FORMULATION OF AN ECONOMETRIC MODEL FOR THE CALCULATION OF THE CONSEQUENCES OF DIRECT PROCUREMENT RISK MATERIALISATION IN HOSPITALS

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ABSTRACT

Any public institution must manage its own budget (public money) so that it can ensure its proper functioning and carry out the purpose for which it was created; in the case of a hospital unit, obtaining health at the highest standards with the lowest costs. As a component of healthcare, public procurement for items necessary for its operation must be effective. For this reason, any healthcare unit must know the risks it is subjected to and be able to manage any negative economic consequences that may result from their manifestation.

KEY WORDS: *public procurement, risk class, purchase cost, additional costs, statistic-mathematical probability, statistic-economic probability.*
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1. INTRODUCTION

If, until 1989, the Romanian society functioned according to „socialist" principles, the state deciding who and what to produce, whom to sell and at what price, how to spend state money, who should be a supplier of products/services, after this year the administration started to become a provider of public services for the Romanian society, becoming more and more autonomous from the Romanian state.

An effective government money management provides the company with finalised quality projects with minimal spending, without waste, since public procurement is a vulnerable activity in many ways (corruption, abuse of office, illegalities of all kinds, etc.). For this reason, a number of national and international organisms have performed analyses to identify strengths and weaknesses, distortions, discrepancies in a certain area, including health, as well as economic segments contribute to the good functioning of that domain.

Such an economic segment that contributes to the proper functioning of a public institution is the public procurement system. Public procurement can be defined as a set of operations that a public institution carries out in order to ensure the necessary operations and to achieve the main objective, in the case of a hospital unit obtaining health at European standards.

2. DESCRIPTION OF THE PUBLIC PROCUREMENT SYSTEM; INSTITUTIONAL APPARATUS OF THE PROCUREMENT SYSTEM

Public procurement is a subsystem of public institutions. For a better

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understanding of procurement operations, it is necessary to explain some of the features characteristic to this functional subsystem. Such notions are:

- the contracting authority – i.e. any public body acting on the central or territorial level, with legal personality, set up to meet general interest needs (such as public health, for example);
- economic operator – a natural or legal person, operating with non-public capital, authorised to carry out a certain type of activity;
- market – the meeting place of economic agents, where some are tenderers and others are buyers, the place (virtual or not) where the demand meets the offer and the competition forms the price;
- demand – the quantity of goods/services/works required on the market;
- supply - the quantity of goods/services/works offered on the market.

The public procurement system has two components: institutional and legislative.

The institutional component includes all the specific institutions contributing to both the supervision of procurement procedures and the regulation of the way in which public procurement contracts are awarded. These institutions are:

- The National Agency for Public Procurement (A.N.A.P.): resulting from the merger in 2015 of the National Authority for Regulation and Monitoring of Public Procurement (ANRMAP), with the Unit for Coordination and Verification of Public Procurement (U.C.V.A.P.);
- the National Council for Solving Complaints (C.N.S.C.): a jurisdictionally independent administrative body set up in 2006, the one called to resolve the complaints submitted within the award procedures;
- the Electronic Public Procurement System (S.E.A.P.): defined as: „a public utility computer system accessible via the Internet at a dedicated address, used for the purpose of applying the award procedures by electronic means";
- the Court of Accounts: institution which controls "the way of forming, administering and using" public money (Bostan (2010)).

The legislative component of public procurement includes:

- the European legislation, consisting in a number of Directives and Regulations;
- the national legislation, which includes primary, secondary and tertiary legislation.

The purchases of a hospital unit are based on the scope of the contracting authority's needs, according to priorities, the funds it has and the ultimate goal – the supply of health. When establishing the needs, the contracting authority must take into account the necessity reports prepared by each department and ward - in the case of a hospital, in order to be able to draw up the Annual Public Procurement Plan. Based on the necessary reports, the Procurement Department of the contracting authority estimates the value of the acquisition, determining by law whether that need is the subject of a procedure or the object of a direct purchase. If the need for a budgetary year is the subject of a direct purchase, then the contracting authority, through the Public Procurement Compartment must put together the direct purchase file. The file of a direct procurement in SEAP will basically include the following elements:

- the necessity report;
- the prospecting of the market, of the general supply for the product/service/job sought;
- the SEAP listing of the product details displayed by the chosen supplier;
- the purchase request initiated by the contracting authority in the SEAP;
- the acceptance of the purchase request by the supplier;

- the acceptance of sales conditions by the hospital.

The stages of a direct purchase are:

a) identification of the needs based on the necessity reports;

b) the estimations of the value of that need;

c) one checks whether the product has been purchased before or it shall be purchased in the future, in order to verify the estimated total amount for determining the possibility of including the need in the direct acquisition category;

d) one studies the market for the respective product and one selects a supplier to place an order it;

e) one puts together the direct purchase file, which shall additionally contain the order in hard copy and a copy of the invoice resulted from the purchase;

f) one shall proceed to the verification/reception of the product and the forwarding of the invoice for payment to the accounting service.

