

CONTRACTOR BUSINESS STRATEGY DECISION IN COMPETITIVE BIDDING: CASE STUDIES

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Abstract: The purpose of this paper is to examine the relationship between relevant parties and contractors regarding the bidding decision during bidding process. The game theory can be a tool for contractors' business decision. This paper will define the business strategies that are demonstrated by contractors and the bidding decision was determined by using the bid model based on game theory. A company might win a tender over its competitors basically because other competitor has submitted the dangerously lowest price or higher price. The bidding process is crucial problem for contractors because involving the complicated decisions and strategies. Bid / no bid decision and mark-up price/ bid price would be two critical items for contractors. Four (4) case studies been conducted and a game tree/ decision tree analysis on their current business strategies were undertaken. It is proposed that a bid model (game theory) would be able provide a systematic support system to help the contractors define their business strategies decision in competitive bidding.

Keywords: Contractor; Business strategy; The game theory; Competitive bidding; Construction companies

1. INTRODUCTION

The ability to understand bid or not decision and predict markup price to make profit is of fundamental importance for the survival and progress of any contractor. Business profitability is closely related to the willingness and ability of businessman to invest and employ. In order to increase the understanding of the bid decision and markup price, there are literature review have been made and examines these factors that influence the firm's business strategy in competitive bidding. As a result it is believed that the game theory is closely related to contractor's decision and that the bid decision and markup price have a vital impact on the contractor's business strategy. The concept of strategy in business is analogue to that in war. Strategy as an area management is concerned with the general direction and long-term policy of the business as distinct from short-term tactics and day-to-day operations (John, 1985). It used to be said that it was more important to 'do the right things' than to 'do things right'. In order words, strategy was more important than management of day-to-day operations. This was probably true during early 1990s when the economy was expanding and property boom of this period, even poorly managed companies found it easy to make profits. The financial crisis that started in July 1997 which affected

currencies, stock markets, and other asset prices in East Asian, the market become more turbulent and competitive. While it is still true that a strategy which positions a company badly compared to its competitors can lead to its failure, it is also true that poor day-to-day management can have the same effect. Success will be achieved only by both good strategy and sound day-to-day management (Houlden, 1990). The methods are to be used by each of the functional areas of the organization in carrying out the business strategy is called functional strategies (Bryars, 1990). Functional strategies are direct to the specification and require much more participation of the staff. These are fulfilled by the contractor firms in term of the competitive tendering process characteristic which are specific, technical and commercial process, Bryars indicated that the complement of each strategy for each of the functional is needed all the time to support the business strategy. The functional strategies are marketing, finance, production/operation, human resource and research and development. Liew Chin Cheat (1994) highlighted 8 items important business factors taken into account in selecting the business strategies for contractors firms; risk, company image, market prospect, timing, long-term environment threat/ opportunities, profit potential, market growth and company strengths/weakness (see Table 1). There are not varying between Bryars and Liew in the business factors selection. I defined that Liew's business factor strategies are extension of Bryar's functional strategies. I placed Liew's business factor strategies can be incorporated into Bryar's functional strategies.

Table 1. Categories Liew's business strategies (1994) into Bryars's business strategies with features' explanation

Business Factor	Features	Functional Strategies
Risk	Risk is the potential harm that may arise from some present process or from some future event. Financial risk is often defined as the unexpected volatility or volatility of return.	Finance
Profit Potential	Profit potential helps business of all size in all categories maximizes profit by identifying issues.	Finance
Timing	Timing is a strategy of attempting to predict market.	Marketing
Company Image	Effort to reinforce company identity, build brand awareness and company good reputation.	Marketing
Market Prospect	Ability to increase company consumption to the client.	Marketing
Company Strengths and Weakness	The company strengths and weakness may give a signal deterring entry to certain market.	Marketing, Finance
Market Growth	Objective assessment of the market environment.	Marketing
Opportunities	Marketing	Marketing

2. Game Theory

Game theory has become an enormously important field to study. It is now a vital methodology for researchers and teachers in many disciplines, including economics, political science, biology and law. What is game theory anyway? I highlighted where game theory could be useful in analyzing and understanding the contractors' business strategy decision. There are several different answers to this question.

