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JUST IN TIME AS A LOGISTICAL SUPPLY CONCEPT

ABSTRACT

Recent developments have shown revolutionary progress in the areas of information technology, logistical science and internationalisation of business. These facts and the elements involved strongly influence the methods of production and provision of services thanks to an irrepressibly growing speed of data and information transfer and surmounting the cultural and geographical obstacles, which has given rise to new concepts of business process optimisation in overcoming the distance in space and time. The result of that development were two concepts in the business world, the Just in Time (JIT) concept and its integral part "Quick Response", whose origins are in the Far East, in Japan, in the automotive industry. The break-through of these concepts and their fast spreading to other spheres of the world economy can be attributed to their overwhelming efficiency. Both concepts aim to release the capital tied in inventories, and to reduce them, avoiding thus any surplus inventories.

KEY WORDS

Just in Time, JIT, Quick Response, QR, inventories, costs, time, logistic concept

1. INTRODUCTION

Traditionally, purchasing played rather a side role in an enterprise, so no one dedicated much attention to it; today, on the contrary, it is recognized that purchasing can contribute considerably to the profitability by cutting the cost price of materials, inventories, as well as transport and logistical costs. The increased sales, in which the purchasing costs are falling, result in a higher profit than the sales in which the sales price, or turnover, is rising. The result of that development was the Just in Time (JIT) concept, which has brought about a rise in profit, or higher competitiveness in the market, resp., through lower purchasing costs.

2. DEVELOPMENT OF THE JUST IN TIME CONCEPT

This concept was launched in the 1980s in the Japanese automotive industry, when Taiichi Ohno and Shigeo Shingo shaped the production process in Toyota, which was later re-named as today's JIT variant. Toyota and the whole automotive industry in Japan became a model for the rationalisation of the cost of materials, inventories, transport and logistics.

Why did JIT develop in Japan, of all countries? Japan has had a long tradition as an aggressive country in terms of military and economy, which enabled and facilitated the establishment of disciplined mutual relations between individual units in the chain of business processes. The smallness of national market and low-priced labour, subject to strict hierarchy and a strong commitment, have also contributed to the development and establishment of this concept. A very efficient infrastructure, which was perfectly aligned with the systemic organization in enterprises, is an additional feature of numerous Japanese enterprises. From the social and geographical viewpoint, this development can be attributed to limited natural resources, a high concentration of population on a small area and dependence on imports, which all led to prudence and avoiding any inefficiency whenever possible.

Such philosophy has given rise to a new approach to the management of materials and inventories of materials and finished products so that the production functions without any inventories at all, even within the internal course of production. The balanced capacities and processing times have created the conditions in which the production is running smoothly, from machine to machine, without interruption. Thanks to this concept, inventories are no longer needed between the workplaces. The underlying JIT concept controls the production and leads to a streamlined production and business operation in general. Consequently, anything that could bring about unnecessary costs and potential losses has to be eliminated from the production, or reduced to minimum, i. e. rationalisation is approached by scrutinising the production process first. Technological process and the operations sequence is therefore organised in such a way that intermediate stores are not necessary at all. The next step is to streamline each operation separately, also the treatment and the time needed to change the tool.

The release of capital tied in inventories and avoidance of any surplus inventories allows a faster response for the enterprise to changed market conditions.

Quality control has a relevant role too, as it supports the "zero defects" and "zero inventories" production models - both of them being the synonyms for a JIT-compliant production, and quality underlies both of them.

The inventory-free production functions with a precisely determined quantity of products for the basic production available at the specified place. The place and time are issues that are addressed by proper planning and arranging the production, or balancing the capacities and synchronisation of the processing time. However, this is not sufficient if the quality of production is unsatisfactory. An inventory-free production therefore, calls for a zero defects production. The latter is underlying for establishing an inventory-free production, and thereby also the "just in time" production.

