UNIVERSITI TEKNOLOGI MARA

DYNAMIC LINEAR PROGRAMMING MODEL FOR QUARTERLY BUDGET ALLOCATION AND EXECUTION

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of the requirements for the degree of
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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

Managing a strategic budget allocation based on votes and a systematic monitoring execution to ensure the effective practice of the budget is still lacking. Due to ineffective budget allocation, execution and monitoring, management is bound to encounter spree-spending of the budget. Most studies on budget allocation of HEIs have used linear programming, integer programming, and multi objective or goal programming for yearly budget planning. However, there is no study concerning the use of Dynamic Programming (DP) in minimization quarterly and yearly budget variance. Thus, this study is concerned with the development of Dynamic Linear Programming models for faculty's budget allocation and execution. The aim is to optimize the efficiency of budget utilization of faculties of a local public university. This study is divided into three stages with four objectives, which are: to analyze the current faculties' budget allocation and utilization, to develop the Quarterly Budget Allocation Model (QBAM) and Quarterly Budget Execution Model (QBEM), to formulate Dynamic Linear Programming model for Quarterly Budget Allocation and Execution (DLP-QBAE) that minimizes the quarterly and annually budget variance and, to determine the optimal strategies for quarterly budget allocation and execution based on the models. The preliminary survey shows that most of the faculties in three clusters did not fully utilize their allocated budgets. The budget allocation and utilization of selected faculties' in three years have been analysed using descriptive analysis, pie chart and Pareto diagram. Pareto analysis determines the highest budget given to the faculties according to the academic clusters. Three QBAM models for determining budget allocation proportion per quarter namely the horizontal line, staircase and zigzag models are put forward. These models are developed based on analysis of past data and they represent strategies for quarterly allocations, which have the potential of maximizing the efficiency of each faculty's allocated budget utilization. The QBEM includes targets for the quarterly budget utilization and the lower and upper bounds for quarterly votes' utilizations. Six changes of parameter (quarterly target of spending) are proposed, resulting in six variants of QBEM denoted as QBEM 1 to QBEM 6. Meanwhile, budget optimization for the budget planning and execution is proposed as the DLP-QBAE model that generates optimal percentage of budget allocation and utilization per quarter based on input of QBAM and QBEM. Analysis of results shows that there is no difference among the three QBAM models while the proposed QBEM 3 gives the lowest yearly budget variance due to the spending percentage of QBEM 3 being the highest among all models. This shows that the higher the yearly expenditure, the lower the variance (yearly budget balance). Thus, to minimize the yearly budget variance, the respective faculty has to optimize the utilization of the yearly budget allocation. This study has produced a comprehensive model for faculties' budget planning and management that will help faculties to utilize the budget more efficiently. With the graphical user interface (GUI) developed, the model has the potential to be applied for managing budget in any organization or department. The DLP-QBAE model can also be used as a base model or modified for the development or extension of the model concerning the same area of problem. It can also be used for other resources' allocation optimization in various other applications.

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