-the study of multi person decision problems (Gibbons, 1992).
-a bag of analytical tools designed to help us understand the phenomena that we observe when decision-makers interact (Osborne and Rubinstein, 1994)
-the study of mathematical models of conflict and cooperation between intelligent rational decisions-makers (Myerson, 1997)

Game theory is a distinct and interdisciplinary approach to the study of human behaviour. The disciplines involved in game theory are mathematics, economics and the behavioral science (Huang and Wu, 1994). Making business decisions requires many different skills and areas of knowledge: financial, organizational, marketing, economic, legal and operational. Contractors increasingly have to make decisions that will directly affect the profits of their firm's rivals or allies. In such strategic interactions, a contractor must be able to think strategically. There are three assumptions that we made throughout the paper:

1. Each player in the market acts on self-interest. They pursue well-defined exogenous objectives; i.e., they are rational. They understand and seek to maximize their own payoff functions.
2. In choosing a plan of action (strategy), a player considers the potential responses/reactions of other players. He or she takes into account her knowledge or expectation of other decision makers' behaviour; i.e., his or her reasons strategically.
3. The rules of the game are common knowledge, which each player knows the rule of the game. The players know each other as well.

A game describes the outcome of each player depends upon the collective actions of all players involved. In order to describe the collective action, we need to know:

- The players who are involved. (Contractors)

- The rules of the game that specify the sequence of moves as well as the possible actions and information available to each player whenever they move.
- The outcome of the game for each possible set of actions.(bid/no bid decision and profit margin)
- The payoffs function based on the outcome.

The prisoners' dilemma is a well-known example and is motivated by the following story. Two suspects are taken into custody. The district attorney is convinced that they are guilty of a certain crime but does not have enough evidence to convince a jury. Consequently, he separates the suspects and tells each other one that he has two choices; to either confess or not confess to the crime. The suspects are told that if both confess, neither will receive special consideration and will therefore receive a jail sentence of five years. If neither confesses, both will probably be convicted of some minor charge and have to spend one year in jail. but if one confesses and the other does not, the suspect who confesses will be set free for cooperating with the state while the suspect that does not will have the book thrown at him and a ten years sentence. The game theory is the strategy application tool that can be applied everyday and everywhere. In a school mathematic competition, if the teacher wants to nominate the student in his class to take part of the event, he needed to choose one student among Malay, Chinese and Indian students in his class. He knows that other two classes were represented by Chinese student and Indian student, while the mathematic question is in Bahasa Melayu form. He noticed that Malay students are strong in Bahasa Melayu and a bit weak in Mathematic, while Chinese student are strong in Mathematic and weak in Bahasa Melayu. Indian student are weak in both. If he choose Chinese student in his class to participate the competition event, it was been 50-50 chance for each other to win the competition because both are strong in mathematic. If he choose Malay student, it might win the competition due to the mathematic question is in Bahasa Melayu form, the Indian student can be excuse in any case. Let me use the game theory to tell the story of the school Mathematic competition. We represent nodes by solid black circles and branches by arrows connecting the nodes. A properly constructed tree is called an extensive-form representation.

Representation of Game

The game studied by game theory is well-defined mathematical objects. A game consists of a set players (1,2 or more), a set of move/information set (or strategies) and a specification of payoffs for each combination of strategies. There are two ways of representing game that are common in the literature; normal form and extensive form.

