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INTEGRATION OF SOURCING ASPECTS INTO TARGET COSTING

Alexandra Nissl and Udo Lindemann

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Abstract

The globalisation of markets influences the supply chain of enterprises: improved options for global sourcing have consequences on cost structures and the importance of an early integration of suppliers in the development process. In a case study, we derived an approach for meeting the challenge of globalisation and benefiting from the enhanced sourcing options. The proposed procedure model describes three alternative procedures in the product development process. Depending on the component complexity and a first cost prognosis, the model assists in the choice of an activity pattern. Thus, an early purchase decision is supported that facilitates a cost-efficient design by the integration of in-house or external manufacturing experts.

1 Introduction

The achievement of elaborate cost targets in order to maintain or increase the competitiveness for global acting enterprises grows more and more important. Many enterprises apply the methodology ‘target costing’[2, 6]. At the beginning of the development process, cost targets, which define the financial framework of the product development process, are specified. Keeping the costs within this limit is an important objective during the development process. Systematic, multidisciplinary processing may assure its achievement. Moreover, support of cost-effective determinations with forecasts of the final product costs is necessary. Where increased costs have been the result of earlier decisions, a definition of measurements for cost reductions is required to realize a more economical solution. In the course of product development such "iteration loops" may be indispensable on more than one occasion.

Methods for cost prognosis are mostly based on costs for known manufacturing processes of in-house production options. Costs for external manufacturing of collaborative suppliers are also unproblematic to establish. For new or unknown production processes, cost forecasts are hard to perform; therefore, their potential for a favourable cost/performance ratio often remains unconsidered. Consequentially, the detailing of the product is often based on known processes. According to the extended sourcing possibilities, the purchasing department solicits quotations from enterprises that use various manufacturing processes. If a potential supplier offers cost-effective product components using unconsidered production means, the target costing process is disturbed. The former cost estimations are unfounded because the detailing of the unit is not adapted for this efficient production process.

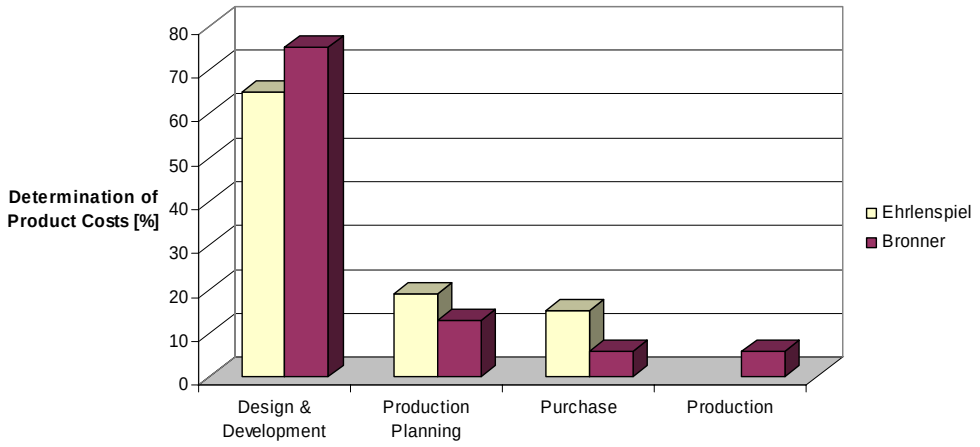

Figure 1. Findings of investigations of Bronner and Ehrlenspiel

Studies to quantify the influence of the different departments on cost determination during product development have already been undertaken. The examinations of Bronner 1968 [1] and Ehrlenspiel 1980 [3] resulted in the technical planning departments (development and production planning) together specifying approximately 85 per cent of the product costs. At the time of the research, few components were purchased parts. In-house manufacturing or a very close cooperation with few local suppliers was standard. Since that time, the degree of the manufacturing depth, the variance of manufacturing options and, at the same time, the purchase structures of the enterprises changed.

This paper describes the effects of globalisation on the supply chain of enterprises. In an industrial case study, we derived a procedure model for the integration of sourcing aspects into target costing. The approach suggests three alternative procedures in the product development process depending on the complexity of the designed component. The starting point of the allocation to a procedure is the complexity of the component and a first cost prognosis on the conceptual level. The model supports an early purchase decision. This early, secured decision assists with a cost-efficient design through the integration of in-house or external manufacturing experts.

2 Influence of Globalisation

The growing globalisation of markets enables enterprises, on the one hand, to source product components and to distribute their products to larger markets. On the other hand, globalisation also leads to an increased number of competitors. Frequently, different providers meet customer requirements in terms of functions and quality. In these cases, the customer mostly bases the order decision on the product costs. This situation leads to an increasing cost pressure on the enterprises: the development of cost-effective products is decisive for existing in the global market.

