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DEVOLOPMENT A SOFTWARE FOR MATERIAL REQUIREMENTS PLANNING AND A CASE STUDY FOR REAL HUĞLU

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ABSTRACT

Material requirement planning (MRP) is a technique of management, listing and control in order to minimize investments, increase production and productivity, and to improve customer service. In this study, it is intended to decrease the stock cost with the application of MRP on a real production environment. Thus, instead of a firm bringing into mass production and especially a firm having assembly lines, on which MRP gives reasonably well results, selecting a firm that have a structure of a "cooperative" in a form of cooperation of partners, managers and procurators together, applicability of MRP is investigated. In order to realize such a purpose, "a study case" is verified on Huğlu Hunting Firearms Corporation in Konya. In Huğlu Hunting Corporation Firearms, a computer program has been developed based upon for these MRP approaches. With the primary applications, stock quantity of production is decreased considerably, with the application of MRP system on 103F.12 model rifle for two years, %60 decrease in stock quantity and %55 stock saving in relation to the cost have been achieved,

Key words: Material Requirement Planning (MRP), Capacity Requirement Planning (CRP), Master Production System (MPS)

MALZEME İHTİYAÇ PLANLAMASI YAZILIMI GELİŞTİRME VE HUĞLU UYGULAMASI

ÖZET

Malzeme ihtiyaç planlaması – MİP (Material Requirement Planning-MRP) yatırımları minimize etmek üretimi ve verimliliği arttırmak ve alıcıya yapılan hizmeti geliştirmek amacıyla kullanılan bir yönetim çizelgeleme ve kontrol tekniğidir. Bu çalışmada, MİP'nin gerçek bir üretim ortamında uygulanmasıyla stok maliyetlerinin aşağıya çekilmesi planlanmıştır. Bu amaçla, MİP'nin oldukça iyi sonuçlar verdiği sürekli üretim yapan ve özellikle montaj hatlarına sahip bir işletme yerine bir ortaklar topluluğu ve yöneticiler ile tedarikçilerin tümünün ortak olduğu "kooperatif" yapısındaki bir işletme seçilerek MİP'nin bu tür kuruluşlarda uygulanabilirliği araştırılmıştır. Söz konusu amacı gerçekleştirmek için, Konya-Huğlu Av Tüfekleri Kooperatifi'nde bir "çerçeve çalışma" gerçekleştirilmiştir. Huğlu Av Tüfekleri Kooperatifi'nde bu yaklaşımı esas alan MİP uygulamaları için bir bilgisayar yazılımı geliştirilmiştir. Yapılan çalışmanın ilk uygulamaları ile ürün stok miktarları oldukça aşağı çekilmiş ve MİP sisteminin 103F.12 model tüfekte, 2 yıl uygulanması sonucunda, stok miktarında %60 azalma, maliyet açısından ise %55 stok tasarrufu sağlanmıştır.

Anahtar Kelimeler: Malzeme İhtiyaç Planlaması (MİP), Kapasite İhtiyaç Planlaması (KİP), Ana Üretim Planlaması (AÜP)

1. INTRODUCTION

The efforts of the manufacturing companies to offer more advanced and quality products, fulfillment of consumer needs and faster delivery times require efficient manufacturing controls and planning to ensure that productivity is maintained, stocks are minimized and resources are optimized. Material requirements

planning (MRP) is a computerized information system for managing dependent demand inventory and scheduling stock replenishment orders [1]. Although the use of these systems in industrially developed countries is extensive, in Turkey it is still in its infancy. The interaction of managerial tasks with MRP and the resulting effects on the adoption and its infusion was the focus of our approach. In this paper we studied the organizational context of a company before and after the implementation of MRP, the guidelines for its successful implementation, the level of MRP usage in the company, the problems encountered, and the resulting benefits. Some of the findings indicate that the MRP system reduces inventories, improves deliveries, and achieves better planning and control.

