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CONSTRUCTION PRICE FORMATION: A THEORETICAL FRAMEWORK

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ABSTRACT: Past theories on construction price formation have been shown to be inadequate in terms of their ability to represent real-life industry practice and price formation predictability. In this paper, we develop a theoretical framework on construction price formation that integrates four theories within the domains of marketing, learning, resource management and economics. These are: (i) marketing pricing theory; (ii) experiential and organisational learning theory; (iii) resourced based theory and (iv) microeconomic theory. Utilising pricing theory from marketing, a foundation is able to be created for the procedure of construction price formation, namely: (i) identifying the objectives; (ii) assessing the tendering environment; and (iii) formation of the price. However, understanding contractors' decision making process in tender pricing as such can be attributed to theories of experiential learning and consequently organisational learning. It is argued that contractors do learn from past experience and history and are able to adapt to different market conditions. In formation of the price, neoclassical microeconomics is able to provide additional insight in terms of the supply and demand model and consideration of the market conditions. Interrelated with the microeconomic concept of scarcity, we appreciate that contractors do have limited resources that affect their tender pricing decisions and resource based theory is used to substantiate this. Integrating the various theories as a unity allows the broader reality to be visualised and add to our theoretical understanding of construction price formation.

Keywords: Tendering, Construction Price Formation, Theoretical Framework

1. INTRODUCTION

Construction price formation describes the procedure of formulating a final tender price for construction work; accounting for various factors fundamental to the construction firms' objectives and capabilities [1]. Friedman's [2] tendering model has been the predominant theory and point of discussion for many construction bidding literature, and its tenability has been tested by numerous researchers in the field (e.g. [3] and [4]). The lack of adoption for this model in the construction industry stems from oversimplified assumptions such as the static behaviour of bidders [3] and also the unwillingness of most contractors to utilise complex mathematical models [5]. Runeson and Skitmore [3] in their review of various tendering theories and interpretations, noted that there is a need to develop a new theoretical framework incorporating at the very least, market conditions. Thus, there is a need to improve our understanding of tender price formation through the development of a new theoretical framework with sound theoretical and empirical basis.

The extension of the theory on tendering has been moving towards different directions, all based on mainstream theories. In particular, there are some research investigating the suitability of microeconomics as a carrier for explaining construction price formation (e.g. [6] and [7]). Other applied aspects of microeconomics, such as market conditions effect on profit [8], the effect of construction demand [9] and market orientations [10] have all been studied in depth either explicitly or implicitly, indicating sound investigations within the microeconomic domain. Another direction of movement (or lack thereof) for construction price formation theory is towards marketing pricing theory. Skitmore and Smyth [11] have related two marketing concepts (marketing mix and relationship marketing) to construction pricing methods. Bearing many similarities between the marketing and construction pricing approaches, the relationship is able to provide a relatively different perspective on construction price formation – a deeper understanding of the *practice* of pricing. As Skitmore et al. [6] have pointed out, the use of neoclassical microeconomics to explain construction price formation is useful in that it can be used for analysis, however not for explaining the practice of price formation used by contractors in the industry. Marketing pricing theory is perhaps the most suitable tool to fulfil the latter objective as it focuses more on pricing practices exercised by managers and executives, how they control the market forces as opposed to microeconomic concepts describing how market forces control the price [12]. In explaining the rationality behind the decision makers' choices, behavioural theorems have been widely adopted, applying scientific research of cognitive and emotional elements to better understand pricing decisions. For example,

Jashapara's [13] survey of various construction firms showed that there was organisational learning evident. In Fu et al.'s [14] study, they found that experiential learning had contributed to increased bidding competitiveness. In essence, experience and learning are interrelated, with Holman et al. [15] suggesting that thinking, reflecting, experiencing and action are all able to be categorised under learning. Learning as a whole, explains how people adapt to new environments and try to improve their performance in subsequent attempts [16], as would be applicable to construction bidders. The final but less apparent movement is the use resource based theory to provide another perspective in the strategic management of a firm. Oo et al. [17] utilised the resource based view to explain heterogeneity in a contractor's mark-up behaviour (in terms of resources and internal capability). They further state that the heterogeneous nature of construction firms may provide different incentives and different courses of action that a firm may find most profitable. As Dzeng and Wen [18] point out, resource based theory is useful for examining a construction project because such projects require valuable and "various" resources from team companies, i.e. sufficient resource capabilities can only be provided by the team of contractors performing the overall construction deliverable. This concept is entirely in line with the microeconomic concept of scarcity, whereby people make decisions based on limited resources.

