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# NPV approach to material requirements planning theory – a 50-year review of these research achievements

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## Abstract

The Material Requirements Planning (MRP) Theory celebrates 50 years of its development. Because delays are Inevitable, Grubbström developed a theory where delays are calculated in the space of complex variables. Using his approach to evaluate time and exposure to risk in complex production-inventory systems is much easier when dealing with multiple delays. Working in the space of complex variables, which describe production flows and cash flows associated with items, it is easier to derive the NPV of activities in the system. This approach allows for a better evaluation of the impacts on the exposure to risks and rescheduling. We presented the development of this theory since 1967 when Grubbström published his first economic article on Laplace Transforms in production and investments. We discuss possible directions for further progress towards age management, environmental sustainability and closed-loop control, risk evaluation, and agile rescheduling in the framework of Industry 4.0. The

overview includes the canon of Grubbström's work to be used as a reference for researchers, who are aware of the importance of correct and accurate timing for the economic evaluation of technical systems. It also underlines an open question: Can this approach support the development of more transparent and resilient financial systems for financing global inventories?

Keywords: MRP theory Laplace transforms production distribution inventories global supply chain time delays lead time annuity stream Net Present Value

## Disclosure statement

No potential conflict of interest was reported by the authors.



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