- *Interest Rate Estimation*: Contractor concern about this factor is shared by developers who almost feel as strongly about it (3.80 to the contractors' 3.88). Interest rates, though not in the realm of construction, should not be allowed to unduly eat away at a project's funds. Professional financial advice could mitigate the corrosive effect of interest rates on a project's finances.

The fact that these two estimation factors are highlighted by contractors should draw our attention since it is contractors who are tasked with bringing these estimates into existence.

The following chart deals with financial factors.

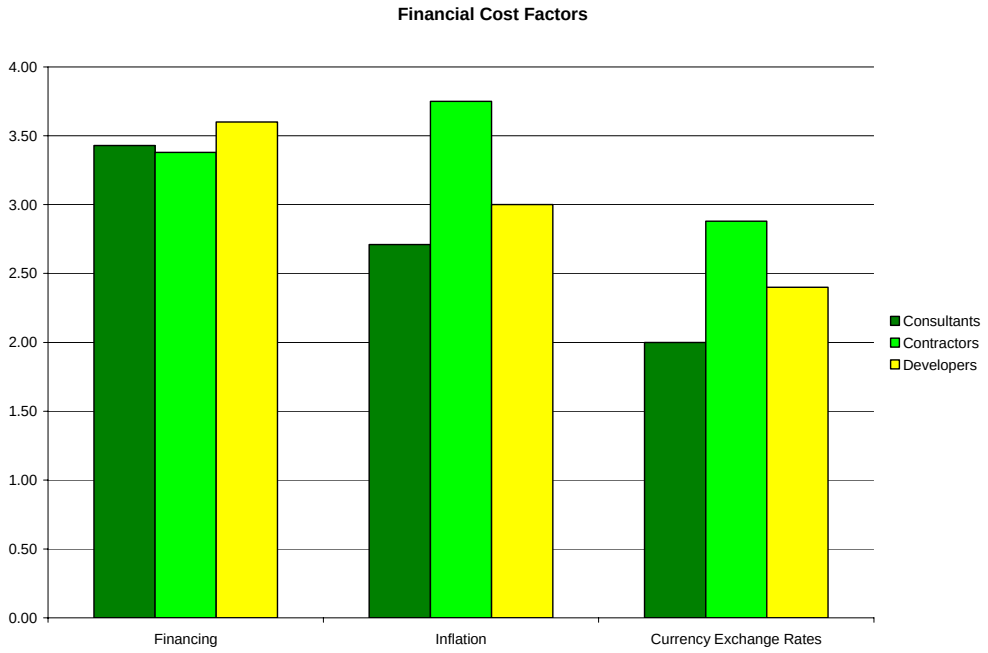

Figure-7

The following observations can be made for the financial chart above:

- Thanks to contractors, *Inflation* scores the highest among financial factors. This may indicate contractor frustration with prices, which in turn raises questions about their purchasing process. For example, if price fluctuation is an issue, contractors would be well advised to seek long-term supply contracts from vendors and suppliers to avoid price uncertainty.

- Developer concern about *Financing* secures it the second highest score among financial factors. This rating may stem from the funding role normally played by developers. However, the fact that the other

respondents feel almost as strongly about this factor signals the larger challenge posed by financing for the construction industry as a whole. In light of this, a two question com to mind: are local financial institutions familiar with and willing to cater to the construction industry? If not, what can the industry do to convince these institutions of their profitability and in the process mitigate some of their concerns?

STUDY LIMITATIONS

Before any conclusions can be drawn from this study, its limitations must be highlighted:

- While the questionnaire filters for qualified organizations, an individual, whose qualifications are unchecked in the survey, ends up providing the response. The survey should either incorporate these individuals in the filtering process or directly target them rather than their organizations.

- The pool of respondents in the survey is too small (a total of 35 respondents) for any authoritative conclusions. Moreover, the dataset does not appear to emulate the surveyed population (the Saudi construction industry) in structure; i.e., proportions of contractors, consultants, and developers. Statistical deductions are only as strong as the size and quality of the dataset they are drawn from. The size and quality of this study's dataset imposes reservations on deductions.

- Owing to their different backgrounds, the respondent groups (consultants, contractors, and developers) display diverging opinions regarding the subject matter. Blending or equally considering such opinions is questionable. A more suitable method should be developed for receiving, treating and analyzing such opinions.

- Despite the experience and professionalism of the survey's respondents, their inputs remain personal opinions whose objectivity cannot be verified. Furthermore, the study neglected to treat the results for outliers and other statistical undesirables which might impair findings.

