

Assessment of Workers' Aptitude toward Assembly Tasks in Production Cells based on the Five Factor Model of Personality

Yanwen Dong

Cluster of Science and Technology
Fukushima University
Kanayagawa No.1, Fukushima city, 960-1296 Japan
dong@sss.fukushima-u.ac.jp

Extended Abstract

Over the past 30 years, cell production or cellular manufacturing has become an integral part of lean manufacturing systems, many organizations have applied cell production concepts in manufacturing and service processes. In a cell production system, factory floor labor is arranged into semi-autonomous and multi-skilled teams, or work cells, who manufacture complete products or complex components. Properly trained and implemented cells are more flexible and responsive than traditional mass-production lines. Successful implementation of cell production can achieve significant improvements in product quality, scheduling, space utilization, control of operations and employee morale.

Academics and practitioners have paid a lot of attention to cell production system design problems, such as the best groupings for products, parts, or machine clusters. Some efforts have also been made toward selecting tools, jigs, and fixtures, determining process flow, determining cell capacity and selection of equipment. However, it has been reported that most of the problems faced by companies implementing cell production system were related to people, not technical issues. As surveyed by several researchers, implementation of cell production is not simply a rearrangement of the factory layout; it is a complex reorganization that involves organizational and human aspects.

As major studies have put their emphasis on technical factors of cell production systems, there is a singular absence of articles investigating the impact of human factors on production cells. This is because human related issues are typically difficult to quantify. Although there are some literatures identifying and dealing with how human factors affect production cells, almost all of them were conducted based on questionnaires analysis or case studies. There are few researches that examine quantitatively human factors' impact in cell production systems.

We have made a series of experimental studies to investigate the impact of human factors. One of our previous studies has shown that both workers and their experience (learning effect) have significant impacts on the productivity of production cells, the impact of these two factors accounts for 67.01% and 19.63% respectively. As two-thirds of variance of the productivity were decided by workers, it is very important to measure workers' aptitude and assign the right workers in the right place in order to implement cell production systems successfully.

In this paper, we put our emphasis on measuring the workers' aptitudes that significantly affect performance of production cells, and make several new contributions about the cell production research through the following examinations:

- (1) Different from most of previous researches that applied questionnaire survey or case study methods, this paper applied the experimental study method. We designed and conducted a cell production experiment, and used the assembly time to measure quantitatively productivity of production cells.
- (2) In order to measure the workers' personality, we applied a short form of Five Factor Personality Questionnaire (FFPQ-50). FFPQ-50 is a 50-item questionnaire that measures the workers' five super traits: extraversion, attachment, controlling, emotionality, and playfulness. A principal component

analysis was conducted to assess the workers' aptitudes that significantly relate to productivity of production cells.

- (3) We applied the partial correlation analysis and regressive analysis method to examine the relation between the workers' scores of FFPQ-50 and productivity of production cells. As the result, it has been clarified that the emotionality of the workers has significantly a negative impact on the productivity and meanwhile, the playfulness contribute positively to the productivity.

Keywords

Cell Production, Experimental Study, Workers' Aptitude, Five Factor Model, FFPQ-50

Acknowledgements

This work was partly supported by Grant-in-Aid for Scientific Research (C) from the Japan Society for the Promotion of Science under Grant No. JP16K03848.

Biography

Yanwen Dong is a professor in the cluster of science and technology at Fukushima University. He received his bachelor degree in 1982 and a master degree in 1984 from University of Science and Technology Beijing, China. He also received PhD in 1996 from the Osaka Prefecture University, Japan. He worked in University of Science and Technology Beijing as a lecture from 1984 to 1995 and in Faculty of Economics, Fukushima University as an associate professor from 1997 to 2004. His current research interests include cell production system, production scheduling, data mining and management information system.