2.1. Quick Response

The JIT philosophy is reflected in the 'quick--response' logistics concept. Unlike the JIT concept, the Quick Response (QR) concept was adopted in the fashion and clothing industry that both have to cope with extremely high costs for inventories. The underlying idea is to shape and organise the business systems for rapid and reliable implementation of priorities imposed by the time-pressed competition. Quick response is in fact another term for the information and communication systems linked to the JIT concept that jointly provide for the implementation of the basic logistical principle "the right product at the right time and place". The rise of this concept can be attributed to the development of Electronic Data Interchange (EDI), Bar Code, Radio Frequency Identification (RFID), laser readers, satellite navigational systems and similar achievements of the information science. They enable a fast and accurate data capture on the current demand for products or services, which supports the enterprises to structure their supply in line with the varying wishes of, and satisfactory to their clientele. The logistical action is a result of the immediate response to the information available, which assumes thus the role of inventory.

In addition, there is another advantage in the structure of costs. While the fixed cost of QR is really high at the beginning, the cost increase for improving the quality of service is slow. The relative advantage of QR can be assessed after comparing it with the traditional cost structure of conventional operation involving a store.

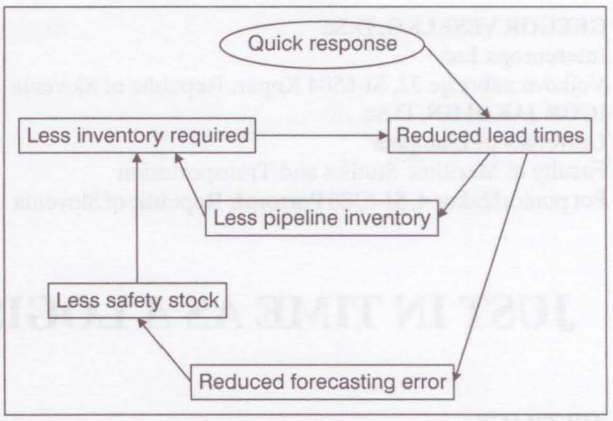

Figure 1 - Virtuous Circle

Source : Christopher, M., 1998.

The QR speeds up the operations in the sequence of business operations (chain), which results in reduced lead times. It is the shortening of lead times that actually reduces the level of inventories needed and the response time. In his book, Martin Christopher calls this notion the "Virtuous Circle", which is explained below.

The figure reveals the relations between numerous elements of the QR concept. The shortened delivery time is being introduced, which affects the reduced level of current and required inventories in the entire chain. Along with that, the percentage of errors in the estimates falls resulting in reduced safety inventories. The business process goes on in a continuous circle, in which one of the main factors for satisfying the user's needs, i. e. the lead time, is becoming shorter.

We are now coming closer to the principle of how the QR concept gets integrated into the JIT system. Delivery time is an essential element of the JIT system, allowing smooth operation in the sequence of stages of a business process. Supported by the information and communication technology, the QR provides for the implementation of the above stated principle.

2.2. Characteristics of the JIT concept

The main features of the JIT concept are highlighted in the relevance and practicability of the system, eliminating the harmful and redundant elements for the functioning of the production process.

The concept implements the main rule of logistics demanding that the right goods in the right quantity and quality be delivered at the right place and time. Moreover, all activities in the production cycle are subject to the requirements of the current market, in which the supply exceeds the demand.

It calls for a strict time coordination of production with all its concurrent production stages relating to technology. Thereby the storage of raw materials,

products, semi-products (goods in progress) becomes almost unnecessary (in particular, the storage of finished products is reduced). This way of thinking enhances the achievements in the sphere of planning, research, control and management, to name only the principal ones.

The JIT concept can only persist in an environment with a highly developed production infrastructure, with flexible production systems that support concurrent stages, with superb information and communication technology, and in which the operations merge in logistical chain and are coordinated therein.

2.3. Information "just in time" and achieving the JIT

The achievement of production and delivery/lead times depends on accurate and timely information. It concerns the positioning of consignments in terms of time and space within the QR concept.

Full compliance of production and business processes is the prerequisite for assuring the execution in due time. Concurrence of elements in the processes is the prerequisite in order to support the functioning of processes. Any non-compliance in the process and blocking of its elements leads to trouble in the management and results in unnecessary cost. At the precisely set time, all the required elements must reach the workplace in sufficient quantity as needed.

