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# Cutting manufacturing failure costs in the tool and die industry by implementing a knowledge transfer system to avoid and correct mistakes more effectively

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**Abstract**

The extremely knowledge-intensive sector of the tool and die industry is forced to reduce costs due to raising international competition. This paper deals with the development and implementation of a knowledge transfer system in order to reduce costs by avoiding mistakes in the tool making process and cutting costs of rework. It constitutes typical weak points concerning shared information and explains a systematic knowledge feedback chain. Additionally it describes the application of supporting knowledge distribution tools, for example mobile tablet apps, and gives examples regarding an improved information flow along the process chain of the tool and die industry.



Keywords: Tool and Die industry, Digitalization, Knowledge Management

## 1. Introduction

The tool and die making industry largely contributes to the economic performance of major economies [1,2,3]. As the tool and die industry provides not only tools but different services for their customers, tool and die manufacturers are industrial product service systems suppliers. In an environment with highly rising competition and new competitors from low cost countries it is facing new challenges [4,5]. Confronted with these new competitors, tool and die manufacturers from countries with higher wages have an even higher need to lower the costs.

A huge share of the costs in the tool and die industry is caused by mistakes, which are avoidable by enabling a modern system of knowledge transfer. Using such a system permits a company to report occurring mistakes and to take measures to prevent them in following projects.

Currently the following issues can be identified as most important to be fixed:

- Mistakes are made in the development phase, but recognized in the following stages. The correction of a mistake, which happens at a primary stage of the tool manufacturing process, costs much less than correcting it afterwards. [6]
- Between different divisions there is a lack of information exchange. A higher rate of communication would provide divisions responsible for preceded steps with valuable informations about their mistakes. [7]
- There is no standard for the communication of detected mistakes. A standardized reporting system would allow the knowledge transfer to divisions responsible for preceded manufacturing steps. [8]


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- Also, the tool and die industry faces a lack of coordination in terms of responsibilities and directives between different divisions. A higher coordination with the obligation to transmit information about necessary corrections after the try-out would guarantee a better supply of informations about mistakes in all steps of the production. [9]

Until now, a solution for the issues in the internal communication has not been developed. For the persistence of the western tool and die industry it is mandatory to improve the communication in order to stay competitive. [10]

### *1.1. The tool and die industry*

The tool and die industry operates at the link between the development of a product and its series production. Thus, this part of the value chain takes a crucial position [9]. The tool and die manufacturing process determines both the costs and the time of the introduction of a new product. Furthermore, the due date reliability and the delivery time are two important indicators for a tool makers' performance. Experts estimate, that the tool is responsible for 60% of the whole production costs. Furthermore, the used tool is responsible for the quality of the series produced product in a high degree. In the tool making industry there exist both internal and external tool manufacturers. An internal manufacturer only produces tools for its parent company, while an external manufacturer takes orders from producing companies that order tools. Most external tool makers are small and medium-sized companies [11].

### *1.2. Knowledge transfer*

Facing the challenge of many new competitors from low cost countries, the western tool and die industry is required to lower the costs and the manufacturing time, which both leads to a higher efficiency in its value chain. A lower number of occurring mistakes takes a key position [11]. In the tool and die industry most mistakes occur in the development phase but are discovered in downstream process steps. Without a systematic upstream knowledge transfer, those mistakes are unavoidable in subsequent projects. The idea of knowledge transfer describes long term actions regarding handling mistakes in the tool manufacturing process. In short term the mistakes have to be removed by rework and wastage. The long term goal is informing upstream divisions in a company about mistakes in former projects. By achieving this, there will be significantly less mistakes in subsequent projects.

Figure 1 states the system of knowledge transfer.

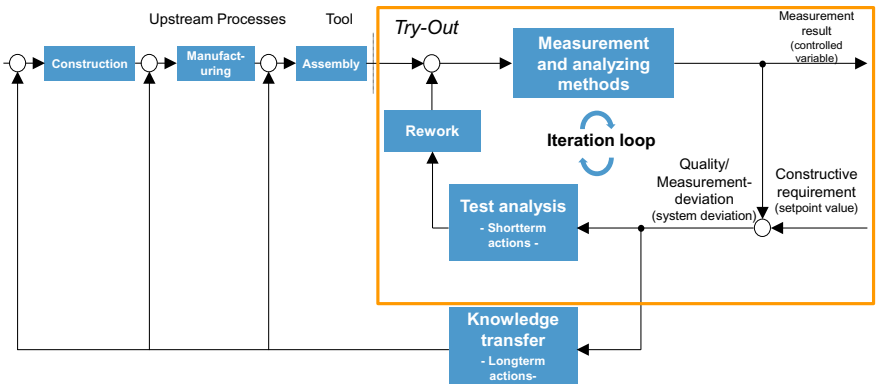


Fig. 1. Knowledge transfer control circuit.

While short term actions are executed to deliver the tools in time, the knowledge transfer is done at the same time. With this procedure, the information is exploited in two ways.

### *1.3. Project overview*

Although providing high quality tools and being very important for western economies, small and medium sized companies cannot afford to develop and establish a knowledge transfer system on their own. Thus it was necessary to assist them by taking over the organization of a project. A project of 16 companies was founded and coordinated. The project consortium was divided into two groups, one plastic processing tool manufacturers and one for metal processing tool manufacturers. The project plan contained several meetings and work phases: In the kick-off meeting the requirements of the knowledge transfer system were determined. The later meetings served the purpose of reconciliation. During the different work phases the methodology of the knowledge transfer system was worked out and the tools were developed.

## 2. Knowledge transfer system

### *2.1. Existing Systems*

There are basically three methods representing current reduction methods of manufacturing mistakes. The first one is the zero-defect program, which aims at a faultless production without wastage or rework. Although delivering great opportunities for increasing the process quality, zero-defect programs can only eliminate lacks of quality that are caused during the production. Contrasting this, it has been empirically proven, that the biggest share of the costs of the mistake correction is based in the product development [9]. Hence, a zero-defect program is not suitable to be implemented in the tool and die industry as a knowledge transfer system.

A possible second method is the six-sigma program. Referring to the standard deviation of the Gaussian distribution, the program aims at reaching a standard, in which even the deviation of six times the standard deviation fits in the quality standards. This method aims at having no mistakes in a continuous process. Although delivering