HOW TO SUPPORT PURCHASING WITH ERP SYSTEMS AS INTEGRATOR OF NOVEL LOGISTIC TOOLS?

ÁGOTA BÁNYAI[1]

Abstract: The increased complexity of globalised supply chain processes leaded to the development of new technologies, methods and tools to improve the enterprise systems. These novel tools (six sigma quality, employee involvement, factory automation, design for manufacturability, lean philosophy etc.) are the most important solution methods to support the realization of critical success factors of enterprises. The integration of these tools can increase the efficiency of them. As an integration tool, enterprise resource planning systems are the most plausible. Within the frame of this paper the author focuses on the integration of these novel logistic tools by the aid of enterprise resource planning systems, especially from the point of view purchasing.
Keywords: enterprise resource planning, integration, logistics, purchasing

1. Introduction

The design and control of materials handling systems and logistic systems became more and more important. The complexity of supply chain processes leaded to the development of new tools and methods to optimize the external and internal processes of systems. These tools and methods can be used both in the case of production and services. The most important objective functions of design and operation of logistic systems are the following: minimization of throughput time of orders; minimization of throughput time of production of products; decreasing of stock levels in the production processes (including work in process); increasing of utilization of logistic, technological and human resources; minimization of costs; decreasing of waiting times and queues. The operation of enterprise processes can be realized by the aid of enterprise resource planning systems. One of the most important parts of the optimal operation of ERP systems is the optimal enterprise strategy supported by an up to date IT system. The logistic modules of ERP systems are connected with the design of production processes, public accountancy, finance, enterprise management, production planning and scheduling, marketing, process planning. The logistic modules include the purchasing, production, distribution and recycling related tasks of the enterprise processes. The external connections of ERP systems are the following: purchasers, trading companies, freighters, users, banks, customs formalities, assurance etc.

The functionality of ERP systems can be increased by the use of different add-on software based on well-known tools and methods in the field of total quality management and lean philosophy. These can support the solution of related problems, but the integration of these tools and methods into the enterprise resource planning system can increase the efficiency of the predefined enterprise strategies.

2. Purchasing in enterprise processes

The most important tasks of purchasing logistics are the following: design, organization, control and controlling of material supply related information flow processes. The

---
[1] PhD, University of Miskolc
H-3515 Miskolc-Egyetemváros, Hungary
altagota@uni-miskolc.hu

purchasing logistic processes should be efficient, rational, flexible and economical. The purchasing processes have to take into consideration the costs, quality of products and processes (both manufacturing and related services), satisfaction of purchasers, competition and market position. The most important key factors of purchasing logistics are the following: selection of optimal suppliers (especially from the approved vendor list), make-or-buy decision, just-in-time or just-in-sequence purchasing, ITC, structure of purchasing system (centralized or decentralized), technological and logistic infrastructure, e-commerce possibilities. The purchasing is related with all enterprise processes. The focus on external relationships in purchasing is both on strong vertical and horizontal relationships [1].

The application of enterprise resource planning systems may result great savings in both costs and human resources in the case of supplier selection [2]. The efficiency of enterprise resource planning systems can be increased by the use of purchasing management consulting services [3]. The obtainment of new market demands, using of common human, technological and logistic resources and the present needs of flexibility leaded to the development of new organization processes and structures in the field of purchasing [4]. The process of purchasing includes the following phases: determination of requests, forecasting, analysis of purchasing market, request for tender, analysis of tender, choosing of purchasers, order of goods, choosing of transportation methods and company, disposition and transportation, receiving of goods, unloading, public accountancy tasks, billing, supply management, choosing of IT to support purchasing process. The definition of optimal operation strategies can be related to other logistic problems, such as the operation strategies for delivery models of regional logistic networks [5].

The design, control and development of these new purchasing processes and structures required not only efficient enterprise software (ES) based on enterprise resource planning (ERP) system and a flexible consulting service, but also the use of other additional tools and methods. In a cooperative framework, the integration role of enterprise resource planning systems become more important, especially in the case of two or more individuals, single organizations, buyer-supplier dyad and multiple organizations [6, 7].
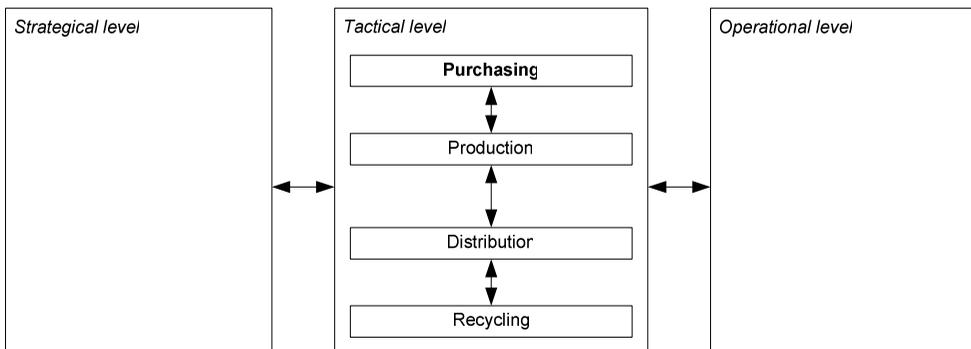