2.1.1 Normal Form

The normal (or strategic form) game is a matrix which shows the players, strategies and payoffs. Here there are two players; one chooses the row and the other chooses the column (Table 2). Each player has two strategies, which are specified by the number of rows and the number of columns. The payoffs are provided in the interior. The first number is the payoff receives by the row player (*Player 1* in our example); the second is the payoff for the column player (*Player 2* in our example). Suppose that *Player 1* plays top and that *Player 2* plays left. Then *Player 1* gets 4 and *Player 2* get 3. When a game is presented in normal form, it is presumed that each player acts simultaneously or, at least, without knowing the actions of the other. If players have some information about the choices of other players, the game is usually presented in extensive form.

Table 2. A normal form game

	Player 2 Choose left	Player 2 Choose right
Player 1 Chooses top	4.3	-1,-1
Player 1 Chooses bottom	0.0	3.4

2.1.2 Extensive Form

An extensive form game is a specification of a game in game theory and represented by a game tree. Each node called a decision node represents every possible stage of the game as it played. There is a unique node called initial node that represents the start of the game. Any node that has only edge connected to it is a terminal node and represents the end of the game (and also a strategy profile). Every non-terminal node belongs to a player in the sense that it represents a stage in the game in which it is that player's move. Every edge represents a possible action that can be taken by a player. Every terminal node has a payoff for every player associated with it. These are the payoffs for every player if the combination of actions required to reach that minimal node are actually played. The game on the below have two players: 1 and 2. The numbers by every non-terminal node indicate to which player that decision node belongs.

The numbers by every terminal node represent the payoffs to the players (e.g. 2, 1 represents a payoff of 2 to player 1 and a payoff of 1 to player 2). The labels by every edge of the figure 2.2 are the name of the action that edge represents. The initial node belongs to player 1, indicating that player moves first. Play according to the tree as follows: player 1 chooses between U and D: player 2 observes player 1's choice and then chooses between U' and D' . The payoffs are as specified in the tree. There are four outcomes represented by the four terminal nodes of the tree: (U, U'), (U, D') and (D, D'). The payoffs associated with each outcome respectively are as follows (0, 0), (2, 1), (1, 2) and (3, 1). If player 1 plays D , player 2 will play U' to maximize his payoff and so player 1 will only receive 1. However, if player 1 plays U , player 2 maximises his payoff by playing D' and player 1 receives 2. Player 1 prefers 2 to 1 and so will play U and player 2 will play D' .

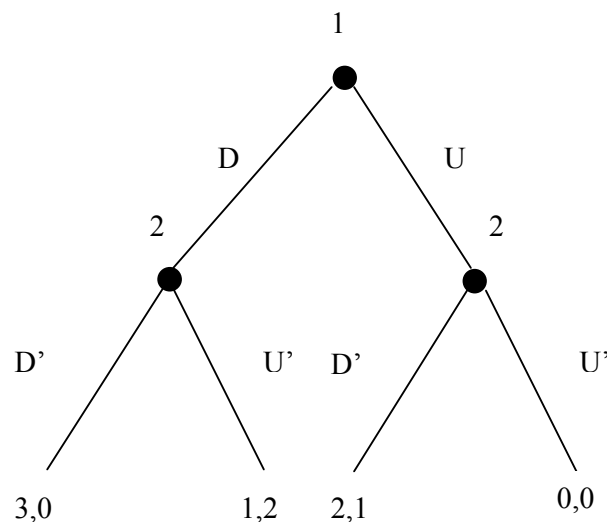


Figure 1. An extensive form

4.0 Case studies

4.1 Case Study one

4.1.1 Contractor Profile

The construction company was found in 1997, specializing in general construction work. They had been completed over 50 contracts at all times in the south region. Their annual turnover volume exceeds RM 5,000,000. The company has been classified Grade 7 and Class A with CIDB and PKK representatively. The company current projects are housing development in Kempas, Kulai and Tampoi with the tender bid of RM 1 billion.

