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Quick Response Manufacturing description

K e y w o r d s: Quick Response Manufacturing (QRM) idea, POLCA system

S u m m a r y: Major part of the article is dedicated to describe and expose ways of implementing modern (the most recent) method of manufacturing management named Quick Response Manufacturing—QRM and POLCA. What is more, measurable advantages that can be achieved by a company which uses that method were pointed.

QRM concept aims to continuously adjust operations to ensuing changes, both internal and external ones. The Quick Response Manufacturing concept assures substantial flexibility of response to signals from the market, a possibility of instant response to customers' needs.

1. Introduction

Quick Response Manufacturing (QRM) idea aims at permanent restructuring of manufacturing processes and continuous adjustment of actions to interior and exterior changes. The Quick Response Manufacturing conception is, in a way, a modification of previous systems. Moreover, QRM is apparently directed to compress time in all the action spheres and delivery chains of a company. Its implementation ensures not only effective time management inside a company but also strengthens cooperation between suppliers and recipients. Besides, it also ensures a flexible reaction to market signals and improves competitiveness of a company in the long-term.

Essentially, the main point of this article is a description of QRM concept as a modern method of manufacturing management, moreover equalisation of traditional approach and rules of QRM.

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2. Quick Response Manufacturing & POLCA System

During the last few years many of the US companies have implemented the QRM strategy, which has given astounding results (Suri, 2003, p. 3). The typical results were shortening the lead time (80–95% both in the stages of production and planning/administration), lowering product costs (15–50%), quality improvement of delivery realisation (40–98%), as well as better exploitation of materials and a decreased number of corrections (80%). QRM has achieved these results owing to detailed management rules, production methods, analysis techniques and tools. Additionally, QRM takes an extra effort to shorten the time of launching the product into the market.

QRM aims at shortening the time of delivery realisation, both as it regards aspects inside and outside a company (Suri, 2003, p. 3). From the client's point of view, QRM means answering the client's needs through an immediate design and products manufacture and matching them (products) to client's needs (exterior aspect). Moreover, from the company's point of view, QRM focuses on shortening the lead time, which results in quality improvement, lower costs and, obviously, fast reaction (interior aspects).

The Quick Response Manufacturing seizes all the precedent approaches, i.e. JIT, flexible manufacturing, group technology and lean production (see also: Brzeziński, 2002, pp. 450–462; Durlik, 2000, pp. 225–229, Pasternak, 2005, pp. 304–311).

The list of QRM's main characteristics convinces us that QRM is a mix of previous systems' results, and thus, it contains a relatively small number of innovations. It appears that the issue related to POLCA system may be the sole one that belongs to QRM only. Among the fundamental QRM characteristics, it is worth mentioning (Laskowska, 2001, p. 118):

- search for new operations execution methods, which focus on time reduction;
- agreement of partial use of the company resources;
- measurement of time reduction and its recognition as the main indicator of company achievements;
- involvement of suppliers and buyers in QRM programme;
- adaptation of QRM in order to improve competitiveness of a company in the long-run, and to involve workers in the process of changes;
- manufacturing systems as a cell structure and its complementing with the help of resources flow control method, which contains 'push' and 'pull' elements (Suri, Krishnamurthy, 2003, p. 5).

The POLCA system (Paired-Cell Overlapping Loops of Cards with Authorisation) is an idea of how to control the resources flow. It consists of elements of the 'pull' system (typical in JIT) and 'push' system (traditional manufacturing systems).

MRP (Materials resource planning) is, in POLCA system, used only at higher levels and it is not applied in manufacturing cells, where the 'pull' system is used. Innovative content of QRM is the rule of combination of single manufacturing cells into

pairs and creation of POLCA cards. In QRM these cards, in contrast with KANBAN cards in JIT, are not assigned to particular products, however they are assigned to pairs of manufacturing cells.

In order to understand the functioning of POLCA, it is worth analysing the case of CFP corporation (Suri, Krishnamurthy, 2003, p. 4) which makes front panels and name tablets for small devices, matching clients' needs. These products are made of different materials, have a wide range of sizes, printed information and different holes and notches which help to install them. The competitive strategy of CFP is based on the provision of services to clients who order small numbers of tablets and panels, through adaptation of strategies that focus on shortening the time between order and delivery. In order to ensure fast reaction, a company like CFP would have to reorganise its whole structure. First of all, the company would have to create cells which focus on subsets of manufacturing processes of similar parts. The cells would differ in type of overprints, size and material used, type of the container, etc. An individual client's order is realised through a fixed combination of cells used to make overprints, manufacture and finalise every order (see Figure 1). Orders may have a variety of requirements. An order for big tablets with many holes may require more time spent on the printing-press cell (F3) and less time on the trimmer, while an order for small tablets may require a totally opposite time allocation in particular cells. Establishment of the operation sequence may vary among orders. Therefore, the idea of shortening the 'takt time' and 'level scheduling' has not been applied.