2. MRP SYSTEM

Competition is forcing management to conduct new methods for improving business and manufacturing operations. Nowadays, there are greater problems for manufacturers at inventory planning and scheduling. Material requirements planning (MRP) is a computer based information system designed to control manufacturing activities within an organization. It is a powerful technique for determining when to order dependent demand items, as well as for scheduling production. With the help of computer programs they are translated into time phase's net requirements and planned coverage of these requirements for each component item needed, taking into account any lead times. Fig. 1 shows a typical MRP system. Successful MRP systems are using the systems approach to inventory; they coordinate not only inventory, but purchasing, manufacturing, scheduling, and planning. This expanded system, known as MRP II, is a computer based information system with related financial, accounting, personnel, engineering, and marketing information. Therefore, it enables the operations management function to coordinate its effort with the rest of the organization, by providing the company with an operating system and a total business plan [2].

2.1. MRP Use in Turkey

Although the use of MRP systems in industrially developed countries is extensive, in Turkey it is only the beginning of their application. The delayed adaptation of MRP systems in Turkey can be explained by the differences in demographic and organizational characteristics (i.e. annual revenues, number of employees, investments, technological infrastructure, etc.). For example, the majority of large sized industries in Turkey are considered medium sized in developed countries. Only few organizations have installed an MRP system, but many of them are planning to do so. Most of them who responded that they use an MRP system are in early stages of its implementation, so that it is doubtful whether these applications can be considered as MRP systems [3].

2.3. Research Objective – Methodology

Because of the limited use of these new technologies in our country, we resolved to analyze the implementation of a complete MRP system based upon a case study. Therefore, we selected, Huğlu Hunting Firearms Corporation in Konya, as a pioneer in Turkey in the area of the Hunting Firearms. This Corporation is not a government company. It's partnership, are produce some Firearms spare parts for this corporation. The aim was to identify and analyze the practice of MRP use, in the case of Huğlu Hunting Firearms Corporation [3].The aim was to identify and analyze the practice of MRP use, the major issues addressed were:

- the organizational context before and after the implementation,
- the level of MRP usage,
- the problems arising from its use, and
- the resulted benefits.

An in-depth interview was carried out with the managers of the organization's departments involved in the design, implementation, and day-to-day operations of the system. The procedure followed was:

- analysis of current situation concerning MRP,
- identification of problems - suggestions for their solution,
- evaluation of benefits.