Tracking the vehicles or shipments by satellite and access to the information by the Internet allow for a direct insight into the current status of the shipment. The time and space are accurately determined, which simplifies the planning, implementation and completion of the business process. In addition, the 'just-in-time' information provides for higher safety, efficient communication in a crisis, preventive maintenance of the business processes, a fast transmission of documentation, effective operation of the fleet of vehicles, improved relations with customers, faster resolving of the claims, and similar.

2.4. Goals of the JIT concept

The underlying goal of the JIT concept is to improve the competitiveness of the enterprise and its viability to satisfy the needs of its customers, meet their changing demand that affects the trends in the market, and thereby retain a good rate of return in a tough competitive environment. The product manufacturing must undergo structural adjustments of its production processes to adapt to these changed preferences.

In addition, ample inventories of materials, work in progress and final products give rise to variability in the business process, which allows for a certain tolerance in achieving the production standards and meeting the manufacture and delivery terms (deadlines). JIT affects the level of inventories by reducing them and exposing any inefficiency in the process. Once the inefficiency elements are identified, they can be eliminated from the system.

The size of production capacities moves towards adapting to the market situation, and any change in the market gives rise to new requirements. The enterprise aims to satisfy their customers with quality, a variety of products at choice, favourable price and short delivery term. This goal can be achieved by improving the operations on the part of the enterprise. In the production segment that means an improvement of quality at the lowest cost price, and providing a rich offer.

The JIT concept is also known as the line production, or inventory-based production, which results in an increased profit and return of investment, less current assets and small tools required, a higher ratio of inventories to sales (faster rate of turnover), improvement of the quality of production, cutting the production and distribution deadlines, etc.

The goals of the JIT concept can be summed up as follows:

- to decrease inventories of work in process,
- to decrease the fluctuations in work process and improve inventory control,
- to decrease instability by eliminating the fluctuation of demand in transition between processes,
- to improve the supervision through de-centralised control of the production process,
- to decrease the number of failures and defects in the production process.

These goals are actually feasible only if the JIT concept is introduced in the enterprise as a system. Given that the function of the JIT concept is to direct, manage and control all the relevant production/distribution flows in line with the JIT principle, it has to comprise all the required and sufficient parts and conditions of the system as such.

2.5. Elements of the JIT concept

The system elements should be focused on the production site, for which the shortened preparatory and completion times in a shared technology are characteristic. Indispensable is a comprehensive preventive maintenance and excellent qualifications of employees for work in various workplaces, which in turn allows for mutual substituting under a constant work load. It concerns the delivery of purchased parts or entire components at the right time, i. e. "just in time".

We further need to mention the canban concept which is a concept for reducing the inventory levels. Inventories can be used as an excellent device for covering up, or rather fictitious overcoming of numerous

incidents and any inconvenience in the production and sales process, such as unsteady demand, inaccurate planning and forecasting, unreliable suppliers, problems with product quality, bottlenecks, and similar mishaps. A substantial inventory on stock does mitigate these mishaps and allows for ongoing operation. On the other hand, we need to be aware of the high cost that are reflected adversely in the final financial result. The canban concept renders it possible, by way of certain operational approaches, to reduce the inventories to the level at which an uninterrupted operation is still assured, and exposes possible bottlenecks and risky, problematic areas.

3. THE IMPACT OF JIT ON THE ENTERPRISES

There are various impacts of JIT on the enterprise. That depends on how an enterprise views and develops its own business processes. If the satisfaction of customers largely depends on a reliable and fast and timely delivery, the enterprise is bound to comply with it by introducing the JIT concept. On the other hand, the customer satisfaction is not the main and only reason for the implementation of this concept. The advantages of the system have already been explained; In Table 1 are some additional points of advantages compared to the usual practice.

