3.6 Proactive Knowledge-Based Risk Management

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3.6.1 Introduction

Globally distributed production networks accompanied by the reduction of the vertical range of manufacturing, customer-driven markets, decreasing product life-cycle times and increasing information flows alter the requirements for the management of logistic systems and processes. The reduction of the size of goods that have to be transported and as a consequence thereof an increasing amount of transports are main reasons for a relative shortage of logistic infrastructure and lead also to rising utilization of existing logistic processes and to more complex logistic systems. These developments for example are caused through the evolution of virtual organizations and the increasing maturity of new information and communication technologies (ICT) technologies like RFID and ubiquitous computing.

To coordinate all these processes, an increasing demand of required information for just in time deliverables is needed. These requirements exceed the abilities of existing standard logistic processes. Dynamic development of modern ICT (e.g. telematics, mobile data transfer, and transponder technology) open new possibilities for the development and emergence of intelligent logistic systems which can fulfill the requirements of rising utilization and relative shortened logistic infrastructure. An approach to face the challenges on existing and upcoming problems in logistics is the concept of autonomous logistic processes represented by autonomous logistic objects.

The autonomous control of logistic processes can be realized through decentralized control systems, which select alternatives autonomously or
logic based semi-autonomously and decide within a given framework of goals. Coming along with the autonomy of the logistic objects is a shift from the responsibility for the realization of the decisions from a central deciding system to the single logistic object. This has to be regarded by developing a concept for the management of autonomous logistic objects and the complexity of the total system which is an after-effect of the high number of logistic objects which are needed in such a system.

The complexity of logistic systems depends on the amount of the embedded logistic objects. The amount and the character of the relations within logistic systems affect also the complexity of the logistic system. The third factor, which is an important influencing factor for logistic systems, is the dynamic of the system. This dynamic is displayed by the number of system states and changes in the amount of system elements. However, the complexity of a logistic system allows still no conclusions regarding the sensitivity of the system in relation to the malfunction of individual objects or relations between them. The integration of strategic planning may enable the system to compensate a temporary or unlimited mal-function of an object or a system relevant relation between two or more objects. The increased use of modern ICT doesn’t necessarily assure the constant availability and high quality of data and information to plan and control the logistic processes. A malfunction or a loss of information and communication systems can lead to substantial negative consequences.

**Risk in autonomous logistic processes**

The increased complexity of logistic systems is followed by a more complicated planning and control of logistic systems and of the related processes in combination with an increased sensitivity of the total system to disturbances and malfunctions. The hazard of delayed delivery in transportation, latency in manufacturing and reduced adherence to delivery dates are results of complex system structures and increased customer requirements. All these numerated disturbances and changed conditions clarify that logistic systems and the related logistic processes are very fragile and the contained hazards and chances have to be managed to ensure the success of the logistic processes. These circumstances show that the development of a management system for risks is essential for a successful realization of autonomous logistic objects. Direct disturbances of the processes caused by risks which exist impartial from the logistic objects and risks which result from the interaction of the logistic processes. Traditional literature on risk management (RM) knows six strategies to handle risk: (1) acceptance, (2) avoidance, (3) reduction, (4) transfer, (5) compensation,