Table 3. The table of measurement of business strategies in bid/no bid decision and bid price in competitive bidding (Contractor C)

Business Strategies	Level of Measurement				
	5	4	3	2	1
	Critical	Strong	Average	Light	Poor
Bid/No bid: Marketing					
a. Market Prospect		/			
b. Market Range		/			
Bid/No bid: Finance					
a. Source of funds	/				
b. Project Profitability		/			
Bid/No bid: Total of Measurement	20-17 Critical	16-13 Strong	12-9 Average	8-5 Light	4-1 Poor
	17				
Bid Price: Production/ Operation					
a. Equipment/plant availability		/			
b. Equipment/plant size and capacity		/			
Bid Price: Human Resource/Manpower					
a. Organization	/				
b. Labor force		/			
Bid Price: R&D					
a. Alternative construction method			/		
b. Productivity improvement	/				
Bid Price: Total of Measurement	30-25 Critical	24-19 Strong	18-13 Average	12-7 Light	6-1 Poor
	25				

4.1.2 Business Strategies

Marketing: The company have been classified as big contractor because can bid for project above 10,000,000 in value. They able to declare their assumption to either existing or new client and agreed that many influence client to invite them for other project or other phase of the project. They tend to know the other competitors' strategies to cause competition in competitive bidding.

Finance: The company has strong financial backup. The company gained a good reputation along the southern part of Johor and ventured with Singapore company for some projects. The company interests in mix development. The development will attracted the local residents invest such properties. According to them, the sole housing will be less attraction compare with mix development and commercial project. They tend to bid for the projects which are consisting of commercial area.

Production: The company has strong equipment and plant. Empire Construction Sdn Bhd is a general work contractor and able to do the general structural work for every project. Its availabilities are indicated available strong in the condition.

Manpower: The company has a proper hierarchy organization as well. The general manager, contract manager, quantity surveyor and estimator will evaluate and estimate the tender bid. the company has sufficient labor force can get from the subcontractor as well.

R&D: The company would conduct alternative construction alternative construction method if the original work can't process further. The company will inspect the entire subcontractor job before handing over. Productivity improvement is primary concerned by company.

4.1.3 Game Tree/ Decision Tree

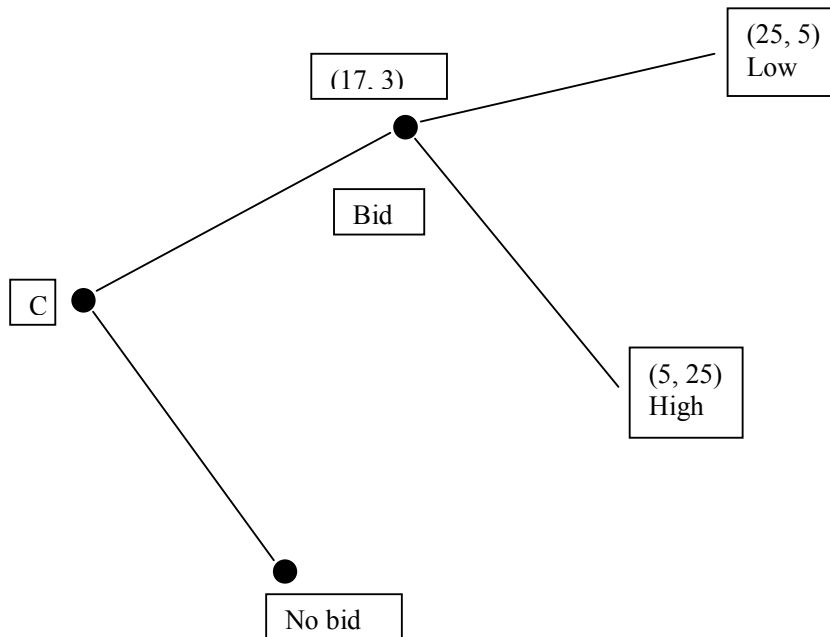


Figure 2. Overall business decision in bid/no bid and markup price decision in extensive form (Contractor C)

Responding to the decision model, contractor C will most probably determine to select bid decision. The possibility of chance for them to bid high, about 85% for every project. During determining of bid price, contractor C would bid the possible

low price due to the payoff (25, 5) is the availability of company ability to bid a low price. The variance of the payoff is about +20, it means greater low bid price will be accepted for the company.

