Integrating TQM and JIT in MRP II framework: development of an interface system 2000 (IS-2000) supporting the interaction of QA, QI, and JIT to reduce manufacturing lead time

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Abstrak

One of the perfomance measurements in manufacturing is Manufacturing Lead Time (MLT). MLT which is the time taken from the job entering manufacturing system until it is ready for delivery. It consists of Set up time (S), Operation time (0), Move time (M), and Queue time (Q). Complexity of manufacturing in job orderfmake to order (MTO) environment leads to increase MLT. This complexity is related to problems in productivity and quality. Well-adopted manufacturing methods related to productivity and quality include Total Quality Management/TQM (represented by Quality Assurance/QA and Quality Improvement/QI), Just In Time Manufacturing (JIT) and Manufacturing Resource Planning (MRP II).

Conceptual Model of interface System 2000 (IS-2000) has been developed to reduce MLT through integrating QA, QI (represent quality aspect) and JIT (represents productivity aspect). In the IS-2000 diagam., the Interface itself is placed in the middle of the diagram showing a place for interaction of JIT, QA and QI. JIT through Single Minute of Exchange Dies (SMED) reduces unnecessary Set up (S reduction), QA through scrap reduction minimises the need for movement (M reduction) and QI through team based problem solving reduces operation delay (Q reduction). Since these activities happen in a shop floor, suitable tools to show behaviour of a shop floor are analytical and simulation model that has been applied in a case study.

The analytical model shows the behaviour of O, S, M and Q regarding the application of JIT, QA and QI. The expected-results of the analytical model are logical. The integrated applications (JITQA, JITQI, QAQI and JITQAQ1) show the benefit of interactions. To Show more dynamic behaviour, simulation model is required.

Simulation model shows a comprehensive behaviour of O, S, M and Q regarding the application of JIT, QA and QI. For example, JIT application decreases set up time of each machine. It means each machine processes job faster. The faster process leads to decrease queue time (Q) at Printer, Extruder and Slitter. However, it tends to increase move time (M) as a negative impact. This negative impact is handled by QA. This interaction becomes JTI` QA application.

IS-2000 is a system supporting the interaction of JIT, QA and QI to reduce MLT. The interaction happens when one application and another application are integrated. This integrated application has greater total effect on MLT reduction than the individual effect of each application, IS-2000 shows quality aspects (QAQI) are related to MLT reduction, therefore this research enriches the study of productivity and quality link. This research offered the benefits obtained from the interaction of JIT, QA and QI to reduce MLT.