- The experience of the survey's respondents appears to be limited to government related housing projects. However, most Saudi housing construction projects are not related to the government. For the study to be representative, it would have to widen its scope to cover non government housing projects in a manner proportional to existing trends.

- The study's coverage is limited to the Central and Eastern provinces of Saudi Arabia. However, to truly represent the whole of Saudi Arabia, the

study would have to at least include the Western province, where a large part of the country's housing construction takes place.

CONCLUSIONS

The aim of this study is simple: to survey the Saudi construction industry's opinion of the influence of certain factors on housing construction costs, analyze the results, and interpret them in a manner that allows for recommendations aimed at reducing housing construction costs in Saudi Arabia.

After analysis, this paper finds that it is more meaningful to consider the respondents' responses separately rather than collectively. In this respect, the study arrives at the following:

- For consultants, *Changes in Design* and *Duration of Contract* tie as the most influential cost factors.

- Contractors consider *Local Laws and Regulations* to be the most influential cost factor followed by *Project Planning and Scheduling*.

- Developers regard *On-Site Disputes* as the most influential cost factor followed by *Work Experience*.

Moreover, the study reconsidered the results from the factors' perspective to arrive at the following:

- Environmental Factors:

Rank	Factor	Respondent
1	Local Laws & Regulations	Contractors
2	Local Competition	Contractors

- Operational Factors:

Rank	Factor	Respondent
1	On-Site Disputes	Developers
2	Project Planning & Scheduling	Contractors

- Contractual Factors:

Rank	Factor	Respondent
1	Overtime/Expedition Stipulations	Contractors
2	Overtime/Expedition Stipulations	Developers

- Estimation Factors:

Rank	Factor	Respondent
1	Equipment Cost Estimation	Contractors
2	Interest Rate Estimation	Contractors

- Financial Factors:

Rank	Factor	Respondent
1	Inflation	Contractors
2	Financing	Developers

RECOMMENDATIONS

Construction projects are complicated endeavors. Their success rests on the interaction of a wide group of players, each with its own unique contribution. However, the party at center stage of this process is the contractor. After all, it is the contractor who performs the *actual* construction. Therefore, this study, in hopes of achieving maximum effect, will target contractor concerns in its recommendations.

This is not to say that other groups' opinions are less important. On the contrary, consultants and developers are major shapers of construction projects. Nevertheless, these parties may not be as in-touch with the construction process as contractors are. Having said this, we focus on the two leading cost concerns as expressed by contractors through this survey.

Local Laws and Regulations

The leading contractor concern is with local laws and regulations. Contractors obviously feel that these laws constrain their operations in some manner or other. What remains to be determined is whether such laws are worthy of the strain they caused the contractor and, by effect, the construction industry. Of course, these laws, when first adopted, were probably intended to prevent or curtail some undesirable eventuality. Such undesirables must be weighed against the anguish these laws cause the construction industry. If the anguish outweighs the law's benefits, then contractors, and the industry as a whole, have logical grounds for challenging this law. The question remains whether the industry has the *resources* for building such a case and the *vehicles*, such as professional associations, for forwarding such arguments.

In the case that the law's benefits outweigh contractor concerns - as judged by the authorities, of course - the question becomes whether the contractor is aware

of and appreciates these benefits. If not, then measures must be taken to familiarize contractors with these laws and why they are in place. An informed contractor is less likely to feel threatened by such laws and will more ably navigate them while conducting a project. The ability to bring about such an outcome lays mainly in the hands of local authorities who can publicize their laws more widely and actively target contractors in these efforts. For instance, authorities may test contractors on these laws as a condition for licensing them.

Planning and Scheduling

Planning and scheduling problem exist for two reasons: unsuitable plans and schedules and laxity in conforming to them.

When the problem stems from the plans themselves, the blame clearly lies in the lap of the planners that put them in place during the planning stage of the project. The most likely culprit for unrealistic plans is lack of project experience on the part of the planners. A remedy might be to reserve planning roles for thoroughly experienced construction personnel who are familiar with the timeframes of construction operations and are aware of the particular dynamics of the local supply chain of services and goods.

The other front of the planning and scheduling problem exists in the implementation phase of a project when the plans and schedules are being executed. No matter how well developed a plan is, it is useless if not diligently conformed to. This, of course, cannot be guaranteed unless a suitable position exists with enough *authority* on the project to force these plans and schedules through.

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