This paper aims to develop a theoretical framework for construction price formation through a synthesis of four theorems, namely: marketing pricing theory, neoclassical microeconomic theory, organisational learning theory and resource based theory. As suggested by Hauser [12], economics provides marketing with a theoretical framework, whilst marketing theory provides economics with empirical grounding, consumer models and an understanding of problems in practice. The theoretical framework devised hence has the marketing pricing theory at the hub of the framework, providing a practical model of the construction pricing decision approach. Attached to this hub are the various analytic tools/theorems that would explain various aspects of the pricing process whether it be physical or technical (e.g. market condition effects) or abstract such as contractors' behaviour. It is worth noting that although the marketing pricing approach is used as the hub of this framework, it is inevitable that parts of the marketing theory will explain the processes involved, e.g. pricing theory encompasses price positioning aspects, factor analysis and price implementation, etc, these explain part of the marketing pricing approach. Figure 1 illustrates the proposed theoretical framework. The dual arrowhead represents a mutual explanatory relationship, i.e. marketing pricing theory provides a practical viewpoint for microeconomics, however neoclassical microeconomics is able to provide a theoretical framework for marketing pricing theory. Arrows towards the direction of a particular module mean, that the particular theory is able to provide additional explanation for the element at the arrowhead.

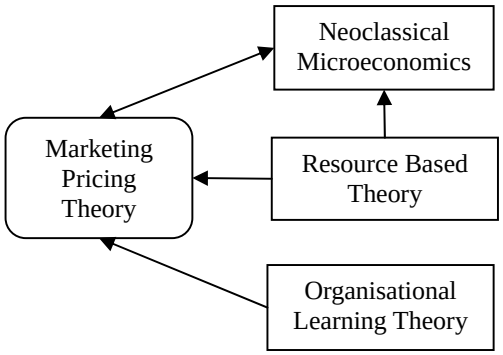

Figure 1. Illustration of the Theoretical Framework

2. A FRAMEWORK FOR THE CONSTRUCTION PRICE FORMATION PROCESS

2.1 The Marketing Pricing Decision Approach

The marketing pricing decision approach outlined by Akintoye and Skitmore [19] (adapted from Assael [20]) contains five key elements, they are:

1. Establishing pricing objectives
2. Considering internal and external factors influencing pricing decisions
3. Assessing the competition and organisational pricing strategies
4. Selecting methods of price determination
5. Price implementation and other considerations

This may be simplified in terms of 4 broad processes including strategy, analysis, decision and application (adapted from the pricing process provided in [21]) Figure 2 illustrates the marketing pricing process adapted for the construction price formation approach. From Figure 2, the mainstream theorems utilised are in italics, these are also below a particular element in the pricing approach, indicating their applicability for explanation and theoretical support.

2.2 Price Formation Strategy

The strategy segment of the price formation process includes two elements: i) pricing objectives and ii) price positioning. Pricing objectives refer to what the construction firm aims to achieve through their tendering decisions. Assael [20] identified that the three major types of pricing objectives fell within cost-oriented objectives, competition-oriented objectives and demand-oriented objectives. In line with the pricing objectives, the decision to bid or not to bid becomes a critical factor. Shash [22] in his study of top UK contractors found that the top five factors affecting a bid/no bid decision were the need for work, number of competitors, contractor experience for the particular project, current work load and the client identity. It is clear that these factors fall into one or more of the pricing objectives aforementioned. Lanzillotti [23] in his study of pricing objectives for large