4.2 Case study two

4.2.1. Contractor Profile

The company was established in 1992 and specializing in general construction work. The company has been classified as Grade 6 and Class B with CIDB board and PKK representatively. The company actives in the southern region with the annual turnover volume exceed RM 5,000,000 in private and government job. The current projects under construction are Senai Hospital, mix development in Kulai and housing development in Tampoi Indah, Johor.

Table 4.4. The table of measurement of business strategies in bid/no bid decision and bid price in competitive bidding (Contractor D)

Business Strategies	Level of Measurement				
	5	4	3	2	1
	Critical	Strong	Average	Light	Poor
Bid/No bid: Marketing					
a. Market Prospect		/			
b. Market Range		/			
Bid/No bid: Finance					
a. Source of funds			/		
b. Project Profitability			/		
Bid/No bid: Total of Measurement	20-17	16-13	12-9	8-5	4-1
	Critical	Strong	Average	Light	Poor
		14			
Bid Price: Production/ Operation					
a. Equipment/plant availability			/		
b. Equipment/plant size and capacity			/		
Bid Price: Human Resource/Manpower					
a. Organization		/			
b. Labor force				/	
Bid Price: R&D					
a. Alternative construction method				/	
b. Productivity improvement					/
Bid Price: Total of Measurement	30-25	24-19	18-13	12-7	6-1
	Critical	Strong	Average	Light	Poor
			15		

4.4.2 Business Strategies

Marketing: The company have been classified as G6 as medium sized contractors that can bid for project no more than RM10, 000,000 in value. They agreed that business marketing prospect influence client for tender inviting. They will attempt t know who other competitors and their other consumption so that can create the competitive reasonable price to win the project.

Finance: The company has sufficient but not strong in financial. According to the Senior Engineer, his company's financial is capable of project cash flow currently. If the next project awarded, they might tender out again to get bid low to reduce the overall project cost. They would choose the government job rather than private due to the government job easy to get the period payment from client.

Production: The company has strong equipment and plant. Empire Construction Sdn Bhd is a general work contractor and able to do the general structural work for every project. The supply source of equipment/ material is strong due to the good interaction in industry relationship. The availability of equipment/plant is available strong in the company.

Manpower: The company has a proper organization which consists of none bumimputera executive and bumiputera executive for private job and government job representatively. The labor force depends on the scale of the project. If the project needs many labor forces, they will try to instruct the subcontractor and supplier to allocate more labor force.

R&D: According to the company, they seldom conduct alternative construction method and productivity improvement activity at the site. They claimed that inspection work done by the main contractor and architect will do.

