

COMPARING FUNCTIONAL AND CELLULAR LAYOUTS: SIMULATION MODELS

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Abstract

The cellular layout has been compared to the traditional functional layout in numerous studies. Most of them are based on simulation modelling. Nevertheless, they generally suffer from the lack of detail in describing their simulation models. The exclusion or the lack of information of key parameters could be serious limitations to any simulation study. The main purpose of this work is the development of comprehensive FL and CL simulation models and their use for illustrating the dependence of the layout performance comparison on the settings of factors either overlooked or kept constant by several simulation studies. Simulation results clearly establish the influence of part type routings, cellular queuing strategy and job overlapping on the ranking of the two layouts.

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Key Words: Manufacturing Systems, Cellular Layout, Functional Layout, Simulation

1. INTRODUCTION

Since its apparition and the spreading out of the group technology concept, the cellular layout (CL) has been compared to the traditional functional layout (FL). Analytical models and empirical research have often been used for the two manufacturing system (MS) layout patterns. However, the major part of the literature devoted to FL-CL comparison is based on simulation modelling.

Results reported by comparative simulation studies vary widely. Indeed, some researches reported that the FL is always superior to the CL with regard to all used performance measures [1-3]. In contrast, further researches found the CL superior to the FL in all operating conditions [4], [5]. Some other simulation studies established that each layout could outperform the other in some particular experimental conditions [6-10]. This divergence in the conclusions is referred as the "cellular manufacturing paradox" [11]. [12] studied this paradox as it emerged from a number of comparative simulation studies. It identified a number of objectivity flaws responsible for the conflicting conclusions. Prior to this study, [11] and [13] reviewed and analyzed a number of FL-CL comparative studies. Their works simply reported the major findings of some published studies without any critical objectivity assessment.

In fact, it appeared from [12] results that some parameter settings, such as under sizing transfer times or excluding job overlapping in CL, biases the comparison in favour of the FL. On the other hand, some other settings favour the CL. Among these settings, machine duplication and very high transfer times can be mentioned. Besides, the same study pointed out the fact that many potentially influential factors were considered constant throughout some of the simulation investigations. In addition, according to the same study, some of the

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