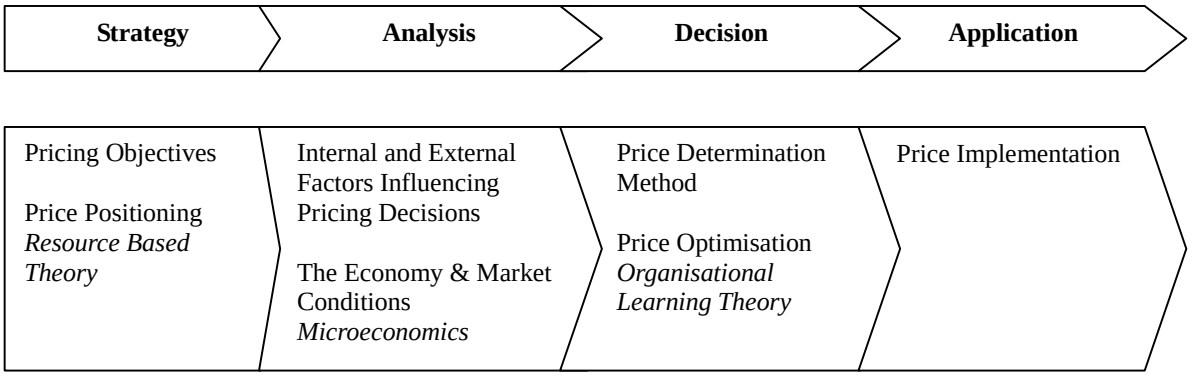

Figure 2. The Adapted Marketing Pricing Approach

companies concluded that different companies will have different pricing objectives, and the difference occurs due to varying company policies and order of priorities. For example, one company may at the present moment seek to expand market share above all else, hence the pricing policies although aggressive, may not achieve profit maximisation. Fayek et al. [24] conducted a survey on 145 Canadian contractors and found that the objective most desired was to win the project, with the next two most important objectives being to maximise the projects contribution to profit and to meet budgeted turnover or deploy idle resources. The objectives for larger firms as Mason [25] states, are provided by managers at the top, in the form of a framework of requirements that must be met by "managerial specialists" dealing with the task of pricing. With respect to smaller construction firms, setting a pricing objective(s) will indeed be similar without as many "middlemen".

Price positioning from a marketing perspective is getting the price right relative to a firm's competitors [26]. They also suggest that the goal of price positioning is to position each product (service) in the perfect spot in order to "capture" the greatest reward for the benefits delivered. In essence, price positioning is a trade-off between benefits and price and it is also crucial in communicating the construction service worth compared to the firm's competitors. Kotler [27] defined positioning in terms of the value perceived by the customer, with value being defined as the customers' perceived benefit vs. their perceived price [26]. Though marketing price positioning is more developed for consumer marketing, Webster [28] states that positioning is an important strategic concept that has equal applicability for industrial products and services. The process of price positioning is described by Kalafatis et al. [29], as being iterative and proactive, with careful consideration of the company, its competitors and its targeted market and client. In terms of the type of price positioning a firm adapts, they found that the positioning strategies of each firm will vary, due to different objectives and company structure, geographical location and control and level of market presence. Porter [30] described competitive positioning in terms of variety positioning, needs-based positioning and access-based positioning. Variety positioning is based on providing a service on the basis of the firm's assets and competencies rather than client requirements, needs-based positioning can be considered as a tailor made product or service for a target market and access-based positioning is the release of a product or service based on the commonality of accessibility [31]. The underlying price positioning dimensions as described by Hooley et al. [31] consisted of six attributes:

1. Low Price – High Price
2. Basic Quality – Premium Quality
3. Limitation – Innovation
4. Limited Service – Superior Service
5. Undifferentiated features – Differentiated features
6. Standard offering – Tailored offering

From these extreme dimensions, it appears that the pricing strategy of construction works could fall into a combination of one or more of these attributes with varying magnitudes. For example, tradeoffs are often required as a compromise to achieve the client requirements (for price), and to achieve a lower priced tender submission, a standard offering with basic quality may be adopted by the contractor.