4.4.2 Game Tree/Decision

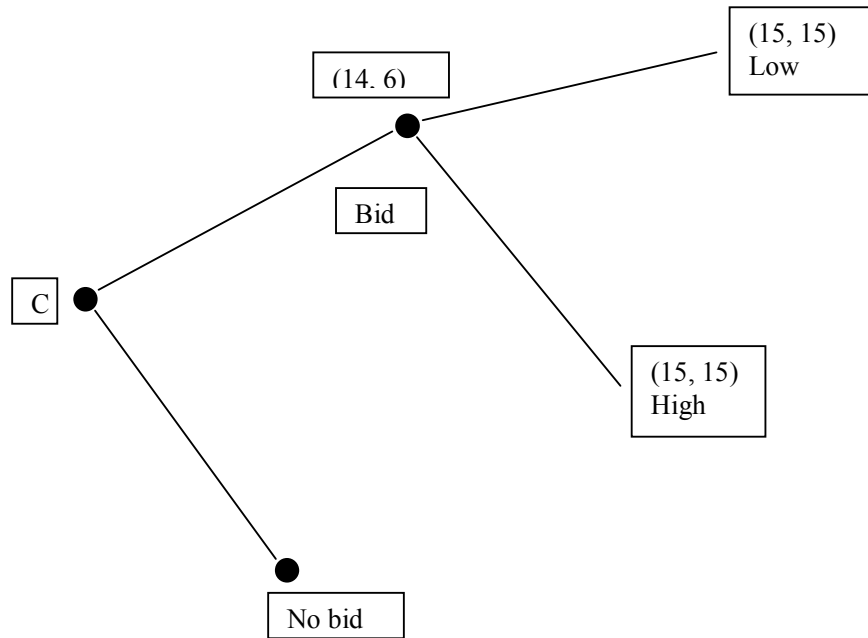


Figure 4.4. Overall business decision in bid/no bid and markup price decision in extensive form (Contractor D)

The decision tree evolved from the business strategies measurement to determine the bid/no bid price decision. Contractor D would select to bid for next tender based on the payoff shows (14, 6), possibility of chance for them to bid is high, about 70%. The variance of payoff responds +/-0. They would not bid the price low; they only can bid the average bid price and hope to get the project win.

4.4 Case study three

4.4.1 Contractor Profile

The company is an associated company with a listed company in KLSE main board. The company has been classified Grade 7 contractor and provides general construction work and project management. Their current project is likely biggest shopping mall in Penang.

Table 4.6. The table of measurement of business strategies in bid/no bid decision and bid price in competitive bidding (Contractor F)

Business Strategies	Level of Measurement				
	5 Critical	4 Strong	3 Average	2 Light	1 Poor
Bid/No bid: Marketing					
a. Market Prospect				/	
b. Market Range				/	
Bid/No bid: Finance					
a. Source of funds		/			
b. Project Profitability				/	
Bid/No bid: Total of Measurement	20-17 Critical	16-13 Strong	12-9 Average	8-5 Light	4-1 Poor
			10		
Bid Price: Production/ Operation					
a. Equipment/plant availability			/		
b. Equipment/plant size and capacity		/			
Bid Price: Human Resource/Manpower					
a. Organization	/				
b. Labor force		/			
Bid Price: R&D					
a. Alternative construction method		/			
b. Productivity improvement		/			
Bid Price: Total of Measurement	30-25 Critical	24-19 Strong	18-13 Average	12-7 Light	6-1 Poor
		24			

4.4.2 Business Strategies

Marketing: The company is an associated company of listed company and registered as Grade 7 contractor with CIDB. The person in charge cum resident engineer claimed that the company is acted as in-house contractor to the mother company in Kuala Lumpur. The project will only process when the associate company approves the project and issues the construction work.

Finance: The company has a strong financial backup. They no need to measure the project profitability because the company is only subsidiary company and the measurement of project profitability done by main and associate company.

Production: The company indicated strong condition in equipment and plant. According to resident engineer, the company primarily focuses the time and cost management of construction work. All the work to be sub divided to other contractors. They responded the equipment / plant is available for the other project at the moment.

Manpower: The company has critical strong in organization. The decision and meeting need to transform into paperwork and to be reported to every level of organization. The team of the organization is mainly consists of profession like engineer, quantity survey and financial expert.

R&D: As project management team, the contractor will inspire the alternatively construction method and productivity improvement as long as within the cost budget and effective timely manner.

