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Reducing the efficiency gap by optimal allocation using modified assignment problem for apparel industry in Sri Lanka

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The Industrial Sector is one of the main contributing sectors of Sri Lanka's economy. As per the Central Bank of Sri Lanka, the largest proportion of the industrial sector is comprised of manufacturing businesses. When it comes to manufacturing, lack of efficiency is one of the key problems faced by them all over the world. Apparel manufacturers, who contribute prominently to the country's Gross Domestic Product, also experience this deficiency. In this study, the efficiency problem in the production lines, which is one of the sections in a plant, is addressed. The main objective of this study is to increase line efficiency by reducing overall working minutes. A comprehensive literature review and interviews with industry experts are done to find the causes of the problem in achieving required efficiency. This required efficiency is predetermined by the operations department. Improper allocation of workers to each operation of a line is identified to be one of the major reasons causing this gap. The studies are conducted on production lines in apparel industry. In order to proceed, Industrial Engineering study or a work-study is carried out using the operations breakdown sheet of a particular garment. It has focused on assigning 25 operators in a single production line for 17 operations that was examined for seven weeks. Apart from one operator being allocated to one operation, special scenarios like one operator is allocated to many operations and many operators are allocated to one operation, are taken into account when doing the work-study. The efficiency is inversely proportional to the working minutes. Thus, by reducing the working minutes the efficiency can be improved. In finding the optimal allocation, best-negotiated approach is developed using a mathematical model and solution is derived by using modified assignment problem. In determining this, modified Hungarian algorithm was applied using Lingo commercial version. The identified model is validated through review of subject and industry experts. The proposed model is expected to be beneficial for the apparel industry in terms of their efficiency. It can be concluded that the result of the study will reduce overall working minutes in order to maximize the efficiency with the proper utilization of this model.

Keywords: Modified Hungarian algorithm, Line efficiency, Work-study, Mathematical model