Pricing analysis in huge construction projects considering the material quality and the building strength (case study: Mehr-e-Pardis Construction Project)

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Pricing Analysis In Huge Construction Projects Considering The Material Quality And The Building Strength (Case Study: Mehr-E-Pardis Construction Project)

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ABSTRACT

Today, pricing of construction projects and the consequences caused by using inferior materials in huge construction projects and also the new shape of modern buildings that are suited to the today human needs, have a significant effect on cost estimating of today's buildings. Therefore, identifying the causes and rooting them in huge projects is essential in order to minimize its negative effects.

The purpose of this research is cost evaluation of huge construction projects considering the material quality and the building strength. This is a correlation research, which is one of the descriptive research methods. In this research, the correlation between independent variables “ material quality and building strength” is evaluated as a criterion in pricing of construction projects with the" case study of Mehr Pardis buildings " and also the ability of independent variables in the prediction of building strength are compared to each other.

An empirical data collection method was performed using Internet websites and computer softwares. In addition, SPSS software was used to analyze the results.

The results show that the building strength in the pricing model of construction projects based on the material quality can has more accommodation with actual efficiency. Therefore, it is suggested that in these constructional projects under different economic conditions, the pricing model of constructional projects based on the material quality is used to explain the relationship between risk and building strength rate .

Key words: Pricing, Building Strength, Material Quality, Maskan Mehr Pardis.
1. INTRODUCTION

Housing as a durable, Immovable, capital, consumable, and with consequential outcomes, accounts for a large share of households' budgets, costs and investments, and plays an important role in the employment and value added of countries [1]. These same features have led governments to intervene in the housing market and make a plan and policy. Housing and its market is one of the topics that has attracted a great deal of urban studies, especially urban economics, during the last forty years [2]. Although urban and regional economic studies consider housing as a commodity, it is the fact that housing has a wide diversity and many types of markets [3]. In other words, the housing market is not a unit market, and has sub-markets that are separated from each other by type of capture, unit type, unit life, residential life, quality, financial provision and size [4].

Material Management is an essential operation to improve the efficiency of construction projects. Material management should be considered at all phases of the construction process and production and manufacturing. This issue is importance, because poor material management can often affect on the entire time, quality and cost of the project. Planning and controlling materials are the important factors, especially to ensure that the quality and quantity of materials and equipments are acceptable, and especially in terms of time, reasonable cost and availability. [5]

In order to create a secure prospect for earning and making a certain profit for public and private sector builders who are involved in building construction and housing, proposing a new method that has the following features is essential:

- Can predict incremental and lowering changes of prices for the major and widely used materials in most construction projects, and possibly estimating their values with acceptable error
- Can assess and evaluate the fluctuations pattern of price for these materials
- Can indicate that the market fluctuations of which material have the greatest impact on the price of other material, or the market price fluctuations of a specified material obtain own main influence from which market or production institution.
During human life period, especially in the last century that urbanization has grown rapidly, housing has been one of the major socio-economic needs of various societies, and governments are working to find solutions to its problems by managing plans and policies [6].

In this research, we try to evaluate constructional costs in huge construction projects with considering the material quality and the building strength in the construction project of Mehr Pardis housing.

The most important factors will be identified by consulting engineers and experts involved in the project. Subsequently, the most important factors are examined by providing a questionnaire to consultants, the employer and the project contractor, and analyzing their responses.

2. THE BASIC OF RESEARCH

The construction industry is one of the largest construction industries that the public is its users. Housing, which is one of the final products in the building industry, plays an important role in the economy of a country. There are many people who work most of their lives to buy or rent a house.

The price of this important commodity is mainly based on its location (land prices), amenities and decorations. Most users do not attend to its quality. However, quality is important for creators in some buildings and they focus on factors affecting the quality.

Of course, the purpose of providing a civil engineering certificate defined and implemented in the construction cycle is to express the quality of the building.

It should be noted that the livelihood of people is such that they often seek inexpensive housing. Therefore, the enough backgrounds for not paying attention to the quality and thus reducing the cost of the building are provided. The result of this phenomenon is what has been witnessed in the not-so-big-earthquake in the past.