4.4.3 Game Tree / Decision Tree

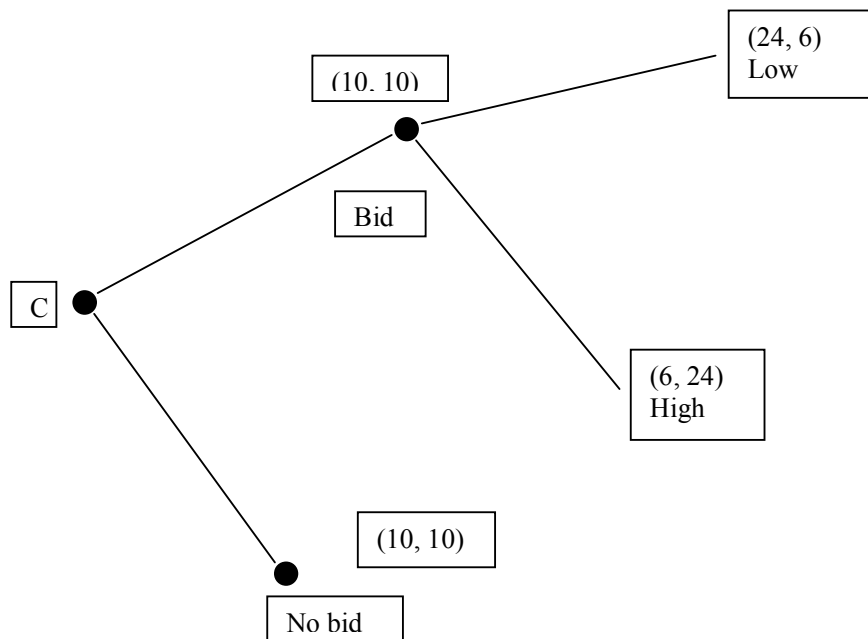


Figure 4.6. Overall business decision in bid/no bid and markup price decision in extensive form (Contractor F)

The possibility of chance for contractor F is only 50%. This is because the company is only subsidiary company and in-house contractor; top management does almost the decision from main company. Although, the company reports unbalance performance in production strategies, but the company shows great performance in research and development strategies. These allow the company determines the bid price when they participate in competitive bidding. The variance reports greater low price, about +18.

4.3 Case study four

4.3.1 Contractor profile

The company commenced business in 2004 and classified as Grade 3 contractor. The company was established from conversion from manufacturer to contractor. The current project is their own factory with the cost volume less than RM 1,000,000. The company's key personnel is a Chinese family based organization

Table 4.7. The table of measurement of business strategies in bid/no bid decision and bid price in competitive bidding (Contractor G)

Business Strategies	Level of Measurement				
	5	4	3	2	1
	Critical	Strong	Average	Light	Poor
Bid/No bid: Marketing					
a. Market Prospect		/			
b. Market Range		/			
Bid/No bid: Finance					
a. Source of funds			/		
b. Project Profitability		/			
Bid/No bid: Total of Measurement	20-17 Critical	16-13 Strong	12-9 Average	8-5 Light	4-1 Poor
		15			
Bid Price: Production/ Operation					
a. Equipment/plant availability				/	
b. Equipment/plant size and capacity				/	
Bid Price: Human Resource/Manpower					
a. Organization				/	
b. Labor force				/	
Bid Price: R&D					
a. Alternative construction method					/
b. Productivity improvement					/
Bid Price: Total of Measurement	30-25 Critical	24-19 Strong	18-13 Average	12-7 Light	6-1 Poor
				10	

4.3.2 Business Strategies

Marketing: The contractor is the new comer and fresh on the construction field. They will only focus on the factory or warehouse construction work in the market. Their marketing strategies are to emphasis on the design and built or turnkey procurement. They will coordinate their own design team and offer their spec into drawing. The quotation will be made base on the final drawing to the client.

Finance: The company has registered as Grade 3 contractor and has an average financial source. They have been persuaded that factory work could be advantage project profitability because the payment could be cleared easily.

Production: The company shows poor in equipment/ plant and supply source because they subdivided the tender again. Therefore, they do not tend to have the relevant equipment on the site.

Manpower: The company has flat organization which means the scale of organization is less complicated. A few general clerks on the organization are needed to run the daily operation.