Figure 1. Levels of logistics

3. Tools to support enterprise processes

The enterprise processes can be designed, developed, controlled and supervised by the aid of different tools and methods. Within the frame of this capture the followings will be introduced: total quality; six sigma, kaizen, lean, production smoothing, PDCA, SMED.

Total quality management includes a huge number of tools and methods to support the quality of products and services: cross-functional product design; process management; suppliers quality management; customer involvement; information and feedback; leadership; strategic planning of processes and systems; cross-functional training; employee involvement [8]. The British Standard (785-1) defines the total quality management as "management philosophy and company practices that aim to harness the human and material resources of an organization in the most effective way to achieve the objectives of the organization". However, the approach of total quality management and *six sigma method* is different, but both management strategies are important for enterprise processes.

Lean is a production practice, which is based on process optimization from the point of view of efficiency (elimination of different wastes of systems and processes). The most important process elements of lean to be optimized are the followings: transportation; warehousing; material handling; waiting; harmonization of produced quantity and orders; defects; use of human resources and talents. There are four levels of lean: lean as a goal; lean as a change process; lean as a set of tools and methods and lean as philosophy [9].

Kaizen is a philosophy, which focuses on continuous change for the better. Kaizen applies a huge number of enterprise processes, such as purchasing, production, distribution, recycling, especially from the point of view of logistics.

Production smoothing is a technique to reduce wastes of enterprise processes. Production smoothing (or production leveling) can focus on volume or product of both of them.

PDCA is an interactive management method to control and improve products and services. It includes four important steps: definition of objectives and processes to fulfill customers demand; implementation of the plan, make products or services; analyses of actual and expected parameters of processes; define required interaction based on the results of analyses.
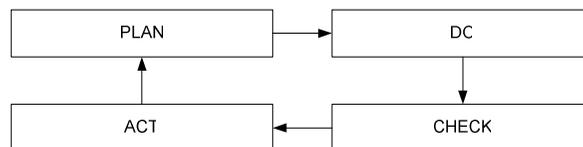
Figure 2. The PDCA cycle

Single minute exchange of the die is a waste reducing method of lean manufacturing, by the aid of which the economic lot of size have to be calculated to minimize the changeover time and improve the flexibility of manufacturing processes.

Design for manufacturability focuses on the product design to assure the optimal manufacturing process. The use of this method makes it possible to reduce the costs of the whole lifecycle of the product from the purchasing of the component to be required to assemble the product to the end-of-life technologies (for example disassembly or shredding).

4. Enterprise resource planning system as integrator

The most important tasks of enterprise resource planning systems are the following: (1) to balance the demand and supply; (2) integration of suppliers and customers into the supply chain; (3) integration of methods and tools to support the decision making processes; (4) integration of functions of distribution, marketing, manufacturing, logistics; financing; product development and human resources.