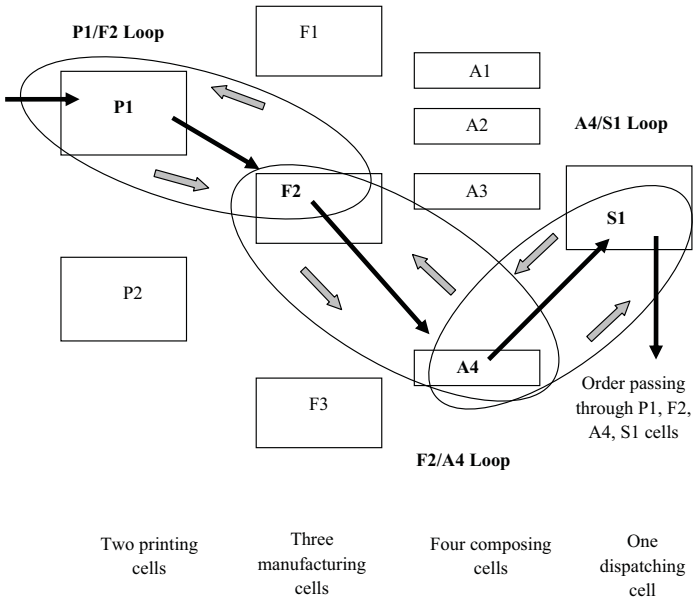

Figure 1. The POLCA card flow related to a particular order in CFP company

S o u r c e: Suri, Krishnamurthy, 2003, p. 4.

In POLCA system the flow of the orders through different cells is controlled by combinations of authorisation and controlling cards known as POLCA cards. Authorisations are generated by High Level Materials Requirements Planning. HL/MRP is similar to MRP, however it does not work on the operational level but regards every single cell more like a black box and only supports planning of the material flow in every cell. The time of authorisation is created by HL/MRP at the very beginning of every order, and as a result, every cell knows when to begin production. However, different than in standard push/MRP system where the work centre should start production at the time of authorisation, in POLCA system the authorisation time means only the beginning of work but a particular cell will not start until POLCA card is available. POLCA cards communicate and control the material movement between cells.

Even though it may look similar to KANBAN system, there are some important differences. Firstly, POLCA cards are used only to control movement between cells but not inside them (cells have the possibility of choice between a variety of different procedures related to material control among existing work posts). Secondly, POLCA cards are not assigned to a specific product (like in KANBAN) but to pairs of cells. Figure 1 shows the flow of POLCA cards related to particular orders in CFP company. The operation sequence for this order directs it from P1 to F2, then to A4 (in order to compose it) and finally to S1 (in order to dispatch it). Thirdly, in comparison to KANBAN, POLCA cards carry over the task while they are moving between both cells until they come back to the first cell in a pair. For example, the card P1/F2 would be bound with the task during its initiation in P1 cell, then it would carry over the task during its execution in P1 cell and movement to F2 cell. Afterward, the card would carry over the task until it left F2 cell. Only when the task is passed forward to the next cell (A4), the card P1/F2 will come back to P1 cell. Since most of the single cells would belong to more than one pair of cells, the cards would overlap thanks to the card looping system.

3. Traditional approach versus Quick Response Manufacturing

The key aspect of QRM is to solve the problem of time reduction between order and delivery. Some of the common approaches towards production management look like a set of incoherent definitions, whereas in QRM the whole set originates from the same topic. However, these rules are universal and may be applied to the whole organisation process—from manual workers to administrative ones, from order reception to its booking, from purchase to sale. Such an approach is more rational in management, than a set of different rules and ideas, as it gives an opportunity to segregate logical messages. Table 1 depicts the synthesis of traditional versus QRM approaches.