But the country's move to industrialization and attention to wisdom development requires the quality to become more prevalent and building quality is considered as the basis for the issuance of the end of work and real estate. In this case, the insurance industry in the building industry will, in the real sense of the place, open its place.
3. PRICING STRATEGIES

The price represents the seller's and customer's perception of the value of the product. The price is the visible element of the product that leads to purchase or not purchase of the product and directly affects on the profit margin[7]. Determining the pricing method is one of the most important and complex decisions that managers have to make. If the price of the product is high, the company will not remain competitive, and if the price of the product is low, there is a threat to reduce the company's profits. It is very dangerous if a company increase or decrease its own products’ price without considering demands [8]. In the field of marketing strategies, various pricing strategies have been identified and introduced.

**Cost Plus Pricing:** Cost plus pricing means that the prices are set based on costs and other elements such as administrative costs and profits be added to it. This strategy is appropriate when pricing procedures follow the organizational rules and also when a project passes through very beginning and ending stages. This strategy is applied when the products are diverse and it is difficult to formulate regulations and consider the market situation individually [9].

**Experience Curve Pricing:** With increasing production experience, the costs of marketing and production decrease. Using cost-reducing privilege, current prices are determined based on future costs (which will be lower than current costs). By setting today's prices based on less future final costs, the company has a kind of price advantage over its competitors. This is a logical way when, firstly, the effect of the experience curve is significant, secondly, the company is already ahead of its rivals, thirdly, customers are sensitive to price [9].

**Return on Investment Pricing:** it means the determination of essential price levels to obtain desired profit [9].

**Phase out Pricing:** The determination of high prices to withdraw products from the market. This strategy does not mean eliminating the product. This strategy is used by specific customers who are willing to pay high prices to access their source of supply [10].
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Skim Pricing: It means high pricing in order to take advantage of customers who are less sensitive to price. The goal is to earn a profit in the short term. This strategy is an opportunity to compensate large investments and allow companies to reimburse their costs in a short time. However, if the prices be higher, the margins and therefore the probably existence of competitors will be higher [11].

Penetration Pricing: This approach means pricing less than commonly level to enter the market and increase market share. This is a method used to prevent competitors from entering the market. Intrusion pricing is used when customers are sensitive to price. The favorite conditions for using this method are when competitors are not expected to react to your prices [14].

Perstige Pricing: In this method, an image of mind and quality is created by using high price. Prestige pricing strategy is a long-term process whose purpose is using the price as part of the overall product image [11].

Part pricing: It means different prices of the same groups for different groups of customers. This strategy is appropriate for the situation that product can be changed in accordance with diverse needs of customers at the lowest cost, or consumer parts are non-competitive and do not exceed the legal limits [10].

Loss Leader Pricing: Companies are attracting their customers with a dramatic price and increasing their market share. In other words, it means pricing one or more products at very low prices to attract customers and combinatorial sales with other products so that company’s profit be acceptable. This strategy is used when there are complementary products that can be sold with the product [10].

Positioning pricing: This method is used for positioning against competitors. Although finding a portion is also proposed in perstige pricing, but here the company wants to set its prices less than or equal to competitors in order to find the product in an appropriate position in customers’ mind [9].
Follower Pricing: The follower pricing means the pricing that is relevant and appropriate to industry leaders. This strategy applies when the market is dominated by one or two price leaders, and extreme price fluctuations may have bad consequences. [10].

Slide down pricing: Slide down pricing goal is a continuous reduction of prices to meet different demand layers. This strategy is used when a product, at a lower price level, is permanently taken into consideration by a larger group of consumers, and the organization with the content of learning curve and other savings on a scale of distribution, promotion and sale, follows production strategy at a lower cost [10].

Pricing based on facilities and additional options: It is a pricing strategy that determines the price of the product based on the facilities and additional options of the product. This strategy applies when the price sensitivity is very low [11].