4. WHAT NEEDS TO BE CONSIDERED?

Operating under the JIT system brings certain benefits to the enterprise, which are visible in reducing the inventories of raw materials, work in progress and final products, improving the quality of products and business processes, decreased needs for storage space, improved occupancy of working assets, identifying and elimination of bottlenecks, and improved use of human work.

In addition to benefits, there is a series of drawbacks that can seriously threaten the operation of the enterprise. Definitely, an alarm is raised due to adverse financial result of the enterprise, or in case the decreased quantity of inventories does not reflect in a positive financial trend, or even worse, if the financial result is getting lower. When the requirements of the market can no longer be met, or the production is stopped due to shortage of products and raw materials, immediate action is needed. Moreover, the rising transportation and logistical costs may point to a critical situation.

To avoid potential risks, we need to fully understand the philosophy and functioning of the JIT concept. The key to potential introduction of the JIT concept, and its success, comprises:

- stabilised material production with an accurate production plan,
- avoidance of changes in the flow of materials and production plans, improving or eliminating the bottlenecks,
- reducing the production and supply functions by cutting the installation time, reducing the number of suppliers,
- lower production and distribution times,
- preventive maintenance of workplaces and other equipment,
- flexible workforce,
- establish a circle of quality-level suppliers,
- optimize transport and logistical operations,

Table 1 - The impact of JIT on the company culture

	Normal operation	JIT
Quality versus price	cheapest, with acceptable quality	superb, compliant quality, error free
Inventories	big inventories from: – discounts on large volumes, – economical production according to the criterion, – safety stocks	small inventory with a reliable, uninterrupted supply flow
Flexibility	long "minimal" lead times, minimal flexibility	brief lead times, assistance to customers, great flexibility
Transport	cheapest, with acceptable service level	very reliable level of services
Buyer/carrier	heavy 'controversial' negotiations	joint risk 'partner relations'
Number of suppliers/ /carriers	high, avoiding autonomous sources, no exposure to dependence	low, long-term open relations
Communication buyer/ /carrier	minimal, subject to business secrecy, thorough control	open, exchange of information, resolving common problems, manifold relations
General	operation running through cost control	operation running through customers

Source : Isaac, G. A. III., 1993

- incorporating the JIT concept in strategic and tactical decisions,
- communication and ability for planning the connections between the parties in the logistical chain,
- trust in the JIT concept (the top management needs to set an example).

5. CONCLUSION

The JIT concept stands for one of the most important concepts for contemporary business operations, supporting the continuous efforts for cutting the production costs, or production differentiation resp., and achieving the satisfaction of the customers. We have listed the main favourable characteristics that follow after the concept is established, and also pointed out all the negative facts that may result from a false understanding and inadequate introduction of the idea. Practical experience in the Far East and in numerous European and American enterprises adds to the value of this concept. In modern business, when the logistical thought, due to the increasingly demanding market in terms of space and time, changes like lightning, the JIT concept, along with QR and canban, is an excellent tool for the implementation of business excellence.

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POVZETEK

JIT KOT KLJUČNI LOGISTIČKI KONCEPT

Zadnja leta smo lahko priča revolucionarnemu napredku na področju informacijske tehnologije, logistične znanosti in internacionalizacije poslovanja. Vsa ta dejstva in povezani elementi močno vplivajo na način proizvajanja produktov in storitev, saj hitrost prenašanja podatkov in informacij nezadržno raste, kulturne in geografske ovire padajo ter nastajajo novi koncepti optimizacije poslovnih procesov pri premagovanju prostora in časa. Tako sta se v poslovnem svetu razvila koncepta Just in Time (JIT) in njegov sestavni del "Quick Response", katerih zametke najdemo na daljnem vzhodu, Japonski, v avtomobilski industriji. Prav pronicljivosti in učinkovitosti konceptov lahko pripišemo glavni razlog za njuno hitro širjenje tudi na druga področja svetovnega gospodarstva. Glavna cilja konceptov sta sproščanje v zaloge vezanega kapitala in zmanjševanje nepotrebnih zalog.

KLJUČNE BESEDE

Just in Time, JIT, Quick Response, QR, zaloge, stroški, čas, logistični koncept

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