Empirically, the direct purchase in SEAP goes through the following steps dictated by the SEAP electronic platform configuration, but also by the logic imposed by practice:

Step 1: The correct identification of the product from a technical/qualitative point of view in the e-commerce site;

Step 2: The study of the market for the product sought and search for an optimal ratio between price and product properties; possibly the request for additional information on its properties;

Step 4: The selection of the supplier;

Step 5: The initiation and publication of the direct purchase on the SEAP electronic platform;

Step 6: The acceptance of the purchase, after the supplier's sales acceptance in SEAP;

Step 7: The listing of the direct purchase in hard copy in order to complete the direct procurement file;

Step 8: The notification in the SEAP of the purchase if it exceeds € 5,000.

Practice has shown that there are nuanced issues regarding the direct purchase of hospital-specific products. For example, given the multitude of products with very similar characteristics, emphasis should be placed, within the contracting authority, both on the correct identification of the required product and on its quality requirements.

Therefore, the correct identification of the required product can be considered a direct purchase risk, along with other classes of risks such as:

- conditioning the purchase on the procurement of a minimum quantity;

- the relatively low price of the product doubled by a small quantitative demand;

- non-reality of the stocks displayed in SEAP;

- inscribing inaccurate data in the necessity report.

From the purchasing department's practice, it was observed that the direct purchase risks in SEAP are the following:

- confusion caused by a lack of clear specification of the product properties in the necessity report;

- inaccurate/insufficient description of the product displayed in SEAP by suppliers;

- in the case of tenderers with the same price displayed in the SEAP, for the same product, it remains at the discretion of the procurement employees to choose the supplier's selection criteria;

- possibility that the product does not actually exist in the stock of the company chosen as a supplier from the SEAP platform;
- emergency situations can generate emergency purchases that lead to insufficient SEAP market testing;
- existence of companies without commercial activity, but displaying products in SEAP;
- additional transport costs resulting from the return of products as a result of the purchase of a non-compliant product;
- supplier's refusals due to profitability (low product price, small quantities required by the hospital).

The number of operations and their sequential enchainment mode make it possible to see the error in the entire system, at each step and at each stage of the direct purchase. Systematically or accidentally, errors cause damage, primarily due to additional expenditure, necessary and sometimes unnecessary, incurred for correcting the acquisition process and restoring it to normal and legal parameters. In all public procurement types, direct purchase has a quite high degree of exposure to error. The existence of additional expenditure burdens the budget, and thus becomes a stringent management problem.

A hospital is a public institution, that is why public procurement, direct or not, as well as its results, are related to managerial performance. In practice, the leaders of a county emergency hospital (subordinated to the County Council and the Ministry of Health) must manage the material resources as efficiently as possible, may they be financial, human, informational, organisational or cultural, in order to meet the health needs of the county citizens in conditions of high performance.

For these reasons, the hospital top management must take into account the risks of procurement in general and, in particular, the risks of direct procurement. It follows that a desideratum of the management team of the hospital unit and the public procurement department is the assessment of the risks and of the cost of the unexpected, i.e. the expenses that may arise from the risk. Clearly, for the risk assessment, any hospital unit should have a working procedure stipulating the working methodology for the evaluation. This risk assessment should help investigate the direct purchase phenomenon. The investigation of the direct procurement phenomenon in hospital units can be done with the help of science of econometry by using econometric models.

3. BUILDING AN ECONOMETRIC MODEL FOR CALCULATING THE CONSEQUENCES OF RISKS MATERIALISATION

In order to be able to sketch an econometric model for calculating the consequences of risks materialisation, it is necessary to establish/predefine en entire series of elements such as:
- the Total Product Cost - it represents the traded amount (required quantity x product price) for the direct purchase;
- other costs – they are additional costs, with their explanation by types of activities having generated them;
- the Total Other Expenses – they represent all the other additional expenses, and may be considered hospital loss in the transaction;
- the general cost/product - it is the total amount spent by the hospital to purchase the product (total product cost + total expenses);

- the establishment of working groups, according to: total product cost, total other expenses and general cost/product;
- the calculation of statistic - and economic-mathematical probabilities and of the aggregate probability (the interference area of the first two), for the risk categories representative for the hospital unit;
- the verification of the distribution laws of the respective calculated probabilities;
- the determination of the risk score by a formula of the type: $T_i = Psm_i Ve_i$, where:

      Psmi – statistic-mathematical probability, i.e. probability of occurrence of type "i" risk

      Vei - value of economic materialisation of type "i" risk
- the ranking of the risks identified to be significant for direct purchase;
- the determination of the type and intensity of the relationship between the two probabilities (mathematical and economic), i.e. establishing the linear/nonlinear dependence;

      On the practical level, in relation to the direct procurement, at least 4 risk categories can be identified:
- conditioning the purchase on the procurement of a minimum imposed quantity;
- relatively low price of the product doubled by a small quantitative demand;
- unreality of stocks displayed in SEAP;
- inscription of inaccurate data in the necessity report.

