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INFORMATION SYSTEMS OUTSOURCING: A MIXED INTEGER PROGRAMMING ANALYSIS

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ABSTRACT

In the recent past, the trend toward outsourcing has become a major information systems phenomenon. Outsourcing is the subcontracting of various information systems subfunctions such as managing of data centers, operations, hardware support, software maintenance, and even application software by user-firms to either incumbent vendors or outside vendors. Outsourcing is therefore emerging as a key approach for managing information systems functions.

In this research, we investigate the outsourcing bidding process pertinent to the selection of one subcontractor by a user-firm. We analyze bidding situations where the bidders have different levels of expertise and cost structures. The theoretical foundations for this research lie in the theory of mechanism design (Myerson 1983), as well as the theory of imperfect information (Philips 1988) and incentive design (Ledyard 1989; McAfee 1986). We build a mixed integer programming model to represent what happens in an outsourcing bidding context involving a user-firm, an incumbent firm, and a challenger firm and explore the implications.

The analysis is conducted over two different time horizons called the ex ante and the ex post periods. Two mixed-integer programming models are presented for two time horizons (in developing the model, we follow Kreps 1990). To reflect the different levels of expertise and cost structures of bidders, a discrete probability distribution is assigned to each bidder to approximate a bidder's true cost. A bidder's true cost is private information, but its probability distribution is assumed to be common knowledge. An incumbent firm is assumed to have cost advantages over other bidders as a result of being familiar with the information needs of the user-firm. Therefore, the incumbent firm is assigned a cost probability distribution that is skewed toward low cost. The competing bidder's cost structure is skewed toward high cost.

The objective function of each model is formulated so as to minimize the expected cost, subject to participation, and truth-telling constraints. Participation constraints indicate that each bidder participates only if a positive profit is given by the user-firm. Truth-telling constraints denote that each bidder prefers telling the truth to misrepresentation.

The preliminary results of the models suggest that a policy of awarding incentives and levying penalties needs to be followed by the user firm. The results show that in order to induce the bidders to behave truthfully, some penalties would have to be levied and incentives would have to be provided. For example, if both the incumbent bidder and the challenger bid the same, the challenger is awarded the bid. If the incumbent firm is found to be inflating quotes, a penalty would have to be levied against the incumbent in the sense that the contract would be awarded to the challenger. Finally, in order to reward the bidder who quotes the true costs, subsides would have to be awarded. Thus, the models provide theoretical justification and guidelines for bidding behavior practices in the real world.

Interestingly, both the ex-ante and ex-post models based on Kreps's assumptions show identical results. Implications of this finding need to be further explored in future research.

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