With respect to resource based view in construction pricing, resources are seen as the limitation for any possible strategy or position of a firm [32, 33]. Resources are defined by Barney [33] as a combination of assets, capabilities and the firm's information and knowledge. Grant [32] described resources as being inputs to the production process. As Hooley et al. [31] suggested, for resources to be utilised in the hopes of economic benefit, the resources must have been utilised first in the market-place. This is in line with Webster's [34] view that competitive advantage must be built on resources and capabilities. For long-term strategy to be sustainable, it must be based on the firm's internal resources and capabilities rather than external market focus [32].

Resource based theory has been shown to be a useful tool for identifying gaps in the construction planning stage. The study employed by Dzeng and Wen [18] utilised surveys on contractor's resources, and triangular fuzzy numbers in order to identify whether additional contractors were needed to address the main contractor's

insufficient resource capacity. They concluded that resource based theory was a useful support tool in assisting with explaining resource utilisation decisions in a project, however, it should not be used alone for determining whether additional contractors were required. The basis for this conclusion was due to the timing and dynamic nature of construction projects (e.g. unforseen circumstances). However, as a strategic tool that is able to employ during the planning phases of a project [32], the use of resource based theory is entirely justified. As Teece et al. [35] rationalises resources - the earlier actions of a firm determine the path dependency, which directs and limits the ways in which a firm can develop. In adopting the resource based view, it can provide a useful tool in assisting with decisions regarding how to deploy resources to gain a competitive advantage or decisions regarding whether or not additional resources are required.

2.2 Analysis in the Construction Pricing Approach

The analysis process for the construction pricing approach begins with identifying the internal and external factors influencing contractors' tendering decisions. Internal and external factors may have an effect on both the decision to bid and mark-up size [22]. However, it is noted that there are a large number of factors that may affect contractors' bid/no-bid and mark-up size decisions (e.g. [5], [22] and [24]). Using a key criterion that a factor is internal to a firm if it can be directly controlled by the firm, the important internal factors affecting the bid/no-bid decision in the literature include: available experience in a particular type of project, management of current workload, profit margins from similar projects and availability of qualified staff. Similarly, internal factors affecting mark-up decision include: the need for work, past profit from similar projects and rate of return.

Analysis of the external environment can be applied through the use of the PEST framework. The PEST framework accounts for the political, economic, social and technological factors affecting the external environment of the construction firm. In general, these factors are likely to affect the construction industry as a whole as opposed to a single firm. Some analysts have extended the PEST framework, adding environmental and legal factors, forming the newer PESTEL framework [36]. As Akintoye and Skitmore [19] suggest, the PEST factors may determine the level of demand for construction work, the degree of competition and the number of construction firms existing. Gillespie [36] suggested that different firms are likely to be affected by different factors, for example, a firm that has borrowed heavily, will most likely be affected by economic factors (e.g. interest rates). Table 1 provides an example of PESTEL factors that may affect a construction firm. Of these, economic factors have drawn much attention from researchers in construction tendering field. In particular, there are a large number of empirical studies on the effects of market conditions (e.g. Chan et al. [8] in their study of changes in profit as market conditions change; Dulaimi and Shan [37] in their analysis of factors affecting bid mark-up decisions; Fayek et al. [24] in their study of factors influencing bid decisions) and Runeson [38] in his discovery that market conditions contributed to variability in the bill of quantities for successful bidders).

Table 1. PESTEL Factors

PESTEL Element	Factors
Political	Government Policies, e.g. tax, labour and environmental laws and local council regulations
Economic	Economic Growth Inflation Interest Rates Market Conditions
Social	Demographics and their effect on the input and output of construction projects (e.g. labour) Demand for project or project type
Technological	Construction technologies ICT innovations
Environmental	Sustainability (Green Buildings) Resource efficient (energy, water etc) Reducing waste and emissions
Legal	Local council regulations and permissions Occupational health and safety

