

# Chapter 10

## Integration of MRP Logic and Kanban Shopfloor Control

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### **ABSTRACT**

*In the 1960s and 1970s, two major thinkers were actively changing the face of manufacturing for decades to come – In the West it was Joe Orlicky with the creation of his MRP concept, whilst to the East it was Taiichi Ohno and the development of Kanban. However, since the two approaches were independently developed for managing production and inventory control, both are often mistaken as mutually exclusive. This chapter addresses the developments in both fields, and through considering the shortcomings of each of the approaches, suggests how MRP logic and Kanban can be combined and integrated to enable a more effective, “hybrid” production and inventory management system that exploits the advantages of each of the techniques. A framework is presented for the integration of MRP and Kanban, which gives details of the purpose of the master production schedule, documents the two primary roles of inventory management considerations, and explains how Kanban operates in such a system in order to eliminate non-value-adding activities and to simplify the production management task. An illustrative case study is also presented in order to give insight to the reader as to how such a “hybrid” system operates in practice, offering practical examples regarding how techniques such as production leveling (Heijunka), net-requirements planning, backflushing, and cost-accounting operate in an integrated MRP-Kanban system.*

### **INTRODUCTION**

The debate as to whether lean production and information technology (IT) are contradictory or complementary approaches to production management has become a hot-topic in recent years.

When we look back in time, it is clear that much of this issue has arisen from the focus on the pull nature of just-in-time production vis-à-vis the push characteristics of Material Requirements Planning (MRP) systems. Though there has been a wealth of literature on this topic throughout

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the 1980s and 1990s, there still remains confusion as to how these two very different methods can be successfully integrated to create a hybrid production planning and control (PPC) system that exploits the advantages of both systems whilst simultaneously eliminating the respective weaknesses. Therefore, the aim of this chapter is threefold. Firstly, MRP and Kanban will be defined as alternative approaches to production and inventory management; secondly, the limitations of both approaches will be addressed; and finally, the possibility of creating a hybrid system that exploits the advantages of both approaches will be demonstrated. The objectives of this chapter are:

1. To understand the essential differences between MRP and Kanban, and to appreciate their requirements and fundamental assumptions;
2. To recognize the difficulties and limitations of both approaches;
3. To identify the advantages of each of the approaches and understand how the two methods can be integrated as a “hybrid” production planning and control system.

**BACKGROUND**

*There’s more than distance separating Japan and America. In the field of production planning and inventory management, the two countries are going in different directions. To the East, it’s Kanban; to the West, it’s MRP. (Goddard, 1982)*

MRP, or net-requirements planning as it is also known, was developed by Joe Orlicky in the 1960s, who at that time was working as a consultant for IBM. It was subsequently popularized in his book “*Material Requirements Planning*” (Orlicky, 1975). One of his major customers was John Deere, the leading manufacture of agricultural machinery. As such, the MRP concept was to be a revolutionary concept for planning material requirements

for dependent demand items. At around the same time, Taiichi Ohno and his colleagues at Toyota Motor Company were developing their answer to the problem of high levels of work-in-process (WIP) inventory on the shopfloor. They were busy introducing Kanban to the workshops of Toyota. The basic definitions of MRP and Kanban are given in Table 1.

MRP and Kanban (the latter being a crucial part of JIT production) are two of the most prominent approaches for production management and inventory control in manufacturing firms in the 21<sup>st</sup> Century. MRP has been widely applied since the 1970s, whilst JIT production, relatively younger in its use in the West, was initially seen as “the magic bullet” by both practitioners and academics. JIT implementation is a demanding process and lacks the support of a standardized software package due to its initial detachment from IT (Dixon, 2004). MRP, on the other hand, has more recently become the core of enterprise resource planning (ERP) software. Thus, a natural consequence of the persistent co-existence of MRP and JIT in industry is the emergence of the desire to compare the two systems, whether in the original form of MRP and JIT or more recently, lean and ERP. As such, the fundamentally different natures of the two approaches are a further contributor for the interest in such a comparison.

*Table 1. Definition of terms (APICS, 2011)*

<b>MRP</b>	“Abbreviation for material requirements planning. A set of techniques that uses bill-of-material data, inventory status data, and the master production schedule to calculate requirements for materials... Time-phased MRP begins with the items listed in the MPS and determines (1) the quantity of all components required to fabricate those items and (2) the date that the components and material are required...”
<b>Kanban</b>	“A method of Just-in-Time production that uses standard containers or lot sizes with a single card attached to each. It is a pull system in which work centers signal with a card that they wish to withdraw parts from feeding operations or suppliers...”

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