2.1 Global Sourcing

Extended sourcing opportunities increase the importance of target costing for the success of the business. An increasing number of enterprises concentrate in-house manufacturing on so-

called core competences. The supply of purchased components involves the advantages of special production processes. The cooperation of purchase and development departments gains in importance and the combination of cost efficient design becomes increasingly complex.

Due to increasing options with global sourcing, many enterprises have relationships with suppliers all over the world. Various manufacturing options, which assist the designing of more effective product concepts, are available on the global market. On the other hand, enterprises can order from the lowest-priced supplier manufacturing a certain product unit according to the product specifications.

2.2 Change in Cost Structure

The rising portion of the purchased volume in relation to in-house components also changes the cost structures of the products and enterprises. With the application of the common cost accounting structure, vendor parts are assigned to material costs.

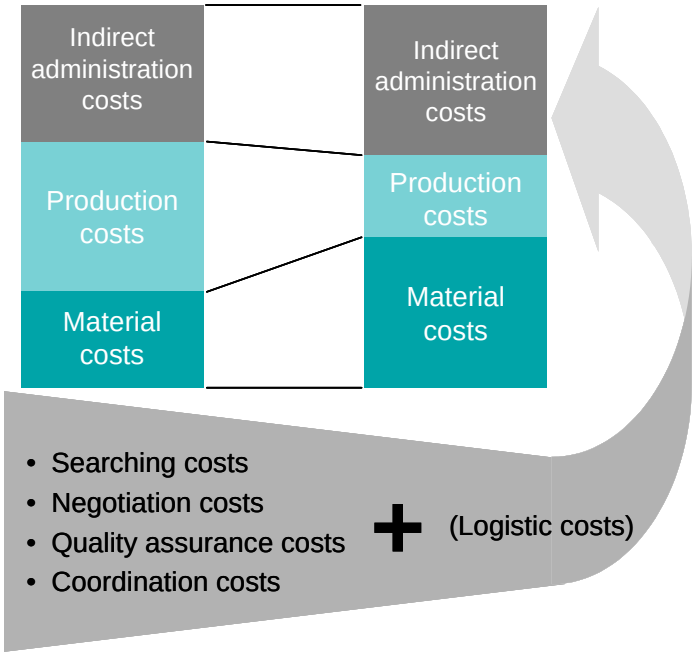

Figure 2. Change in Cost Structure

With increasing external manufacturing, the searching, negotiation, quality assurance and coordination costs rises. Moreover, these costs exhibit a high degree of intransparency, which complicates a component-specific addition to the involved costs [6]. Global sourcing also generates rising logistics costs, which should be considered in the target costing process.

2.3 Integration of suppliers

The product documentation resulting from product design forms the basis for the manufacturing of the product units. In order to plan the manufacturing process as efficiently as possible, the documentation must comprise the know-how for an optimized, economical production. This requires, dependent on the product complexity, the early integration of manufacturing experts into the development of a product.

Just as internal production experts are integrated into the product development process in early phases, so the integration of manufacturing experts of potential suppliers is also necessary.

Frequently, suppliers justify price increases by subsequent changes of product components [6]. Apart from an exact specification and interpretation of product functions, a prevention of later changes also requires production knowledge. The avoidance of subsequent changes can be achieved by an early integration of suppliers into the product development process. As a result, this leads to an improvement in the continuity, efficiency, and suitability for practice of the target costing process.

3 Results

Far more factors of global sourcing affect the development of products than could be stated in this contribution. Some fundamental effects of target costing have been pointed out. We derived a procedural model for the early integration of sourcing aspects into the product development process.

For the achievement of the cost target, a concurrent support of cost-effective definitions with prognoses of the effects on the final product costs is necessary. The bases for prognoses form the known cost determinants. At the beginning of the design process, on the basis of the prepared concept, a first cost prognosis takes place in order to facilitate the selection of the following development procedure.