R&D: The alternative construction method and productivity will be less encourage by the company due to the costly reason. Light improvement will be considered as long as effective in term of cost and time. The company did not find it easy making breakthrough.

4.3.3 Game Tree/ Decision Tree

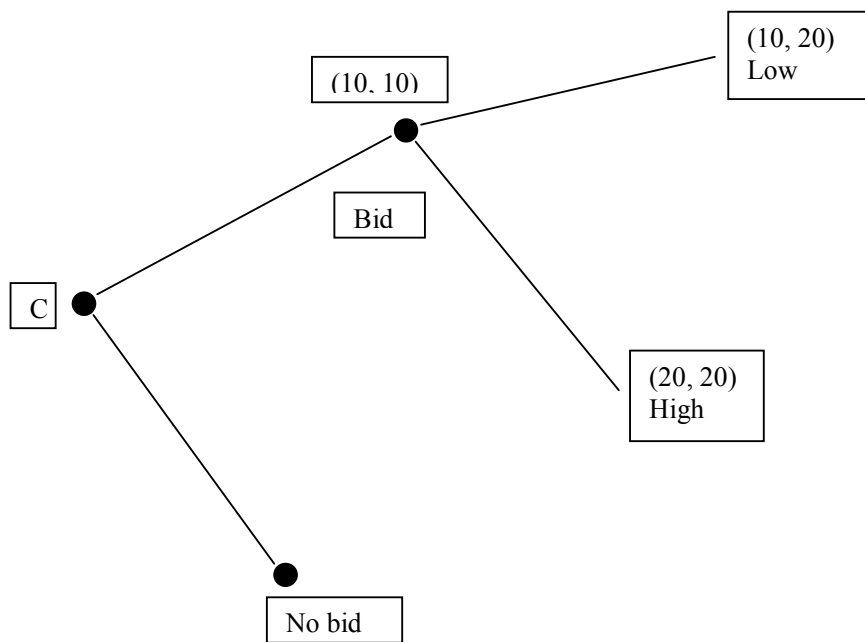


Figure 4.7. Overall business decision in bid/no bid and markup price decision in extensive form (Contractor G)

It would be possible of the company marketing strategies, the bid or no bid decision shows the surprising payoff; bid or no bid in 50% each. The company will only decide to bid at the pinch. Beside that, the payoff of markup price totally against with the conventional procurements' payoff. The contractor tends to bid the high price. The procurement system may the main reason to influence the mark up price because the quotation is under a package work to the client.

5. Conclusion

There are several analyses can be carried out base on comparative studies above:

- a. The large scale firms which are grade 7 or class A contractors tend select bid decision in greater probabilities (more than 80%) and willing to bid a greater low price (variance = + 20).
- b. The large scale firm which is in-house base contractor only decides the bid/no bid decision base on their top management. The relevant contractor would able to bid a greater bid price to compete other competitor as well.
- c. The medium size contractors (grade 4-6 or class C-D) respond inconsistent in bid/no bid decision and bid price decision. The differences variance in decision base on their current business strategies decision performance (See table).
- d. The small size contractor (grade 1-3 or class D-F) indicates intend to bid greater high price in competitive bidding (Table).
- e. The unknown contractor's registration with CIDB or PKK, they most probably will bid low price and depends on the depth of the relationship with the regular client and experience in the industry.
- f. The depth of the client relationship and experience in the industry may influence contractors to make their bidding decision.

Table 4.11. A comparative studies for the contractors' registration, pay off of bid/ no bid and bid price

Contractor	Bid/No bid Payoff/ percentage (%)	Bid Price Payoff/ Variance
3. Contractor C	(17, 3) 85%	(25, 5) +20
4. Contractor D	(14, 6) 70%	(15, 15) +/-0
6. Contractor F	(10, 10) 50%	(24, 6) +18
7. Contractor G	(15, 5) 75%	(10, 20) -10

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