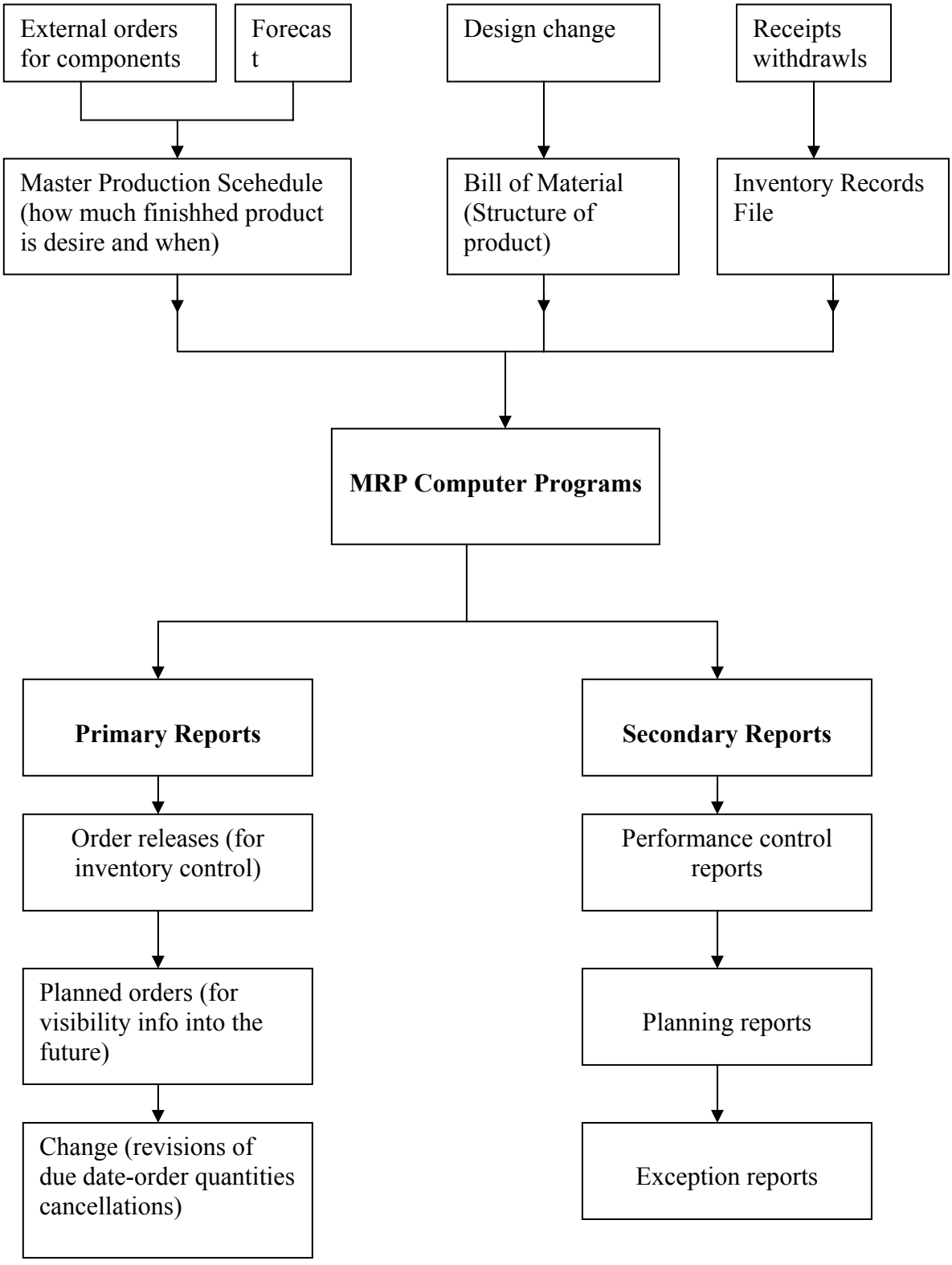

Fig.1. A typical MRP system

2.4. Research Findings - Discussion

2.4.1. Organization's environment

Huğlu Hunting Firearms Corporation was founded in 1962 in Konya, which was 155 partnerships. The corporation has been active for 40 years in the field of Firearms with the greatest expertise in the production of Firearms Company in Turkey. The annual revenues of Huğlu Firearms Corporation for 2001 amount to 150 000$, with additional exports of 65%, the main characteristics of the internal environment of the organization are the following:

- the company-owned facilities since 1962,
- the high quality of products as result of the Turkish products qualification certificate based on the Turkish Standard Institute (TSE),
- the continuous training and retraining of personal, in order to keep it update on new technologies,
- the implementation of new technologies in production planning and control,

The company is confronted with the political, economic and technological forces, which tend to restrict and define its activities, having an impact also on its customers and competitors.

2.5. Precautions to Be Taken Before MIP System Is Applied To the Factory

In this firm, before establishing MIP system, it is necessary to take some precautions and fix the troubles. Based on the researches made in this field, fixed matters about the troubles in the cooperatives and precautions to be taken are summarized below.

1- Reasons for the time loses in the cooperative were researched and it was understood that most of the partners did not have enough information about technical drawing and were not able to use central devices such as compass, micrometer etc proficiently. Therefore as most of the devices do not have a stand art production, it was deduced that devices were used by making testes to be another. This problem was conveyed to the management by inviting all partners who do not have enough technological information and other workers in the factory, courses lasting for 3 months were organized in the company and at the end of this course, it was understood that production rate increased 60% with this application the company had aimed to prevent time loses.

2- As by assembly, the working system of devices with one another with test methods, were abolished among the partners, by – device flow was stopped and thus, nearly 60 % tire saving was gained.

3- In the factory, especially taking the density of the operation lire into consideration, the places of the workbenches were changed and generally 60 % time saving was gained concerning material carrying durations in the factory.