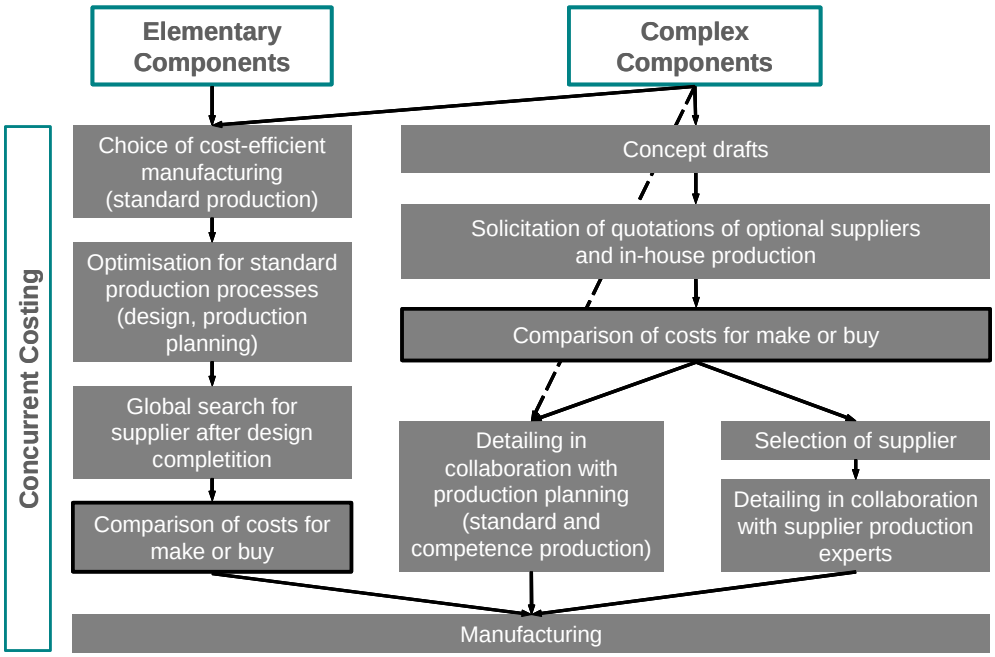

Figure 3. Procedure Model for the Integration of Sourcing Aspects into Target Costing

A model of the proposed procedure of product development is represented in Figure 3. At its core is a differentiation between elementary and complex components. Elementary components are defined as being low-cost and with only minor production requirements. For these components, first cost prognoses ensure an economic production with standard manufacturing processes, known in design and production planning. Additionally, the

required quantity does not require mass production. Process steps with cost comparisons between different sourcing options are illustrated with black frames in the model.

For elementary components, the model proposes the following procedure:

- Choice of cost-efficient manufacturing. This decision results from the first cost prognosis, the component geometry, and the requirements of the component. In most cases, the designer is able to make the decision; consultations with production planning are optional.
- Optimisation for standard production processes. The designer accomplishes the detailing through its manufacturing knowledge, with optional consultations with production planning.
- Global search for supplier after design completion. On the basis of the product documentation, the solicitation of quotations takes place.
- Comparison of costs for make or buy. The most favourable source is determined and pursued with involvement of quotations and all subsequent costs.

For the development of complex components, any of the three procedures suggested in the model make sense. Complex components are defined as cost-intensive with increased requirements for the manufacturing process. If manufacturing by means of standard techniques has proven to be the most economical in the first cost prognosis, the development process should be adapted to the procedure of elementary components.

At first, the development of complex components not allocated to the left procedural branch is the same for in-house or external manufactured units:

- Concept drafts. At the beginning of the development of complex components, a draft of its shape is made on the basis of the Wirkgeometrie. The results of first dimensioning calculations are already available.
- Solicitation of quotations from optional suppliers and in-house production. Inquiries regarding technical realisation options and costs are started on the basis of available product specifications.
- Comparison of costs for make or buy. The most favourable source is determined and pursued, with involvement of quotations and all subsequent costs.

The decision between in-house and external manufacturing can be made by means of the available information. If the in-house production has proven to be more economical, the next step is:

- Detailing in close collaboration with production planning. In order to ensure an optimal manufacturing process, design and production planning cooperate closely.

This procedure ensures a favourable internal sourcing. Due to strategic considerations like the protection of knowledge that is apparent from production documents, in-house production could be advantageous even if it involves higher costs. Often in-house manufacturing using core competences is the most favourable manufacturing option. The solicitation of quotations for these components is then not necessary. In this case, the first three steps of the procedure for complex components can be left out. The detailing of the component in cooperation with the production planning may start in accordance with the procedure visualised with the dashed arrow.

If a bought-in part is the more favourable alternative, or necessary because existing internal manufacturing methods do not allow its production, the next steps are:

- Selection of supplier. On basis of the quotations, the development partner and supplier can be determined. This decision is made together by design, production planning and purchase departments because it is influenced by monetary, development and production aspects.
- Detailing in collaboration with supplier production experts. In order to ensure an optimal detailing for the intended production process, design and supplier production experts cooperate closely.

After all, the fundament for an optimised manufacturing process is accomplished according to the determinations of the beginning of the design process. The most cost-effective sourcing is presumably achieved.

4 Case Study

The procedure with the proposed model was carried out with the development of a planetary gear (Figure 4). The main elements of the gear are the cogwheels, the driveshaft, the pinion cage, the housing and a fastening plate.

