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Supply Techniques

Reading Paper

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Supply Techniques

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PREFACE

Professional supply managers do not only have to know how to negotiate or how to manage suppliers but are also increasingly challenged to work in cross-functional teams in order to create competitive advantages for their companies. As a result, supply managers repeatedly need to apply new, non-classical supply techniques. A small selection of these supply techniques are presented in this reading paper that should provide the reader with a general overview and application examples for each technique.

Furthermore, this reading paper would not have been possible with all the conceptual details and the broad range of examples without the support of the following students: Sinem Atakan, Ankid Kedia, Anne-Kathrin Greiner, Arora Shaurya, Marco Linz, Valentin Recker, Valérie Heymans, Ingmar Schaaf, Jens Burchardt, Jörg Gerbig and Jan Philipp Lüdtke.

We thank them for their contributions and wish the readers an interesting time.

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1 Basics

History and definition of the Failure Mode & Effects Analysis

The failure mode & effects analysis (FMEA) has been developed in the 1960s by the National Aeronautics and Space Administration (NASA) in the context of the Apollo missions. Firstly being used in the aeronautics and space industry, FMEA has been adapted by production companies (mainly in the automotive industry).[1] In Germany, the method was standardized in the industry standard DIN 25 448 under the name "Ausfalleffektanalyse" in 1980.[2] It is also mentioned in the German DIN EN ISO 9004-1 industry standard as an appropriate quality assurance tool.[3]

The FMEA is a formalized analytical method with the purpose to identify, analyze and avoid potential failures of products and processes.[4] The potential failures are identified by interdisciplinary teams who also analyze them and assess their individual risk. The goal is to formulate appropriate methods to prevent the occurrence of failures or to minimize their severity. According to this, the FMEA can be seen as a method for estimating and grading risks. It represents a guide to where attention and modification would be most effective in reducing the failure probability.[5] As a result, critical components can be identified for which the selection of an appropriate supplier is essential.

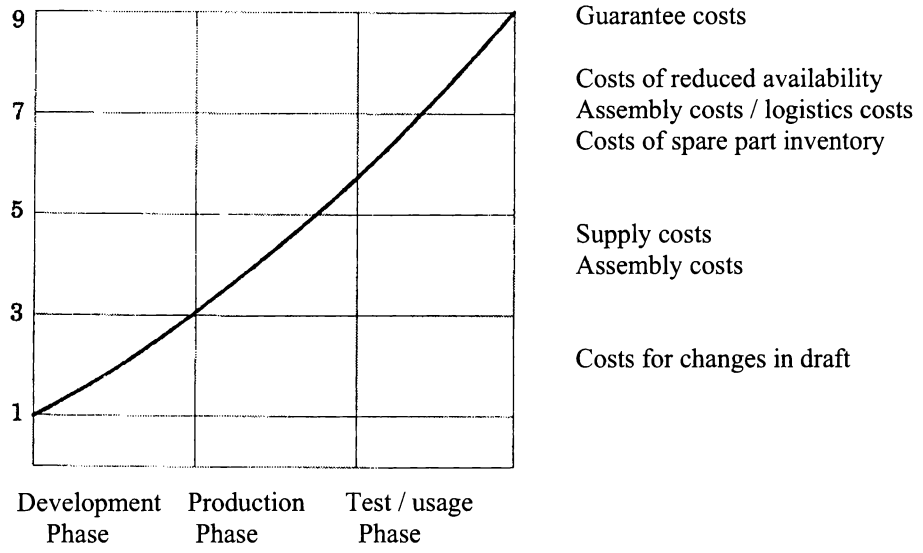
Description of the Failure Mode & Effects Analysis

The FMEA in general carries out a risk analysis. The risk of a failure is determined by and increases with its actual impact and its probability of occurrence. The probability of occurrence itself depends on the probability that the failure appears and the probability that the failure is discovered. The FMEA risk analysis is based on these three risk elements: For each identified potential failure the severity of its impact as well as its probabilities of appearance and detection are determined. Based in this information, the risk of each potential failure can be assessed and the potential failures can be rated according to their

[1] See Schmidt, et al. 1991.
[2] See Pfeifer. 2001.
[3] See Rinne and Mittag. 1995.
[4] See Gilchrist. 2000, p. 16.
[5] See Reinhart. 1996.

importance. In a next step, appropriate preventive actions are formulated in order to reduce the individual risk. The risk can be reduced either by preventing its occurrence or by minimizing its impact. Here, failure prevention represents the better alternative.[1] In order to prevent failures, the FMEA has to be involved in every step of the product development and production process. It has to assure at the end of each step that the next step can be enrolled on a nearly failure and risk free basis.[2] The early identification of failures is important because the costs for failure elimination increase with the time (see figure 1).[3]

***Figure 1**: Relationship between point of failure identification and costs for failure elimination*



***Source:** According to Timischl. 1995, p. 38.*

As the FMEA is a rather demanding method, it should be focused on critical aspects of the product development and production process. A FMEA is in general useful within the context of safety regulations, safety relevant parts, new materials, new developments, significant changes, risky processes etc.[4] The FMEA can be used in this context as a leadership tool setting improvement goals (e.g. by demanding a reduction of the Risk Priority Number (RPN)) which will be defined later on and by controlling there achievement.[5]

[1] See Reinhart. 1996, p. 87.
[2] See Reinhart. 1996, p. 88.
[3] See Timischl. 1995.
[4] See Reinhart. 1996, p. 89.
[5] See Kamiske and Brauer. 1999, p. 30.

The FMEA is carried out by interdisciplinary teams because the current high degree of division of labor leads to a high division of knowledge. In consequence, product quality is influenced by nearly all divisions of a company.[1] Therefore, the cooperation of specialist in different fields is considered to lead to higher success rates in identifying failure potentials and developing appropriate preventive actions in general. The actual composition of the teams depends on the type of the examined product or process and its individual development stage.[2]

The FMEA is a method that allows collecting a company's already existing knowledge about quality determinants and failure causes in order to use it on a continuous basis for quality improvement and failure reduction. It therefore makes feedback loops possible and prevents from making the same error twice.[3]

Types of the Failure Mode & Effects Analysis

According to their focus and objectives, three different types of the FMEA can be distinguished: System-FMEA, Construction-FMEA and Process-FMEA. The System-FMEA emphasises on the construction aspect of a product or process. It succeeds the completion of a design draft. Its purpose is to identify failures within the draft, access their risk and propose preventive actions in order to guarantee a faultless draft. Especially the system-safety and reliability as well as the conformity to governmental regulations are in the focus of the System-FMEA. The Construction-FMEA identifies and prevents failures that potentially occur in the context of the construction and development process in order to receive a perfect outcome. Finally the Process-FMEA identifies and prevents failures that can occur within the production process in order to assure an excellent quality of the final product. The System-FMEA is basis for the Construction-FMEA from which the Process-FMEA can be derived.[4]

2 Functionality of the Failure Mode & Effects Analysis

FMEA process can be divided into 5 essential steps: 1) preparation, 2) risk analysis, 3) risk assessment through Risk Priority Numbers, 4) interpretation of

[1] See Pfeifer. 2001, p. 403.
[2] See Reinhart. 1996, p. 88.
[3] See Pfeifer. 2001.
[4] See Bruhn and Masing. 1994.