      With the help of the pre-calculated elements, on the practical level it was found that if all four investigated risks were to occur simultaneously, each additional amount of 1 lei spent - and thus lost by the hospital from the budget - would have the following composition:
- 17.7 bani (1 bani representing one hundredth of 1 lei) would be lost due to inaccurate data inscribed in the necessity reports;
- 21.0 bani would be lost due to condition of making purchases in minimum quantities imposed by suppliers;
- 22.0 bani would be wasted due to low prices of products (displayed by suppliers in SEAP) and small quantities ordered by the hospital;
- 39.3 bani would be lost due to the supplier's display of unreal/inaccurate stocks on SEAP.

      To highlight the economic consequences of risks materialisation, we have at disposal the following reliable data:
- transaction value ("total product cost" indicator);
- total amount budgeted for all the transactions performed by the hospital in the surveyed budgetary year (the "total product cost" indicator – 87,113.07 lei);
- the statistic-mathematical probabilities - of occurrence / materialisation - of each risk category;
- the statistic- economic probabilities of each risk category materialisation.

      When "sketching" the economic consequences, namely in the materialisation of a certain risk of risk category, one starts from the idea that the risk has already occurred, i.e. the statistic-mathematical probability is equal to 1 (certain event).

      In order to define the econometric model it is necessary to calculate:
- the weight of total other expenses in the total value of the "total product cost":

$$\frac{\sum Cst}{\sum Ct} = \frac{4166,96}{87113,07} = 0,0478$$

- the weight of the transaction value (direct purchase) „i" in the total value of the transactions:

$$\frac{Cti}{\sum Ct} = \frac{Cti}{87113,07}$$

The significance of the indicators in these relationships is the following:

$\sum Cst$ - total additional expenditure (of total transactions);

$\sum Ct$ - sum of total costs/product;

Cti - cost of „i" transaction.

Noting by Cst the estimated additional expenses (losses) estimated for transaction „i", a prefiguration model thereof is the following:

$$Cst_i = \frac{Cst_i}{Ct_i} x \frac{Ct_i}{\sum Ct_i} x \sum Ct_i$$

It follows that a first estimate of the extra costs incurred due to the materialisation of the risks in a transaction can be made by multiplying:
- the weight of additional transaction costs in total expenditure;
- the weight of expenditure for the products in transaction „i" of total expenditure (total of the total costs/product);
- total sum of all expenses.

Due to the fact that the first weight is unknown, it can be successfully replaced by an average weight, represented by the weight of total additional expenditure in total expenditure for the products of all transactions, i.e. by the value of 0.0478 - pre-calculated. Thus, the above relationship, of estimated losses, will become:

$$Cst_i = 0,0478 \frac{Ct}{\sum Ct_i} \sum Ct_i$$

This is a very useful way to calculate the preliminary value of the possible damage at the conclusion of a transaction. The test of the calculation algorithm was done taking randomly one of the direct acquisitions in SEAP that took place in 2016, the one for the product „Micrococcus Luteus Reference Strain". One obtained:

$$Cst = 0,0478 \frac{1101,1}{87113,07} 87113,07 = 52,63 lei \cong 57,08 lei$$

4. CONCLUSIONS

As we can see, by the proposed econometric model, one obtained the calculated value of 52.63 lei. This value is close to the actual value of the additional expenditure for the product „Micrococcus Luteus Reference Strain" - of 57.08 lei, the difference of 4.45 lei being insignificant for a county hospital in a budgetary year. It follows that the econometric model can be applied with a rather small error margin.

Each hospital in Romania should gather data about: the risk categories to which it is exposed, the probability of occurrence of the risks, the additional costs generated by the risk manifestation, the calculation of the risk score, the hierarchy of these risks, etc. In this way, each hospital in Romania could determine whether purchasing a product is more economical by direct purchase, or budget savings could be made by including the product in a tender process. Obviously, this is not possible at present because the Public

Procurement Act does not allow this decision-making freedom on the hospital level. If this responsibility to choose the way of procurement (procedure or direct purchase) belonged to the hospital, certainly the department of specialty, but especially its management, would be more careful in spending the public money.

The forwarded econometric model, by establishing and ranking the general and customized direct acquisition risks, could assist hospitals in making decisions regarding the procurement method.

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