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An optimized production assignment algorithm for custom-made garments

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ABSTRACT

Unlike mass-volume products, custom-made products provide multiple options at the ordering stage and therefore require a system flexible enough to accommodate these needs. This study developed a worker-balancing algorithm for custom-made products that enable equitable workload distribution across different numbers of workers. The key variables considered are task duration, the number of workers, and the type and complexity of the tasks involved in producing custom-made garments. The proposed algorithm is designed as an optimized production assignment by sequentially assigning the number of workers and tasks for each production operation. The main steps of the algorithm are as follows: (1) calculate the basic pitch time (BPT); (2) determine the number of workers and the time per worker required for the highest-level task; and (3) redistribute the workload between the highest-level task and the second-highest-level task. The algorithm was applied to generate production assignments for scenarios involving four to seven workers. The outcomes of the proposed method were compared with the current five-worker assignment in use. The results show that balance efficiency increased from 69.9 % to 83 %. To further validate the algorithm, a production process was modelled and simulated using a discrete-event systems simulation tool. The simulation confirmed the reliability of the balance efficiency, as labour utilization closely matched the calculated balance efficiency. This study is significant because it addresses workload balancing in small-scale, custom-made garment production. Moreover, it offers a practical approach to distributing task durations that accounts for both worker competencies and the specific nature of the tasks performed.

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