

# A Case Study: Identifying and Mastering Complexity

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## Abstract:

This case study shows that the early use of complexity management methods during the product planning stage can expose large cost savings potential. Variant reduction in later stages, while still able to reduce some costs, cannot achieve similar results.

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Complexity Management

# A Case Study: Identifying and Mastering Complexity

## Results: 47 % fewer parts and 15 % less manufacturing costs

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### Excessive Complexity Over Time – Time to Redesign?

The following case describes how avoiding complexity from the beginning can yield much higher cost savings than reducing complexity retroactively after it has already been created.

Product complexity tends to naturally grow over time. New features are added to products that were not part of the original specifications or new technologies are integrated over the life cycle of a product. Once the complexity reaches certain levels, an investment in additional infrastructure (e.g. an additional warehouse or die-set) is almost unavoidable. In this case, an increase in complexity has resulted in an increase in complexity-related costs. As a rule of thumb, the later in the product's life cycle additional complexity is introduced, the higher the subsequent increase in complexity costs. When trying to eliminate costs caused by complexity, keep in mind that they cannot be completely eliminated by simply eliminating the complexity that caused

them in the first place. A certain amount of fixed costs is simply sunk and many of the variable costs cannot be reduced until long after their initial cause has been eliminated through complexity reduction (Fig. 1). As a rule of thumb, the later in the product life cycle the complexity is reduced, the smaller the cost savings.

Combining those rules of thumb leads to the conclusion that in some cases it may be more rational to completely redesign the product rather than to continue adding additional complexity.

### Case Study: 47 % Fewer Parts - a 15 % Decrease in Manufacturing Costs

A manufacturer of commercial vehicles was at a point where the historically grown complexity had slowly eroded profit margins. Two models were especially affected by this phenomenon. The company concluded that reducing the complexity would result in large efforts with only few benefits. Realizing this, the company wanted to know:

- If redesigning the product would be more beneficial from a cost perspective than to retroactively reduce the product complexity
- What measures should be taken in the future to best avoid complexity-related costs

The key question was if the two old models with their historically grown complexity and partial redundancy of features could be substituted with a new model series without limiting customer choice.

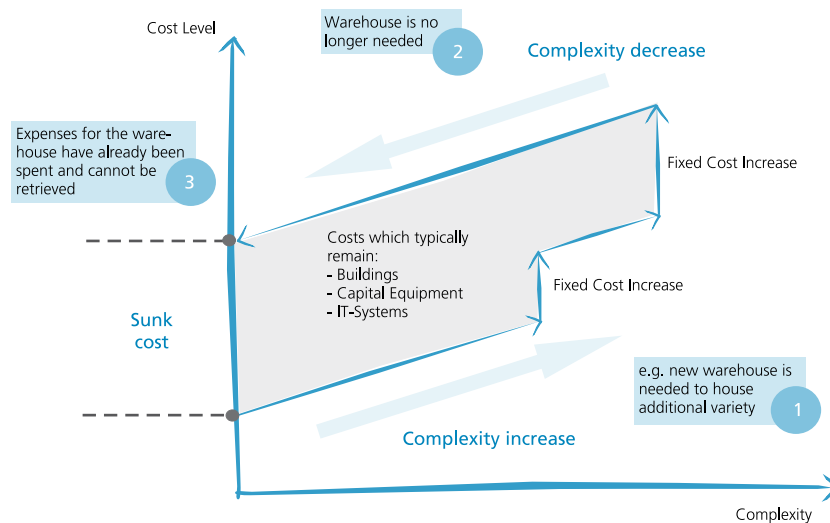


Figure 1: The Majority of Costs Related to Complexity Remains Even After Complexity Has Been Successfully Reduced

After defining the scope and objective of the analysis all relevant product data for the cabin was loaded into the Complexity Manager Software on a feature level as well as variant level.

The Feature Tree data of the Complexity Manager software displays the functions of products as seen by the market. The analysis showed that the two models, that were subject to replacement, consisted of more than 1,700 cabin variants with about 80% redundant features and options. A simulation by the software revealed that it would be possible to simplify those 1,700 into less than 300 variants by redesign. In addition, the analysis showed that this could be done without limiting customer choice at all (Fig. 2).

The Variant Tree on the other hand, shows all the internal parts needed to assemble the product. Subsequent simulations revealed an even more dramatic result. By applying complexity management methods and modular designs, it would be possible to reduce the total number of parts by 47%. Yet again, this reduction could be achieved without any limitation to customer choice (Fig. 3).

The reduced complexity was simulated in a complexity cost model and revealed that the manufacturing costs could be reduced by a total of 15% when also taking additional development and tool costs into account.

