MATHEMATICAL MODELS REGARDING THE SELECTION AND CONTROL OF MEDICAL TECHNOLOGY INVESTMENTS

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Keywords: maintenance costs, leading replacement coefficient, normal life expectancy.

The mathematic pattern proposed [1] for the evaluation process is developed in two stages:

(a) The first stage, also called the **objective stage** is based only on **technical data (quantitative evaluation)** and it calculates a **priority coefficient of replacement PCR_1**.

(b) If PCR_1 exceeds a certain level, we pass to **second stage**, also called the **subjective stage (qualitative evaluation)**, based on information supplied by interviews and questionnaires from medical personnel. Within the stage, **the second priority coefficient of replacement PCR_2 is calculated**.

I.The objective stage is based on the following characteristics: **Age (x_1); The costs of maintenance (x_2); Downtime (x_3); The function of the machine (x_4); The quality of the logistic prop (x_5).**

The shares for the characteristics taken into consideration are: 25% of the maximum score is due to the logistic prop; 30% to the machine's functions and 45% to its state.The resulted pattern is:

$$PCR_1 = 9\,(x_1 + x_2 + x_3) + 7{,}5x_4 + 25x_5 \quad (1)$$

II. If $40<PCR_1<60$, then we will pass to **subjective stage** who takes into consideration the characteristics: **The behaviour of the machine during functioning (K_1); Frequency of usage (K_2); The comparison with newer patterns concerning the performances regarding the precision of the diagnosis, the therapeutic efficacy, etc. (K_3); The comparison with new pattern concerning the facility of usage (K_4); The comparison with newer patterns concerning the yield (K_5).**

The shares for the considered characteristics are: 20% of the maximum score is due to the machine's performances, 20% to the frequency of usage, and the rest, of 60% supports the influence of the comparison with new patterns existent on the market.

$$PCR_2 = 5(4K_1 + K_2) + 10(K_3 + K_4 + 2K_5) \quad (2)$$

The interpretation of PCR_2 coefficient: If $PCR_2 \geq 80$, then it is urgently recommended to replace the machine; If $40 \leq PCR_2 < 80$, then the machine has problems and it is recommended a new evaluation until the end of the year; If $PCR_2<40$, then no actions of correction are taken.

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