In analysing the economic effects, at the local level, microeconomics provides a suitable method of analysis as it deals with markets where goods and services are sold. It also explains how firms' decision and behaviour are affected by the supply and demand for goods and services [39]. Macroeconomics, on the other hand, is more suited at the national level, especially for forming economic policies [40]. Skitmore et al. [6] suggested that construction firms were market aware, in terms of both market orientation and market pricing. Their analysis of supply and demand effects developed two functional relationships, i) a positive correlation between price and demand (i.e. bid price increases with the demand) [9] and ii) an inverse relationship between price and supply (i.e. bid price decreases with increased supply), where supply was defined as the intensity of the competition. To better visualise the place of microeconomics within construction price formation, consideration can be given to the conceptual orientation of pricing. A diagram from Monroe [41] adapted to the construction pricing context is shown in Figure 3. It can be seen that demand factors set a maximum price that can be charged, this is related to the client's perception of value from the contractors' service provision [41]. Direct variable costs set a minimum price that can be charged, as contractors at the very least aim to recover their service/construction costs. As Gabor [42] has noted, service industries (Skitmore et al. [6] suggested that construction firms belonged to one

of the service industries) are either cost based or market oriented, with cost based being primarily concerned with the recovery of production costs and a reasonable profit. The difference between what the client is willing to pay (perceived value to client) and the contractors' cost-based price represents the initial pricing discretion. However, the final pricing discretion is narrowed down through considering factors such as competition, which decrease the bid price that a contractor formulates, and firm objectives and regulatory constraints raise the bid price to a minimum level. The firms' objectives are financial requirements that increase the price offered in order to recover fixed costs and overhead and also to meet expected profit levels [41]. Council regulations such as reduction on construction noise, and perhaps waste containment also increase the minimum bid price that can be exercised by a contractor.

According to Skitmore et al. [6], the problems associated with applying microeconomic analysis to construction contract auctions is attributed to the demand and supply curve being "lumpy". They point out that supply and demand are correlated to the big projects a firm is contracted for, and time is required for these projects to complete, thus there is a delay for price changes to reach the market (i.e. the point in time where the firm can take on another project). The other problems lies within obtaining accurate cost estimates, and often a contractor will not know what their actual project costs will be, thus the cost curve for the firm will vary in light of resource capacities and economic conditions [43]. Despite of this fact, Azzaro et al. [44] suggested that cost estimates are continuing to form the basis of the contractors' tender prices. Whilst in a conventional microeconomic problem, all elements are able to be quantified (e.g. a certain price, quantity or certain demand and supply function), it is much harder to do so in reality, at least in the case of the construction industry. This is due to the fact that the construction industry is characterised by a high degree of uncertainty [45]. However, there are a wide variety of approaches that aim to increase the accuracy of cost estimation and market condition assessment [46]. For example, considering estimated costs or actual cost as a variable and the collection of information on the current state of the market (e.g. price levels and competition).

2.3 Decisions in Construction Price Formation

Decisions for construction firms during price formation would involve the selection of a suitable pricing determination method and considerations for optimising a final bid price. Phillips [47] detailed three traditional approaches to pricing, namely: i) cost-plus; ii) market based; and iii) value based. There are advantages and disadvantages of all three approaches, in the sense that they favour one element over other, for example, market based pricing is based on competition, and it ignores cost and customers. As Phillips [47] states, cost-plus pricing is the oldest approach to setting prices and the most popular, however, its biggest disadvantage lies within the lack of consideration of the market and support for price differentiation. Skitmore et al. [6] point out that market

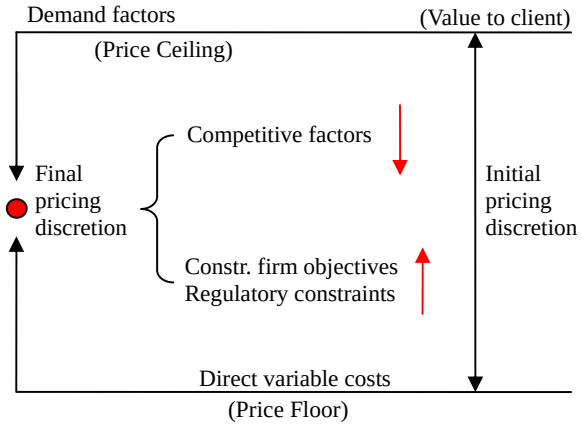

Figure 3. Conceptual Orientation to Construction Pricing *(Adapted from [41, p.13])*