The above mentioned tools and methods can be applied efficiently, if they have connection with forecasting, planning and scheduling. Therefore it is important to integrate these tools and methods with the enterprise processes to enhance the efficiency and decrease the complexity of the systems. Figure 3. shows one possible relation among the modules of enterprise resource planning systems and tools in the case of Oracle Applications.
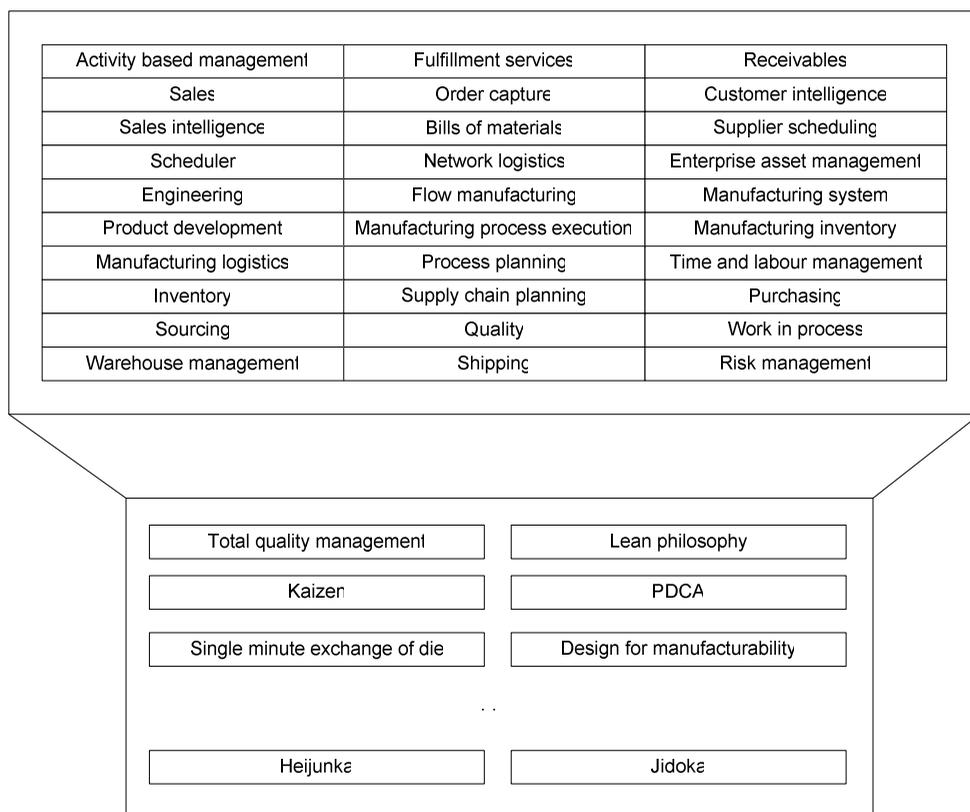
Activity based management	Fulfillment services	Receivables
Sales	Order capture	Customer intelligence
Sales intelligence	Bills of materials	Supplier scheduling
Scheduler	Network logistics	Enterprise asset management
Engineering	Flow manufacturing	Manufacturing system
Product development	Manufacturing process execution	Manufacturing inventory
Manufacturing logistics	Process planning	Time and labour management
Inventory	Supply chain planning	Purchasing
Sourcing	Quality	Work in process
Warehouse management	Shipping	Risk management

Total quality management	Lean philosophy
Kaizen	PDCA
Single minute exchange of die	Design for manufacturability
Heijunka	Jidoka

Figure 3. Logistic tools and ERP integrator modules in case of Oracle Applications

As Figure 3. summarizes, the support of purchasing processes required the cooperation of a huge number of OA modules with logistics-related tools and methods from the product design through enterprise asset management to the execution and control of manufacturing processes.

In case of other enterprise resource planning system the cooperation of these modules is also very important. Figure 4. shows one possible relation among the modules of enterprise resource planning systems and tools in the case of SAP.
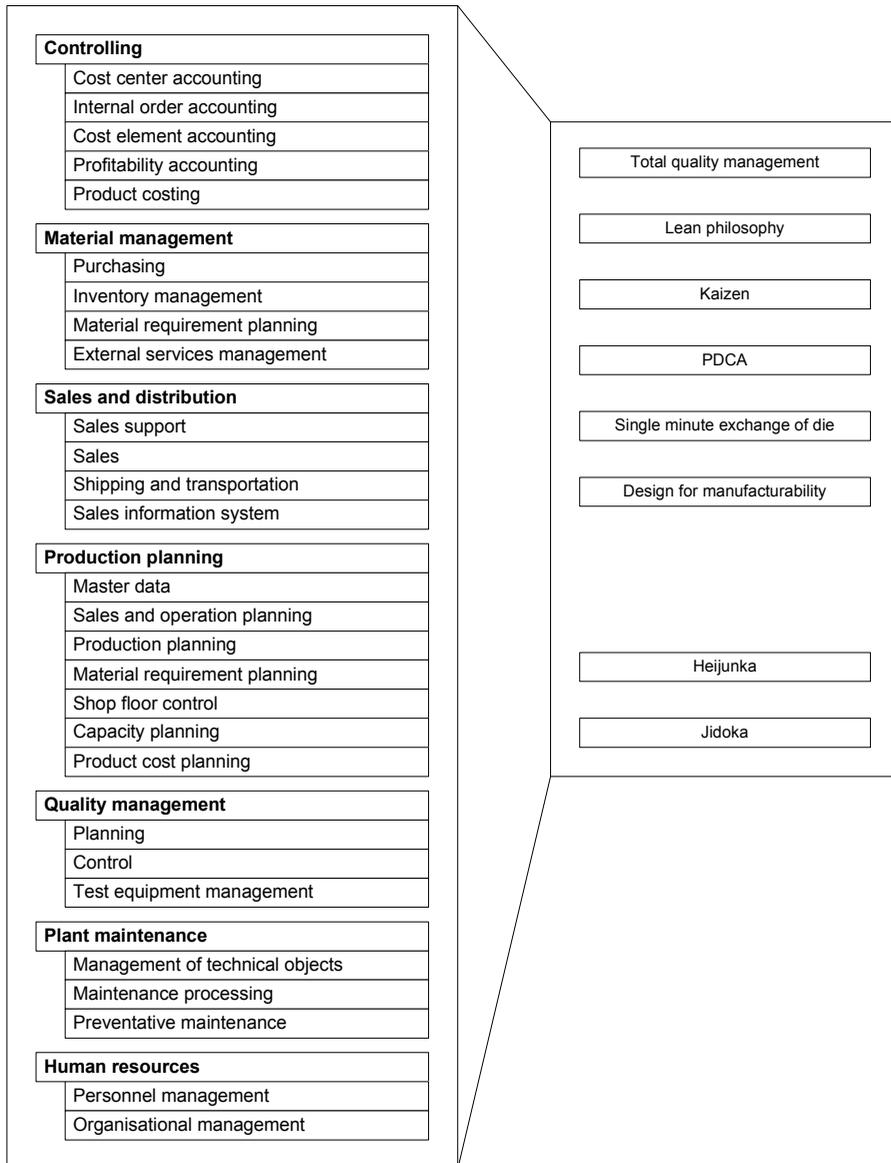
Controlling
Cost center accounting
Internal order accounting
Cost element accounting
Profitability accounting
Product costing

