Development of a Decision Support System for Finding the Optimal Employee-Workstation Combination for a Manufacturing Assembly Line in a Garment Manufacturing Firm: An Experimental Study

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Assembly lines are traditional and still attractive means in manufacturing processes. Lean manufacturing, which is one of the modern manufacturing concepts, seeks to make the product flow through the process and eliminates non-value-adding activities. In order to achieve this, a balanced assembly line is critical as the assembly line is at the heart of the manufacturing process. Correct task allocation to workstations and correct employee-work station combination are two of the most important factors in balancing a garment manufacturing assembly line. However, in most of the small and medium scale Sri Lankan Garment Manufacturing Firms, frequent changes in physical assembly lines are required to cater to small order quantities and the use of manual methods in arranging line layouts are found to be time consuming and tedious. Even so, most of the assembly line layouts are found to be re-adjusted several times until an optimum layout is achieved. Although many studies have been done elsewhere, the fact that there is a dearth of research in Sri Lanka in this context, led to the present study of developing a Decision Support System (DSS) for obtaining the optimal employee-work station combination for a manufacturing assembly line in a Garment Manufacturing Firm.

After a comprehensive study carried out on a manufacturing assembly line in a medium scale garment factory and some relevant literature were studied in depth, a DSS was developed using *Java* programming language and *MySql* database. The effectiveness of the DSS was experimented using two manufacturing assembly lines of the same shift which were to produce ladies skirts for the first time. The two assembly lines were recording neck-to-neck manufacturing efficiencies for the past two months with other production runs. For one line, the employee-work station combinations were found manually and for the second line, the combinations were found using the DSS. The two manufacturing assembly lines were fed at the same time and the line outputs were observed for one week.

For Line 1, the production executive took ~45 mins for deciding the workstation-employee combination of the assembly line and it took only ~7 mins for the second assembly line when the DSS was used. Therefore, the time taken for obtaining the employee-work station combination was improved by 84% when the DSS was used. The production results during the first week were observed to be on par with each other, which proved the use of the DSS was effective. Therefore, with further studies, this DSS can be improved as a day-to-day operating tool assisting managerial decision makers in Garment Manufacturing Firms. Since the DSS is very easy to run as it is platform-independent, user friendly and does not incur additional costs for installation and running, it could be a means for streamlining the manufacturing assembly line preparatory process for better efficiency.