4. THE BUILDING STRENGTH
It refers to a set by which can see the increase of security, strength, and strength of space, collection or construction. "The purpose of this action is to increase the durability and integrity of the structure of space organization" [12].

Background Of Legislation And Quality In The Construction Industry
With a quick look at the collection of past artifacts, one can conclude:

- The construction industry in Iran is based on the principles of design and engineering.
- Architecture and building culture has been integrated with the people's culture and architects have well aware of its importance in everyday life.
- The principles and rules of architecture and building execution have been used from a perfect harmony.
- The building construction from design, implementation and supervision has been done by a group led by experienced architect who has learned the necessary training from generation to generation.

These principles and rules have been described in various aspects of organization and coordination as follows:

- Professional criterias between the employer and the manufacturer;
- Relations between designer, builder and supervisor;
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- Recognition and proper application of materials with respect to local materials;
- Calculating building structures;
- Optimal use from natural forces such as wind, sun, etc. in the design of buildings [13].

But in the last few decades, engineering has undergone a change in a variety of fields in the country, that its consequence is inconsistency and incoherence. Although engineers and experts in the country mainly have science and knowledge, but lack of practical experience during studying make problems. It may be said that the quality of the building is not designed.

However, the basic condition for improving the quality of the country's construction industry is to develop comprehensive and efficient regulations that are appropriate to the technical, economic, social, cultural, climatic and environmental conditions of the country and to adhere to them. To implement the rules and regulations, we require a cultural establishment. It is also important to note that in today's world, regulations are an indicator for the technical progress of each country. Not only does the rules and regulations prevent the waste of time and facilities in the country, but also provide the necessary field for local technology.

5. FACTORS AFFECTING THE BUILDING QUALITY

The most important factors affecting the quality of construction are: the condition of the site, the design, materials’ quality, implementation methods and the conditions of maintenance and repair of the building, which will be described further [14].

Today, there is not enough research to know the country's structural conditions, and there are some basic weaknesses in this regard. However, in the 2800 standard, the zonation map of probably earthquake threat was provided, the "Design of buildings against earthquakes".

In terms of design, engineers get essential information from their academic training and often make good designs and their calculations have a precise base. There are also efficient regulations and rules in this area.

The weakness of the constructed structures often depends on three other factors: conditions of implementation, the materials’ quality, and maintenance and repair.
Structures are often built up by unskilled and inexperienced workers. The materials’ quality in the site of construction workshops is often obscure, and users have no systematic maintenance and timely repair program for their buildings. These factors can be addressed as the process of defining and by considering the principles of quality management.

6. BACKGROUND RESEARCH

Abedini [15], explained about identifying and assessing risk in building projects (Case Study of Mehr Province, Qom Province)”. Mehr construction projects, in terms of implemention synchronization and as a unique historical phenomenal in the sector of buildings mass production, have played a key role in the national economy cycle, employment and a good opportunity for thousands of rural and urban families who have been demanding personal house. On the other hand, large-scale investment for building millions of residential units after many years, requires strong management. One of the important issues in managing such projects is quantitative and qualitative risk analysis. Complexity and dynamics in construction projects have increased the uncertainty in the risk analysis process. The risk assessment capability for a project will significantly contribute to the successful delivery of the project. Therefore, the purpose of this study is to provide a quantitative risk assessment method based on the knowledge and experience of many experts in identifying risks and their structure, as well as their mental judgment of parameters such as the occurrence probability and the effect intensity of the risk, which is considered for general evaluation of the Risk. This methodology is highly dependent on the experience of the risk management team and its simplicity makes it possible to do such an assessment in significant decisions during the life cycle of the project. Another benefit is that this method is independent to previous years' data, so that the unique feature of development projects do not cause a problem for this method. In order to achieve the objectives, a questionnaire was prepared and 150 experts from Road and Urban Development Department of Qom province, companies and co-ops and construction contractors of Mehr Building, supervisors of construction engineering organization, directors and supervisors of workshops and civil engineers who directly are contributed by the Qom Mehr housing projects, distributed. 80 questionnaires were collected from
the above mentioned number. Identified risks were classified by factor analysis and ranked first by using artificial fuzzy assessment based on occurrence probability. Empirical research findings showed that the highest risk is in the construction industry, and the overall risk index (ORI) of Mehr Housing Projects can be considered as "high" and "very high". Therefore, the risk of investing in Mehr housing projects in Qom province is interpreted at a very high and dangerous level.