Material management
Purchasing
Inventory management
Material requirement planning
External services management

Sales and distribution
Sales support
Sales
Shipping and transportation
Sales information system

Production planning
Master data
Sales and operation planning
Production planning
Material requirement planning
Shop floor control
Capacity planning
Product cost planning

Quality management
Planning
Control
Test equipment management

Plant maintenance
Management of technical objects
Maintenance processing
Preventative maintenance

Human resources
Personnel management
Organisational management

- Total quality management
- Lean philosophy
- Kaizen
- PDCA
- Single minute exchange of die
- Design for manufacturability
- Heijunka
- Jidoka

Figure 4. Logistic tools and ERP integrator modules in the case of SAP

In case of SAP, the support of purchasing processes is based on the integration functions of the following important areas: controlling, material management, sales, production planning, quality, maintenance, plant management, human resources.

5. Summary

The design, development, reengineering, control and controlling of purchasing systems is based on enterprise resource planning system. The efficiency of ERP systems can be increased in case of integration of some logistics related tools and methods by the aid of them: total quality; six sigma, kaizen, lean, production smoothing, PDCA, SMED, design for manufacturability etc. Within the frame of this paper the author focused on the integration possibilities of these tools and methods, especially from the point of view of SAP and Oracle Applications.

Acknowledgements

Literature

[1]   Rozemeijer, F. (2000): *How to manage corporate purchasing synergy in a decentralised company? Towards design rules for managing and organising purchasing synergy in decentralised companies.* European Journal of Purchasing & Supply Management, Vol. 6. Issue 1, pp. 5–12.

[2]   Lin, C. T.–Chen, C. B.–Ting, Y. C. (2011): *An ERP model for supplier selection in electronics industry.* Expert Systems with Applications Vol. 38, Issue 3, pp. 1760–1765.

[3]   Werr, A.–Pemer, F. (2007): *Purchasing management consulting services – From management autonomy to purchasing involvement.* Journal of Purchasing and Supply Management Vol. 13, Issue 2, pp. 98–112.

[4]   Bányai, T.–Hudák, G. (2006): *Model of resource optimization of networking companies.* In: Stanislaw Legutko (ed.): Development of Mechanical Engineering as a Tool for Enterprise Logistics Progress. Science Report. Project CII-PL-0033-01-0506. Division of Technology Planning. Institute of Mechanical Engineering of Poznan University of Technology. pp. 353–364.

[5]   Telek, P. (2010): *Operation strategies for delivery models of regional logistic networks.* Advanced Logistic Systems. Theory and Practice, Vol. 4, pp. 33–40.

[6]   Kelle, P.–Akbulut, A. (2005): *The role of ERP tools in supply chain information sharing, cooperation, and cost optimization.* International Journal of Production Economics, Vol. 93–94, pp. 41–52.

[7]   Koh, S. C. L.–Gunasekaran, A.–Cooper, J. R. (2009): *The demand for training and consultancy investment in SME-specific ERP systems implementation and operation.* International Journal of Production Economics Vol. 122, Issue 1, pp. 241–254.

[8]   Cua, K. O.–McKone, K. E.–Schroeder, R. G. (2001): *Relationships between implementation of TQM, JIT, and TPM and manufacturing performance.* Journal of Operations Management Vol. 19, No. 6, pp. 675–694.

[9]   Pettersen, J. (2009): *Defining lean production: some conceptual and practical issues.* The TQM Journal Vol. 21, No. 2, pp. 127–142.