Table 1

Traditional approach versus QRM overview

Approach/ rule	Traditional approach	QRM
1.	All the workers have to work faster, harder and longer in order to shorten the production time	It is necessary to find new ways of production focusing on decreasing the lead time
2.	In order to finalise actions it is necessary to keep staff and machines working	Manufacturing reserve capacity should be strategically planned—actions should be planned at 80% or even 70% when resources reach the critical level
3.	In order to shorten the lead time, efficiency should be improved	The efficiency indicator is achieved through measuring the shortening of task execution time. Traditional indicators of efficiency and resources usage should be eliminated
4.	It is necessary to pay attention to delivery on time by every department and deliverer	It is necessary to consequently follow the measurable and cost-effective shortened time of tasks realisation
5.	Installation of MRP may shorten the time of tasks realisation	MRP should be used in HL/MRP. Moreover, the organisation of production should be restructured into simple, product-oriented cells, and then the POLCA system—supplemented with them, which puts together advantages of the 'push' and 'pull' strategy
6.	Quantity discounts should be negotiated, as the production materials are ordered in high numbers	Motivating deliverers to implement QRM, which will result in smaller deliveries and lower costs, better quality and a shorter task execution time
7.	Clients should be encouraged to buy bigger amounts of products through implementation of quantity discounts and bonuses	Educating clients in the field of QRM and negotiation of timetables which are compatible with smaller delivery sizes at reasonable prices
8.	QRM may be implemented through the creation of task groups in every department	To overcome the functionality boarders through introduction of the Quick Response Office Cell (Q-ROC) which is looped, linked, multifunctional and trained team that focuses on the target market segment and is capable of decision making
9.	The reason for QRM implementation is that it will be possible to charge clients with higher fees for faster finalised work	The reason for QRM implementation is that it improves efficiency of a company and ensures future security
10.	A lot of money will be invested in technology in order to implement QRM	The biggest battery during implementation of QRM will not be the technology but mentality—special training should help managers to understand that. Then, companies should be involved in shortening the time of tasks realisation at lower or no costs, leaving expensive technical solutions for later

S o u r c e: author's own study based on: Suri, 2003, p. 8–16.

The Quick Response Manufacturing has worked out specific and detailed rules regarding manufacturing enterprises. Indeed, QRM provides all the main rules of a production organisation. Simultaneously, it aims at absolute shortening of launch-

ing time. QRM lets the management introduce one unified message instead of introducing several actions and shortcuts.

QRM builds on fundamental rules of the production system dynamics to ensure recognition of enterprise reorganisation in order to achieve fast effects.

The idea of QRM aims at permanent restructuring of manufacturing processes and constant customisation of actions to interior and exterior changes taking place.

As it has been mentioned above, the key aspect of QRM approach is how to reduce the time between order and delivery. Some of the traditional approaches may look, at the first glance, as a set of incoherent ideas. Managers and workers have to remember a list of rules, such as e.g. "Five S". The set of QRM rules provides the opportunity of production arrangements.

4. Conclusion

In the era of technical development, financial aspects are not the most important ones when it comes to success in business. Information is gathered and processed in order to manage clients, products and services. Information about clients, surroundings and competitiveness of your own company and the relation between them is extremely important. Only when we do posses that knowledge, we may successfully run our company.

QRM emerged in order to satisfy the requirement of fast and flexible reaction to quickly changing demands. Lean Management and the Quick Response Manufacturing provided for the necessity of cooperation between partners from the delivery chain in order to sustain decreased costs, increased quality and shortened reaction time. In QRM, there is an additional postulate aiming at time compression and flexibility of a given company.

QRM idea aims at permanent restructuring of manufacturing processes and continuous adjustment of actions to interior and exterior changes.

This article is addressed to both theoreticians concerned with the QRM issue, and practitioners who manage manufacturing processes. It may also appear interesting to students who are studying the field of economy (e.g. marketing, production management, or IT and econometrics).

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Charakterystyka systemu wytwarzania – Quick Response Manufacturing

S t r e s z c z e n i e: Koncepcja QRM dąży do permanentnej restrukturyzacji procesów wytwórczych oraz ciągłego dostosowywania działań do zachodzących zmian zarówno wewnętrznych, jak i zewnętrznych; jest ona pewną modyfikacją poprzedzających ją systemów. Nadto QRM jest najwyraźniej ukierunkowana na kompresję czasu we wszystkich sferach działania przedsiębiorstwa i łańcucha dostaw. Jej stosowanie zapewnia efektywne gospodarowanie czynnikiem czasu wewnątrz przedsiębiorstwa oraz w kooperacji z dostawcami i odbiorcami, elastyczność reakcji na sygnały płynące z rynku oraz poprawę konkurencyjności przedsiębiorstwa w długim okresie.

Artykuł adresowany jest zarówno do teoretyków zajmujących się tym zagadnieniem, jak i do praktyków zarządzających procesami wytwórczymi. Może on również zainteresować studentów wszystkich niemal kierunków ekonomicznych, a w szczególności kierunku zarządzanie produkcją, zarządzanie i marketing czy informatyka i ekonometria.

S ł o w a k l u c z o w e: koncepcja Quick Response Manufacturing, system POLCA