Sepahvand [16], proposed his research entitled "Designing a Selection Model for the Selection of Pricing Methods for Construction Companies in Recession Period by Using the Combination of the BSC and AHP Method". The purpose of this research was to design a model for selecting the pricing strategy of construction companies during the recession period by using a combination of BSC and AHP methods. Usually, organizations use the BSC method not only to evaluate performance, but also as a framework for formulating strategies, and controlling their implementation. In the present study, we first design a pricing pricing model by using the BSC method, and then use the AHP hierarchical analysis process for weighting in order to eliminate the problem of balanced views and objectives. This method reduces the Personalization rate of weighting goals. According to the information obtained using Expert Choice software, customer-based pricing strategies, pricing strategies for internal processes, pricing strategies supporting growth and learning, and pricing strategies sponsoring the company have respectively The highest weight is due to the recession period.

Lick, Lotte, Batman, and Langfard [17], evaluated the negative impacts associated with road development (in particular, noise pollution and vision problems related to road construction), were assessed road development in Glasgow, Scotland, in order to determine monetary values.

Pire and Schimizo [18], analyzed the long term cost-benefit of a new urban train system in the Hook Line 7 for Tokyo by using the simple and two-step rozen Hedonic methods. They have estimated the benefits of the entire new urban train system using the cost function of earth Hedonic and the utility function.

**Research Hypotheses**
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1) The quality model of power materials has more explanation in predicting real efficiency than the building strength model.

Table 1 Findings of the first hypothesis

<table>
<thead>
<tr>
<th>The first main hypothesis</th>
<th>Pearson Correlation Coefficient</th>
<th>The significance level</th>
<th>Interpretation</th>
<th>Duration-Watson</th>
<th>F Statistic Coefficient</th>
<th>The significance level</th>
<th>Interpretation</th>
<th>T Statistic Coefficient</th>
<th>The significance level</th>
<th>Determination coefficient</th>
<th>Interpretation</th>
<th>the first main hypothesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>First sub-hypothesis</td>
<td>145</td>
<td>0</td>
<td>Existence of correlation</td>
<td>83.981</td>
<td>21.819</td>
<td>0</td>
<td>Existence of a linear relationship between variables</td>
<td>88.404</td>
<td>0</td>
<td>The existence of regression relationship</td>
<td>0.021</td>
<td>Priority of the second hypothesis (Building Strength)</td>
</tr>
</tbody>
</table>
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<table>
<thead>
<tr>
<th>Second sub hypothesis</th>
<th>Pearson correlation coefficient of material quality in pricing</th>
<th>Significant level of material quality in pricing</th>
<th>Interpretation</th>
<th>t Statistic test (material quality in pricing)</th>
<th>Significant level of material quality in pricing</th>
<th>Interpretation</th>
<th>Material quality variance in pricing</th>
<th>Building strength variance in pricing</th>
<th>Interpretation of the second main hypothesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>323</td>
<td>0</td>
<td>Existance of correlation</td>
<td>86.7</td>
<td>Independence of errors</td>
<td>6.10</td>
<td>0</td>
<td>The existence of a linear relationship between variables</td>
<td>22.10</td>
<td>The existence of regression relationship</td>
</tr>
</tbody>
</table>

2) The error rate of predicting the real efficiency and the building strength of the material quality model is less than the building strength model.

