Cost Estimate Methodology in procurement processes of ME

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Abstract: For procurement process in Health Technology Management (HTM), after the step of planning, design and specification that will meet the clinical demand, we seek to set the amount to be spent on its procurement. Following, in public institutions, after the application approval, bidding process starts for the procurement, which must fully comply with the laws governing the Public Bidding. For the technology incorporation in the health unit applicant, usually the process is quite lengthy due to its complexity, however, if well planned, budgeted and defined, its chances of achieving success within a reasonable time is much higher. In this paper, we will consider in the budget definition of Medical Equipment (ME) to be acquired, which in most cases becomes the villain of delays justifications. In this context, this paper aims to present a new methodology for defining the estimated value / cost that will be used in a future bidding process, aiming at greater effectiveness of these processes and the reduction of the implementation period, which cause a lot of damage to the bidder body, the health unit and the citizen.

Keywords — Clinical engineering, Health Technology Management, Medical Equipment, cost estimation, Health Care Facility.

I. INTRODUCTION

In present days due to the dynamism and volume that the activities are performed, a control over management action is required within a group that seeks an organization dedicated to increase the profit on a determined product. Thus, there are cost methods that aims to minimize costs and maximize profits, according to Porter [5] this means “deliberately choose a different set of activities to deliver a unique mix of values.”

Usually when developing a technical specification (TS) of Medical Equipment (ME) to meet clinical demand of a Health Care Facility (HCF), are sought-in the market technologies required in TS. Then is requested to the suppliers to submit a budget of their equipment and by considering these budgeted amounts it is presented the estimated cost for use in the public notice. Another way often used in the Health Technology Management (HTM) is the calculation performed by the arithmetic mean of the values quoted in a previous bidding process; however, the result is very inaccurate because of the wide range of values and usually carries old process addictions. In both methodologies the estimated value information does not take into consideration the other requirements that incorporate the bidding process and especially the necessary time from the estimated value definition up to the procurement conclusion with the payment to the homologated provider in the bidding process.

Given this finding and the experience in HTM in the HCF [9,10] along with the Santa Catarina State of Health Bureau (SES/SC), it was identified that undoubtedly the definition of the estimated value of ME to be acquired is one of the main factors that have influenced the huge delay in the processes and in many cases making it desert or finalized without the completion of the good procurement.

So with the objective of developing a methodology for the definition of ME cost that would bring benefits in the agility of the bidding process, to be employed in the Dimensioning and Incorporation of Technology (DIT) for the field of Clinical Engineering (CE) in the Institute of Biomedical Engineering (IEB-UFSC), it was conducted the present study.

In this paper, initially it presents traditional methods and defined by the study to meet the definition of the value of ME. In sequence, it compares the value estimated by the methods used before and after the study to low technology and high added value, comparing percentage according to the methodology used, ending with the benefits of this new methodology and the need for further comparative studies seeking further refine the estimate of the future value.

II. METHODOLOGY

Furthermore, is a brief definition of the methods traditionally established, such as: Absorption Costing, Variable Costing, Standard Costing, Activity-based Costing (ABC) to analyze which of the methods would best apply or adapt to the Clinical Engineering activities at IEB-UFS.

Absorption Costing: “Characterized by the appropriation of all the internal operational cycle costs to the final carriers’ costs” [2], i.e. all production efforts are distributed to all products.

Variable Costing: Attributes to each cost a specific classification in the form of fixed or variable costs. Lopes de Sá says that the variable costing is “the cost counting process that excludes fixed costs” [3].

Standard Costing: “The standard cost is a pre-assigned cost, taken as basis for the production registration before determination of the effective cost” [8]. So it would be the cost that should be pursued in full efficiency and maximum yield.
Activity-based Costing (ABC): This costing system aims to supply the need for more accurate information on the cost of each activity involved in the production processes and the generation of services. "The ultimate goal of ABC is to create information for a decision to improve the competitiveness of enterprises" [4].

A. Applied costing at DIT on IEB-UFS

Applied costing at DIT of IEB-UFS: The fact that all methods have advantages and disadvantages between them, and none of them would be directly applied or adapted to this reality; key ideas of all methods were extracted. For example, the idea of involving total costs (Absorption Costing), focus on unit cost (Variable Costing), use the maximum efficiency (Standard Costing) and a constant database updates (ABC Costing).

The methodology employed aims to separate in the database the ME initially approved or rejected, as long as acquired under the same technical specification. For example, assuming that a public notice for procurement of General Surgical Table there are three approved proposals, assuming that all of them will work at its maximum efficiency, only one will be the winner of the bidding process/public notice, the lowest cost compared to the others. While on the other hand, there is a General Surgical Table that was disapproved for some reason, such as: excessive cost; incompatibility of technical specifications; lack of sample (in case of brand and/or equipment unknown by the medical staff); or still if it failed the clinical judgment. Thus, this method to separate the approved and disapproved, serves as the first filter to enable the estimated value for the public notice, because in this universe of approved and disapproved, only the approved ones will be considered.

To be able to estimate a more accurate value, it will be examined the bidding processes history in which the studied equipment had the declared winning bid and it will be made a filter which will consist in stopping the entry of devices approved with cost higher than 30% of the winning product. Therefore, it will be used for calculation purposes of this methodology, the value of equipment which are in the database with costs up to 30% higher than the value of the winning bid.

After the insertion of these two filters, it is necessary to weigh in this information to be able to apply to all equipment. Therefore, mathematical methods will be used, such as geometric mean, because then no data will dominate the sample, normalizing the scope of the estimated value. This mean is applied only to approved and that do not exceed the amount of 30% of the winning equipment value.

To increment and reach an estimated value closer to the reality of the technology supplier market, that notwithstanding seek to increase their profit margins, sums up to the average of the dollar variation and the inflation of the period following the closing of the bidding process (from which the cost data were taken – Table 1) until the estimated cost of ME setting date, both applied on the geometric mean of the product values under the conditions stipulated in this methodology.

The necessity to increase the value with inflation is due to the fact that this “consists of the persistent and widespread increases in costs of goods and available services to society” [1]. And to try to correct or tend to neutralize the cost discrepancy is performed monetary correction, which results in increasing the cost of medical equipment.

Finally, as the dollar exchange rate varies from day to day, to streamline the quotation update, is computed an average of the period so that this variation is considered in the estimated final cost.

III. RESULTS AND CONSIDERATIONS

To verify the accuracy of the methodology with respect to the first quoted model, a comparison will be made of these methodologies.

The equation of the methodology of mean cost:

\[ P_f = \frac{P_1 + P_2 + P_3 + \ldots + P_{n-1}}{n-1} \]  

Being:
- \( P_f \): Final cost.
- \( P_1, P_2, P_3, P_{n-1} \): Equipment Cost;
- \( n-1 \): Quantity of equipment.

The equation developed for the new methodology applied:

\[ P_f = M_g + (INF_v \times M_g) + (DOL_v \times M_g) \]  

\[ P_f = M_g \times (1 + INF_v + DOL_v) \]  

Being:
- \( P_f \): Final cost;
- \( M_g \): Geometric mean with the costs within the stipulated conditions;
- \( INF_v \): Inflation variation in the period;
- \( DOL_v \): Dollar exchange rate in the period.

Using two cases for comparison, the first in which costs have a great variation, but with a low earned value, and the second when there is little cost difference, with a high earned value equipment.