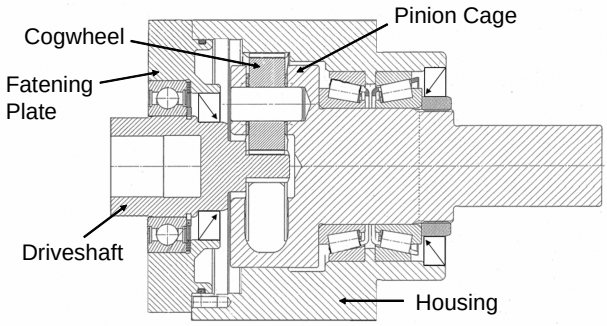

Figure 4. Planetary Gear

Apart from the fastening plate, which is based on standard production processes, all components were classified as complex components.

It was clear that the cogwheels would be produced in-house. The production of cogwheels is a core competence of the enterprise and therefore the most favourable manufacturing option. The driveshaft requires specific knowledge. For that reason, external manufacturing was not considered. For both the cogwheels and the driveshaft, the procedure with the dashed arrow was chosen. The detailing was carried out in close collaboration with the internal production planning department.

The quotations of potential suppliers and in-house production on the basis of concept drafts led to the decision to choose a cast housing for the gear. This involved the selection of a supplier, as casting is not an in-house manufacturing process of the enterprise. The detailing was carried out in close collaboration with a casting expert of the foundry. Other designers benefited from the cooperation: they took the opportunity to ask casting-specific questions to improve future cast designs. This also benefited the interests of the foundry: the knowledge of

specific difficulties provides an advantage with offering support for particular production problems.

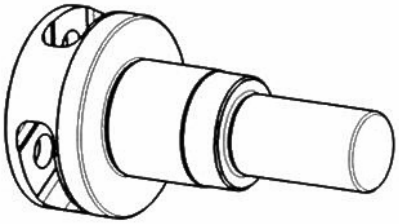

Figure 5. Pinion Cage

The development process of the pinion cage (Figure 5) is an example of a sourcing decision taken too late. Assuming that the production with standard production techniques is the most cost-effective, the left branch of the procedural model was chosen. The global search for a supplier as well as in-house cost prognoses resulted in unacceptably high component costs. Even the use of a forged blank with a favourable shape could not cut the chipping costs significantly. The achievement of the target costs for the gear was at risk. A second global solicitation of quotations independent from production techniques was successful: the pinion cage was quoted as a finished worked cast component, inclusive of the necessary logistics, at costs only slightly above the former material costs. However, the detailing had to be adapted to the new production process, which caused additional costs and difficulties in keeping to schedule.

5 Discussion

Having the various options of global sourcing at one's disposal, the exclusive accomplishment of cost prognosis accompanying the product development process without the consideration of different provision opportunities is not sufficient. The processes of the product development must be adapted to this progression. The proposed model comes up for discussion with optional procedure steps.

The model presents three fundamental procedure patterns, which integrate aspects of the later sourcing into the product development process. Accompanying the development, forecasts of the final product costs support cost-efficient decisions. For significant results of the cost prognoses, the prospective sourcing has to be considered.

The presented procedure for elementary components is common in small and medium-sized enterprises. However, there it is often used for the development of complex components as well. The late solicitation of quotations that the procedure involves may necessitate an adaptation of the product documentation due to special requirements.

The rising portion of purchased parts in connection with rising product complexity confirms the assumption that the procedure presented last is the most reasonable for the development of the majority of components to ensure the achievement of the target costs.

The assignment of all involved costs of purchased components is not yet solved satisfactorily in the common cost accounting systems. For the support of a successful target costing process, this information must be available.

6 Conclusions

The increased purchase options involved with global sourcing have a massive impact on the target costing process in enterprises. Because of an increasing number of influences, a forecast of the final product costs becomes more and more complex. Depending on the component, the application of different procedures for its development is necessary. A premise is an early decision on internal or external sourcing. On the basis of this decision follows the development of the component in cooperation with the appropriate production expert to ensure the optimisation of the detailing for the chosen manufacturing processes. Thus, formerly unknown production processes are accessible for the enterprise.

The confirmation of the general application of the procedural model is still missing. The implementation in the described case study promises an advantageous use in practice. The present activities show a particular need for a multidisciplinary collaboration in the sense of an integrated target costing process.

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Alexandra Nissl
Department for Product Development,
Technische Universitaet Muenchen,
Boltzmannstr. 15
D-85748 Garching,
Germany,
Tel: +49 (0)89 289 15152
Fax: +49 (0)89 289 15144
E-mail: nissl@pe.mw.tum.de
URL: www.pe.mw.tum.de