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## Customer Integration To Gain Cost Efficiency Alongside Tool's Life Cycle

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### Abstract

Today's efforts to optimize industrial production processes exceedingly focus on tools' life cycle costs. Toolmaker and its customer are the two entities influencing tools' life cycle costs. Due to lack of information exchange neither life cycle assessment nor cost efficient life cycles can be realized. An effective lever for penetrating information exchange and therefore gaining cost efficiency alongside tool's life cycle is the integration of the toolmaker into the value creation process of its customer. The so called customer integration succeeds through innovative product-service systems alongside tools' life cycle networking the value creation processes of toolmaker and tool user. As the findings of research project TEC in this paper practical solutions for realizing customer integration are introduced and measures for gaining life cycle cost efficiency alongside tool's life cycle are explained.

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### 1. Introduction

Due to its key role in the value chain between product development and mass production the tool making industry is one of the most important industries in the manufacturing sector [1]. The key role is justified as the tool making industry enables the product development to realize new products as well as the series production to produce those products at a high quantity and economical prices. Efficient and highly productive tools are the bases for a high-performance manufacturing sector [2]. The tool making industry therefore largely contributes to the economic performance of major economies [3, 4, 5, 6]. However due to an increasingly global production environment the tool making industry in high wage countries stands in an aggressive competition with suppliers from Eastern Europe and China [7, 8]. Facing this challenge, the industry has to develop business differentiators to preserve international competitiveness. As differentiation over tools' quality or price is not a successful strategy any more, low life-cycle costs and therefore cost efficiency alongside tools' life cycle comes into play. Gaining this cost

efficiency tool making companies in high wage countries would be able to justify their higher acquisition prices by lower production costs and market overall more cost-efficient tools.

To approach a solution for tool and die making companies to gain cost efficiency alongside tools' life cycle this paper is divided into six chapters.

After an introduction in the second chapter the German tool and die making industry as well as its challenges derived from trends in the manufacturing sector are introduced.

In the third chapter prior works on life cycle assessment are analyzed and considered regarding their capability to address the introduced challenges.

In the fourth chapter an explanation model of tools' life cycle costs is presented. Within the 11<sup>th</sup> Transnational Collective Research Project Proposals (CORNET) program, the Laboratory for Machine Tools and Production Engineering (WZL) Aachen, Germany, and its research partner IFT Vienna, Austria, set up the "Total Efficiency Control" (TEC) project to focus on this topic. From the beginning in 2011 the TEC project has been supported by 14

German and Austrian tool making companies to enhance relevance. An explanation model of tool's life cycle costs was developed followed by a Resource Consumption Calculation Tool (RCCT) that allows the forecasting of total costs for tools over their entire life cycle. The explanation model in combination with the RCCT makes tool's life cycle costs transparent.

Based on this transparency in the fifth chapter an approach is introduced to stimulate cost efficiency finally: customer integration. Through customer integration the tool making company is integrating into the value creation process of its customer. Thereby the toolmaker is enabled to get production process information by the meaning of field data of its tool. Getting the production process information the tool making company has access to all costs alongside tool's life cycle, which has not become reality in the tool making industry by now. Customer integration can be realized through services alongside tools' life cycle. In this paper these services related to the tool as the core product are explained and their influence on cost efficiency over the tool's life cycle is clarified. These findings are results of the research project as well and were worked and verified by the 14 international tool making companies.

The conclusion in chapter six will finalize this paper.

In the following the word "tool" is used to describe tools as well as dies. Therefore companies of the industry are described by the expression "tool making company" and the industry itself by the expression "tool making industry".

## 2. The German Tool Making Industry

### 2.1. Overview over the German Tool Making Industry

The German tool making industry has about 54.000 employees [9]. 80% of the produced tools are either injection and compression molding or forming tools. After the global crisis in 2009 and 2010, the industry has recovered very quickly and is almost back at pre-crisis sales. Most of the 4.800 German toolmakers are medium-sized companies with less than 20 employees [10] (Figure 1). The market access of toolmakers can either be external or internal. An external tool shop offers customers tools as its final product. Internal tool shops, on the other hand, build tools for their companies' own production. They are therefore a supporting unit within a producing company.

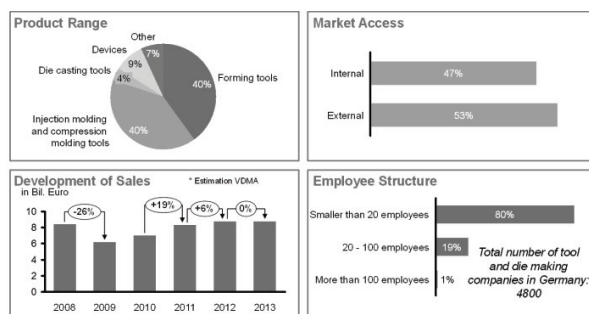


Figure 1: Key Facts about the German Tooling Industry

However German toolmakers are still facing margin losses even after the crisis and consistently increasing sales. The reason for this development is the upcoming competition especially from Eastern Europe and Asia. The quality of their tools has increased enormously but their prices are still low. Thus the German tool making industry tries to stay competitive by focusing on the five fields of action costs, time-to-market, quality, innovation and productivity [11]:

**Costs:** Depending on the sector, tools account for up to 30% of the total production costs [12]. Due to the use of the tool, planned maintenance and unplanned repairs, additional costs which are directly connected to the tool accrue over the lifetime. Experts assume that 60% of the total production costs are determined by the production tool [13]. Innovative tool concepts enable the customers to realize significant cost-saving potentials over the life cycle of the product because of the tools high productivity. Therefore tools' life cycle costs become the most important lever.

**Time-to-Market:** Product life-cycles shorten continuously in most industries. In times of high global competitive pressure, the success or failure of a product is often decided by the passed time to the market launch. Referring to the realization of a new product, the production of the tool is on the critical path between product development and mass production. It is often one of the last remaining factors for a significant lead time shortening. Therefore the speed of order processing in tool making and the lead time in tool manufacturing has direct impact on the product success.

**Quality:** Beside the tool by itself and the interaction between the tool and the machine, the production processes of goods and services are essential to the products quality. These factors determine the customers' perceived quality and thus its satisfaction. In addition to technological developments, various organizational measures, caused by the high complexity of the tool manufacturing, are necessary to achieve high customer satisfaction through quality.

**Innovation:** The production of a tool provides its services in both directions of the value chain. New types of processes and tool concepts enable a more economical production. Because of its expertise the toolmaker can actively participate in the customers' product development.

**Productivity:** The productivity of a tool in use significantly determines its life cycle costs. Therefore a high level of tool availability is a crucial factor in the tool's overall cost calculation, which affects the production of the tool. Thus the importance of the tool's purchase price often retreats into the background when focusing on the entire life cycle.

### 2.2. Challenges for the German Tool Making Company

In the global competition the European tool making industry faces a challenging environment. This is characterized by changing conditions of the global market for companies in high-wage countries and new competitors from Asian low labour-cost countries with growing technologic potential. Therefore three main challenges can be identified for the tool making industry – increasing product derivatisation, shorter product life-cycles and lower factor costs of global competitors.

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