4- Canceling the operation lines randomly designed, operation line were redesigned with the cooperation in the level of workshop chief governor, unnecessary operations were abolished by can bring same operations and the operation durations of the devices were decreased nearly 15%.

5- By fixing operation times between the operations, waiting times were determined for the following operation and by directing the operators working on the workshops to other workshops, capacity was increased and work heaps were minimized.

6- By the help of production planning, by-stock devices were minimized and timeless work production was prevented.

7- Getting in touch with the firms providing raw materials for the factory, these firms, raw material provision durations were reanalyzed and necessary contracts were made and guarantees were taken.

8- One of the most important problems is that the partners of the factory who make fason work have the idea that "whether the products are sold or not, what is important for us is that we always go on our production." Partners were tried to be informed and persuaded about how big the financial value of the investments made on the stock were by forming seminars and giving necessary education.

9- At the time of the establishment of the MIP system, by taking a project team consisting of 15 members from those working in the factory, partners making fason work and administrators into consideration, the

members of the cooperative were persuaded to accept this system and project team was informed about MIP system.

After all these arrangements, the process of the establishment of MIP system was started. In order to operate MIP system, by gaining assistant devices such as workshops, production, device, raw material and fason in the factory, an overall data base started to be farmed. With computer assistance, one of the most important results of the MIP application is its making the organizational changes necessary. This enables an increase in the system effectiveness by abolishing big organizational troubles.

Application of MIP system which will enable long lasting results is not easy. It requires organization, effort, cost and attendance, but a good application pays back all the things done in a short period of time. In "Hug Hunting Rifles Cooperative", in the establishment of MIP system, matters to be taken into consideration may be stated as follows.

1- Determining the situation of the firm in terms of production planning.
2- Project organization and management
3- Environment analysis
4- Software education
5- Application of the software
6- Application and improvement
7- Education
8- Cost.

Suitability of software and hardware is an important issue that has to be taken into consideration. Software and hardware must fit the requirements of the company [3]. A Thorough requirements analysis and selection process took place by Huğlu in Turkey develops a news suitable software and hardware for production planning and control. The hardware which is in use is based on PC architecture with Pentium III 500 processors.

The planning production manager considers the PC solution more flexible, demanding less specialized knowledge from users, easy to maintain, and less costly than mainframes and minis. "MRP00", new Turkish integrated PPC system was developed.

Because of the units in a cooperative are composed of both workers and companies, the success of the MRP system is proportional to the success of all members at such an enterprise. This study, which is a realization of frame study at "cooperative level", shows various properties than ordinary MRP applications.

1. In the study, information technology software has occurred as a necessity. Data processing system prepared has firstly been used as a function of planning. The effectiveness on the implementation of the system, basically, is subject to how much what is known, economical waves, educational level provided by the enterprise.

2. During system implementation, some difficulties such as economic, technologic and political factors have occurred. Thus,

   a) Drawbacks raised from the first introduction of the system to the company

   b) Lack of communication between company administrators (partners) and workers

   c) Having not radical precautions for the company by the administers due to hesitations of loosing reelection chance

   d) Insufficiency on technological information of company administrators (partners) and workers raised by different educational backgrounds

   e) Different production approach implementations for majority of parts

   f) Inappropriate machine tool scheduling not having number of operations and densities into consideration

   g) Inappropriate material flow due to inappropriate machine tool location

   h) Inappropriate arrangement of process sequencing

   i) Drawbacks such as thought of "I works on a part even it is not sold"

To overcome this kind of drawbacks, company oriented education programs have been prepared and been implemented throughout three months in company. This is aimed to provide recognition and acceptance of the system by administrative partners and suppliers.

3. The correctness of data is affected by the lack of communication between groups and especially by recording it to inventory defective or late. The correct data generation and making the system widely used, communication is very important.
4. The main responsibility of the system regarding its usage and control belongs to the Manager of Production Planning. Managers responsible with different departments at the same time using similar authority in same places cause problems that the MRP system would not be distributive. Thus, education of top managers has a big significance.