based pricing is aimed at providing a price that maximises profit, with the realisation of relationship between quantity demanded and price. Phillips [47] on the other hand, appreciated that there were many possible definitions and broadly defined market based pricing as "pricing based solely on the prices being offered by the competition". However, the applicability of this broad definition to construction contract auctions leads to some gaps, as in a first-price sealed bid auction, there is a very low possibility of knowing the exact bid prices of competitors (save for collusion), their bid price would have to be based on their knowledge of the competitors' bidding history. As Gruneberg and Ive [48] suggested, established firms may have information on competitors that new market entrants will not have. Value based pricing in its broadest sense was defined by Phillips [47] as being a personalised form of pricing, whereby each customer is quoted a different price based on his/her perception of value for the product or service being sold. He identified that the problem with value based pricing was the inherent difficulty in discerning customer or client value for a product or service, in addition, competitive pressure would also drive their prices lower regardless of their perceptions of customer value. Nevertheless, it has been argued that companies do not use any one approach in its pure form, but rather a hybridisation of the approaches, "supplemented by a considerable amount of improvisation" [47, pg.26]. This is in line with the conclusion made by Skitmore et al. [6] in that construction firms were concerned with production costs and market pricing, thus "making pure cost based pricing highly unlikely". In addition to cost-based and market based pricing, Akintoye and Skitmore [19] identified four other price determination approaches, namely: (i) standard rate table-based approach – basing prices from a construction pricing book (e.g. Rawlinsons cost guide [49] and Cordell cost guide [50]); (ii) historical price-based pricing (basing prices on historical bids and making certain adjustments); (iii) subcontractors bid-based pricing (as the main contractor, basing bids on the subcontractors bids); and (iv) the cover price approach (submitting a purposely high bid to achieve a particular objective e.g. to test the market or show market presence).

It therefore seems that a construction firm's choice of pricing determination method is likely to be circumstantial within the content of factors affecting its decision.

Tender price optimisation may come in many forms, in general, it may be a way to increase or decrease the price level in response to previous experience. Fu et al. [51] suggest that experience was a synthesis of several domains including: i) managerial experience; ii) technological experience; iii) costing experience; iv) local experience; and v) institutional experience. The culmination of these would allow for revision of the bid price in order to better achieve the construction firms' goals [51]. Not surprisingly, this leads to the theorems of experiential and organisational learning in explaining tender price optimisation. Kolb [52] made a linkage between learning and experience, suggesting that experiential learning was the process of transforming experience into knowledge. Kolb's theory of learning was described by a four-stage cycle consisting of experience obtained through practical activities, abstract conceptualisation (learning from the experience), reflective observation (reflecting on the experience), and active experimentation (planning and developing on the experience gained). Sternberg and Zhang [16] suggest that the demands of a task promote adaptation within a subject allowing them to gain experience, learn and hence become more skilled with time. These skills may perhaps lead to the realisation that the previous tender price was too low in order to meet the firms' objectives, or perhaps the bid was too high and was not competitive enough to win the contract. A study of past bidding attempts on a case by case basis, weighing the positive and negative aspects may lead to effective improvement in rational decision making [53]. In the context of a construction firm, Marquardt [54] states that there are three levels of learning in an organisation, namely: i) individual learning; ii) team learning; and iii) organisational learning. Levitt and March [55, pg.320] defined organisational learning as "encoding inferences from history into routines that guide behaviour", where routines were defined as procedures, strategies, rules, cultures, frameworks and in general anything that contradicted formal routines. They categorised organisational learning as consisting of: i) learning from direct experience; ii) interpretation of experience; iii) organisational memory; and iv) learning from the experience of others. They further classified learning from direct experience in an organisation into two mechanisms: i) trial and error experimentation (where a routine (bidding strategy) gets used more if it has better success at reaching the objectives, and used less if it is associated with failure [56]), and ii) organisational search (drawing from a pool of routines and picking better ones when they are discovered [55]). Interpretation of experience as the name implies, is where people from organisations classify event outcomes as being "good" or "bad" [57]. Organisations utilise significant effort in order to understand history, this knowledge is usually used to benefit the organisational decisions however at some times, interpretation of the experience is difficult or erroneous [55]. Organisational memory refers to the experience recorded in documents, files and even standards of professional practice, and this experience archive is able to be referenced in the future should the need arise [55]. Finally, learning from the experience of others refers to the diffusion of archived experience throughout the organisation. For this to occur, it requires the attention to organisational and individual networks [55] and often makes formulating a competitive strategy more complicated [58]. Diffusion of this experience and the new routines associated with learning are possible through several methods, contact with key personnel within the organisation dealing with the decision at hand, meetings with various experts and managers and even through a set of guidelines or a framework provided (by the firm) for developing pricing strategies – the ways of diffusing knowledge are many. As Levitt and March [55] state, intelligence of an organisation is based on lessons on history, however care must be taken as learning and experience do not always lead to better outcomes. This is certainly the case with construction price formation, as not every project undertaken can be expected to yield positive returns and thus the firm undergoes a continual process of learning.