7. RESULTS

Table 2 The summary of findings of the first hypothesis
7.1. Estimating costs and pricing of construction projects
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The United Nations Industry Development Organization (UNIDO) has been working with government organizations, business institutions and private companies to solve their industrial problems for more than 30 years and has tried to teach them how to solve their problems. One of the tools that Unidio has designed for this purpose is the Comfar software. The first version of the software was released in 1962. After that, Unidou has been working continuously for the improvement and development of this software. The third version of Comfar was released under Windows in 1995, after which it is updated annually to develop the technical and user requirements. This software has been completed based on the experiences, views, descriptions and needs of over 5,300 users in 140 countries, as well as on the basis of the Unido guidebook and for industrial feasibility studies. COMFAR is a software approved and published by the United Nations Industrial Development Organization. According to the organization, after reviewing the methodology for evaluating economic and financial plans and projects in more than 50 countries, the software is based on the designed methodology bu Uniodo, and now the output reports of this software is one of the required documents to grant loans and facilities by Iranian banks to applicants for investment in projects. Therefore, this software has educational application at universities and also is a commercial and valid software for financial and economic organizations all over the world (Iran Applied Management Development Research Institute, 2007).

Limited resources require that existing facilities be used optimally and capitals are used as best as possible. Lack of proper use of capital not only destroy opportunities for investors, but may also face them with Irrecoverable losses. One of the most effective ways to use the available facilities and also prevent potential losses is to have sufficient information for predicting the results and determining the factors affecting the project profitability. Collecting, categorizing and analyzing information on facilities and constraints, as well as estimating hardware and software needs for implementing investment projects, and ultimately predicting project profitability and its economic, social and cultural effects on the society, are the achievements of conducting proper and scientific feasibility studies.
When demand rate is much higher than produce ability of the largest same unit, the ability to invest and meet technical requirements (buildings, machinery, raw materials and etc.) is definitely a determining factor in the amount of construction. This case can also be distinguished after studying the market and examining the construction ability of other units. After determining the production capacity, it is necessary to make the essential predictions for technical requirements of the project. Therefore, it is first necessary to define the production process and determine the methods and equipments, this issue requires studying the exact specifications of the construction projects as well as specifications of the selected technology for their construction. At the end, a list of the number and type of machinery and equipments based on the construction capacity, the manpower required and its organizational structure, the characteristics of buildings and facilities based on the number, type and arrangement of machinery and the number of Human power and material quality and building strength building, is neccery. Also, systems and sub-systems of organization’s management structure are defined by considering the technical characteristics of the unit. At the time of exploitation, these systems play a key role in the optimal use of resources, cost savings and productivity improvements. For example, the existence of a maintenance planning system (PM) in construction projects, using engineering methods, minimizes the possibility of machine and plant failures, or the existence of a system Controlling construction, by defining the optimal amount of each purchase order for quality materials, prevents building instability, as well as other systems (MIS management information systems, QC quality control systems, etc.) that the absence of any of them in the organization, in today's competitive atmosphere,means discarding part of the available facilities and capabilities (instructions for preparing Explanation of Industrial Design Justifiability, UNIDO, 1991).

The information obtained at the end of the technical sector studies is the basis for the financial review of the plan. Thus, the monetary value of the defined items in the technical sector will be used as input information in this section and, after calculating and obtaining a process from the financial status of the plan in the coming years, It provides useful and necessary analysis for deciding how to invest and obtain facilities and predict the plan’s
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profitability in the coming years (the Unido Handbook for conducting feasibility studies for projects Industrial, 1994)

8. SUGGESTIONS

After carrying out the steps of a scientific research, if the research is conducted in a systematic and researcherial process, the researcher can certainly states comments on the findings and results of the research to improve future research. As a result, some suggestion will be presented in accordance with the obtained results for future research in the following.

8.1. Suggestions based on research findings

According to the results obtained from the assumptions, the proposed model of this research is a pricing model for construction projects based on materials quality. This model can explain the relationship between risk and efficiency in pricing the Mehr Housing Project during the years 2008-2009, and has shown its capability rather than pricing model based on the building strength.

According to the obtained results, it is suggested that in these construction projects under different economic conditions, the pricing model of construction projects based on materials quality materials be used to explain the relationship of risk and strength rate. Because, according to the research findings, the building strength in the pricing model of construction projects based on materials quality can be more compatible with real efficiency.

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