At full implementation period, the new system has been applied to one department and it's a group of products. The successful results obtained show an acceptance of usage at the whole system and it has been put into implementation. [3]

2.6. Identification of Problems – Suggestions for Their Solution

In this section problems concerning the MRP use in Huğlu are identified, steps taken by managers to overcome these problems are explored and criticized, taking into consideration other experiences. The quality of MRP output depends on the quality of data input. Therefore, the quality of planning is directly proportional to the accuracy and structure of data held on the system, particularly demand determination, data on current inventory and bill of material [4].

For the demand determination, Huğlu gathers the data from the customers the department of production planning, based on this information, prepares the MPS, and MPS usually fluctuates, nearly an average of 10% inflated at the end of production. A major problem emerges because of the character of the main customer and the process for the order designation. Due to the fact that mainly the customers belong to the Turkey public sector, the orders are given after a bidding, the approval of which usually takes a long time and depends on external factors (i.e. political, economic). On the contrary, the required delivery time, after the approval, is very short. The company follows a three stage process to get an order: bidding, planning and carrying out. Due to the limited number of competitors, the practice is to consider the potential customer order as already approved. The planning process begins by developing a master schedule that indicates the timing and quantity of required finished items.

3. BENEFITS

In the investigated case the benefits reported were the following: decrease of inventories, reduction in raw material and inventory costs, increase in consumer service, faster response to changes in market environment, and better management information through immediate access to information. For the measurement of the reduction in inventories, models are used by the production manager in order to determine an index to observe the course of invenories. Reduction in inventory costs for the last year was estimated to be 20-30%. The MRP system enables them to achieve faster response to changes in the market environment, a necessary prerequisite for getting assignments from the public sector. Furthermore, better consumer service is observed. The above benefits conform to the findings of several studies.

4. CONCLUSIONS

Differences in relation to the profile of the Turkish enterprises explain the limited adaptation of MRP systems in Turkey. This research is based on a case study exploring the use of MRP in a Turkish manufacturing company. The implementation of MRP needs to be considered in a strategic context, since it will impact the whole company, its procedures, methods and culture, and its ability to compete in the market. In our case study it acts as indispensable information technology software. It is used as a data processing system, priority planning, and the reasons responsible for the accuracy of input data are, in general, flawed communication between the involved parties, particularly the delay or lack of updating the inventory records. The human factor is considered the most important aspect for the accurate and realistic input data. The main responsibility for the use and control of the system lies on the production planning manager, limiting the participation of the managers from the other departments. The absence of familiarity and direct contact of the above managers hinders the possibility for further expansion of the existing MRP system to an integrated

system. Training should involve managers from other departments, as well as the employees responsible for the input of data, in order to comprehend the importance of accurate records for the efficiency of the system. The effort for better communication between the involved parties, aiming to improve the data accuracy and the diffusion of the system, is one of the most important factors to be taken into consideration.
In the beginning of the study of Huğlu Hunting Firearms Corporation, a C class enterprise (there are not proper working a formal system, nor enough database, and low attendance of administration and trust) passes to an A class enterprise which it totally works in a close-loop and a formal system is used by top administrators.

Software and hardware problems were not reported as major ones summarizing, we can conclude that the greater responsibility for the effectiveness of MRP lies in the human factor, its expertise and ability to communicate and interact with the system.

REFERENCES

1. Manthou, V., Vlachopoulou, M., Theodorou, P., **International Journal Of Production Economics**, The implementation and use of material requirements planning system, 1996, Elsevier, pp. 187-193.
2. Duchessi, P., Schaninger, C.M., Implementing a manufacturing planning and control information system, 1989, California, pp. 75-90
3. Düzcükoğlu, H., **Doktora Tezi, Gazi Universitesi Fen Bilimleri Enstitüsü,** Malzeme İhtiyaç Planlaması Yazılımı Geliştirme Ve Huğlu Uygulaması, 2002.
4. Barrett, R.A., **Computer and Operations Research,** Study of replanning frequenceies in a material requirements Panning system, 1991, Elsevier, pp.79-86.