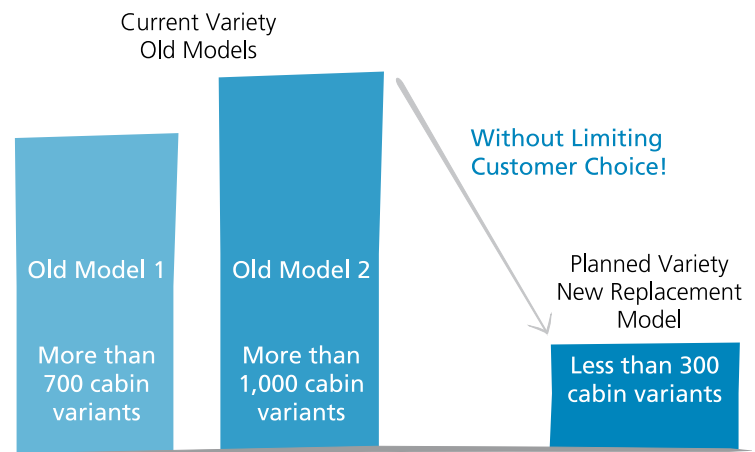
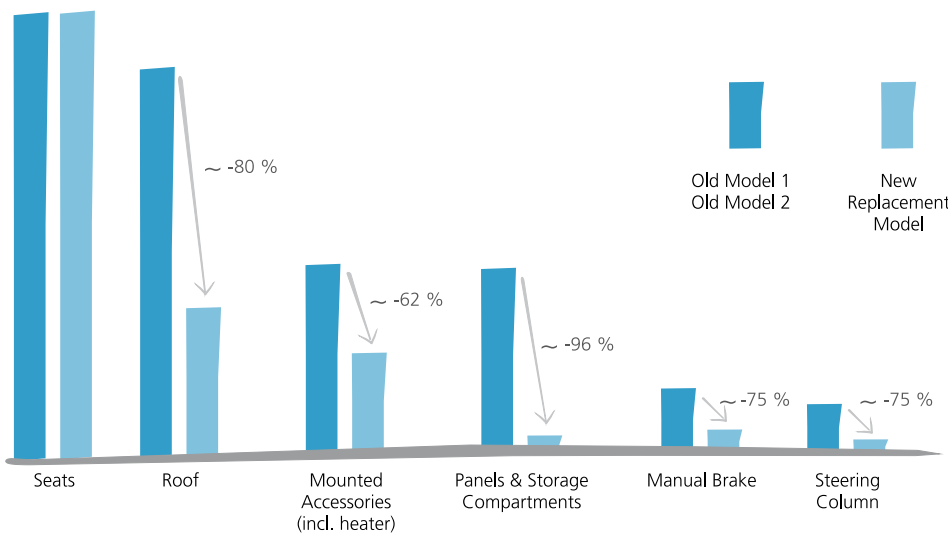


Figure 2: Grown Variety From the Old Models Was Successfully Avoided In The New Replacement Model

Besides, smarter complexity means fewer tool costs, shortened assembly times, scale effects in procurement etc.

In total, the redesign would result in nine-digit figures of savings and the decision was made to replace the two older models with a new complexity-optimized model without limiting customer choice and allowing for easier ways to incorporate additional complexity in the future.



Dealing With Complexity the Smart Way Enables 47% Fewer Parts Without Limiting Customer Choice, While Decreasing Manufacturing Cost by 15%

Figure 3: Amount of Parts for the Partial Module in the New Model Compare to the Existing Two Models

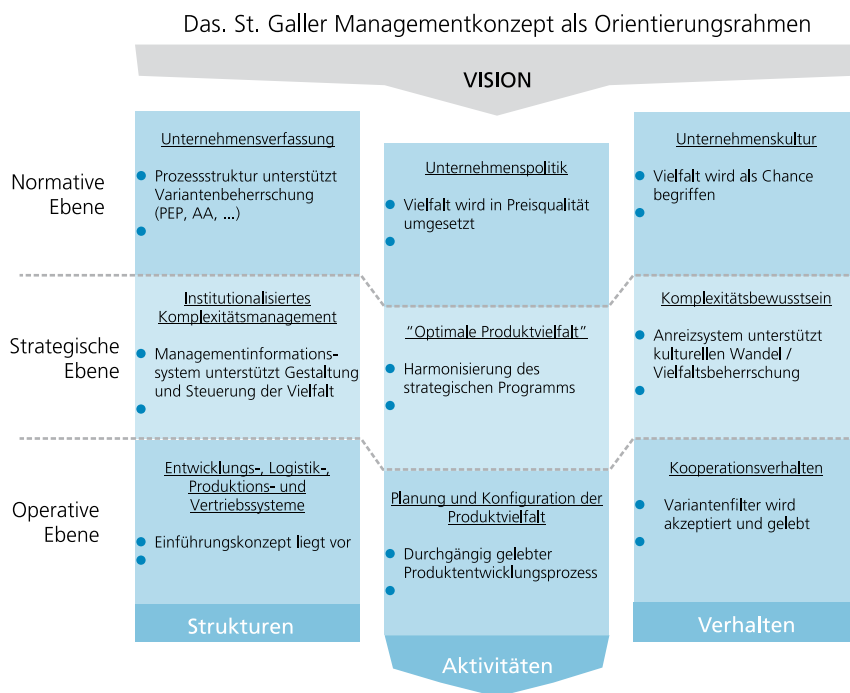


Figure 4: The Complexity Management Toolbox Goes Well Beyond the Technical Aspects of the Product

### Sustainability

While the new model was initiated, the organization had to develop a set of measures to learn from the past and to develop smart ways to deal with in the future. This toolbox for Complexity Management was not limited to technical aspects of product design but resulted in a holistic Complexity Management Framework, which would only be sustainable if it encompassed all organizational levels and incorporated the necessary amount of cultural change (Fig. 4).

### Conclusion

Complexity Management methods may be employed during different phases of the product life cycle. Avoiding complexity will yield more opportunity than reducing existing complexity retroactively. The most benefit is achieved if complexity is an integral part of the product planning process and included in Complexity Management Framework.

The case study shows that companies do not have to live with the cost associated with complexity and make the best of fit. On the contrary, radically avoiding complexity by re-designing the whole product with all its complexity band-aids from the past can be a sensible way to manage and avoid complexity resulting in 15% net cost savings.

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