2.4 Application of the Pricing Approach

Price implementation is the final stage in construction pricing, and involves finalisation of the previous elements in the marketing pricing approach outlined in Figure 2. The agreement and/or consideration of the construction firms' pricing objectives, price positioning, environment analysis and price determination method (including any optimisations) give rise to a final bid price. In terms of the overall marketing scheme, pricing is just one aspect of the marketing mix. The marketing mix includes the 4P's, namely: product, pricing, place and people. As Skitmore and Smyth [11] have noted, the pricing aspect is the dominant aspect of the marketing mix. However, as Borden [59] stated, the elements of the marketing mix vary depending on "how far one wishes to go", i.e. the elements are dependent on the situation and context. In terms of the construction industry, Skitmore and Smyth [11] concluded that relationship marketing was more applicable (compared to the marketing mix) because of the business to business notion at the core of relationship marketing. Considerations of the client are also important, as a value added service demonstrated to specific clients and referral markets allow for the price to be increased eventually [11]. It is also important for client retention to ensure continued business, for it may cost more in the search for new clients [60].

As Nagle and Hogan [61] suggest, pricing is not a series of one-off decisions, each proposal creates expectations of offers made in the future, not only for existing clients but other potential clients as well. They further suggest that creating better pricing policies is not sufficient, with management of pricing implementations necessary to make them effective. This implies that proactive pricing is necessary for optimum results. The key aspect of proactive pricing is monitoring and measuring the results of previous tendering attempts.

Applying a particular strategy for a single project is not enough to determine the success of that strategy, rather continuous monitoring across several projects are required to gather sufficient data for analysis [61]. The results of the analysis may be used to formulate future pricing policies/guidelines in order to improve a firms' performance.

3. CONCLUSION

This paper presents a theoretical framework of construction price formation through a synthesis of four theorems. With marketing pricing theory providing the practical backbone of the theoretical framework, the other three theorems are able to provide additional explanation of various aspects of construction price formation in practice (i.e. resource based theory in explaining pricing strategy, neoclassical microeconomic theory in analysing pricing strategy, and organisational learning theory in explaining decisions made in tender pricing). Empirical support for the proposed theoretical framework was obtained through a literature review providing a different perspective on construction price formation.

The limitations of this study are realised as the theoretical framework being based entirely on a literature review. In addition, some of the literature were not of a construction pricing context and more-so on a general marketing context. The next stage planned for this study involves validating the proposed theoretical framework with in-depth interviews with experienced industry practitioners. Part of the validation involves investigating the extent that the proposed theoretical framework applies in practice and whether or not construction firms possess the resources and technical capabilities to perform the outlined pricing approach.

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