Value Analysis Revision and Cost Reduction on a Laboratory Fume Cupboard – Winning Market Share through Correct Product Positioning and Value Creation

AUTHORS: WOLFGANG WEIMER, DIRECTOR COST ENGINEERING AT WALDNER LABOREINRICHTUNGEN GMBH
DIPL.-ING. SEBASTIAN MEINDL, PVM, TVM, PRESIDENT OF KREHL & PARTNER

Wolfgang Weimer is Director of Cost engineering at WALDNER Laboreinrichtungen GmbH & Co. Kg in Wangen, Germany. He is responsible for cost engineering, strategic and operational purchasing and all Value Management activities. Currently, he is project manager of the integration of big acquisition done by the WALDNER Company as well. Before joining the WALDNER Company, he was Head of Purchasing department in a large regional brewery.

Sebastian Meindl is co-president of Krehl & Partner in Germany, the leading Value Management Consultant Company in Germany. Since his start with VA/VE/VM, Sebastian Meindl performed hundreds of VM-related studies in Germany, whole Europe and USA. He is active for his clients in their Asian facilities as well. He trained thousands of future VA/VE-specialists. In parallel to his work and since more than 15 years, Sebastian Meindl is engaged in the VDI [Association of German Engineers] as an honorary member of VDI Technical Guideline Commissions.
Sebastian Meindl holds the European Certificates of Professional for Value Management and Trainer for Value Management and the German Certificate Wertanalytiker VDI.

1. Abstract

The WALDNER Laboreinrichtungen GmbH & Co. KG Company is a company of the successful WALDNER Group with its commercial residence in Wangen/Allgäu. Its range of products includes essential laboratory fume cupboards, laboratory tables and laboratory cabinets as well as the related media carriers (media covers, media cells, etc.).

The side-installed laboratory fume cupboard (SI fume cupboard) is the most important safety device which is used to protect the users during experiments and analyses. The extracted air volume stream from the fume cupboard ensures that hazardous gases and concentrations are extracted from the internal workspace.

The market penetration of the SI cupboard, which already exists in a 2nd generation, was very small during the entire lifecycle and thus lagged substantially behind expectations which caused the executive management to initiate a concentrated value analysis project. Through this project, the manufacturing costs were supposed to be significantly reduced in order to thus be able to attain more attractive pricing and thus higher sales unit figures.

During the project, the existing product was fundamentally scrutinized. Initially, the customer requirements were investigated in order to understand how the customer “functions” and/or what characteristics and features are truly important from the customer’s perspective. By intensively examining the current competing products as well as a determination of the position of the own product in the market environment, additional important findings were able to be attained.

For the subsequent creative phase of the product design, some guidelines were defined which were based on the findings from the analytical phase. The basic requirement for the successful product design was the examination of the steel processing and steel working. This was crucial–even if it corresponded to a change in paradigms in comparison with the previous fume cupboard–because WALDNER instead used wood materials for its products in the past.

Through the aide of the value analysis method, the interdisciplinary project team succeeded in designing the SI3 fume cupboard based upon the customers’ requirements and even exceeded the prescribed goal for reducing manufacturing costs.

Figure 1: SI fume cupboard from WALDNER in its 2nd generation

2. Presentation of the Company: WALDNER Laboreinrichtungen GmbH & Co. KG

The WALDNER Laboreinrichtungen GmbH & Co. KG Company is a company of the successful WALDNER Group with approx. 1,400 employees worldwide. WALDNER has developed and produced laboratory equipment for various customer requirements for more than 60 years.

The modularly-structured SCALA laboratory equipment system has continued to safeguard WALDNER's industry leadership. The modular equipment system includes, among others, laboratory fume cupboards, laboratory tables/laboratory cabinets, media carriers as well as supply and disposal systems. Many innovations and developments from WALDNER have become the standard in laboratories worldwide and have contributed to WALDNER's outstanding reputation.

A product from the SCALA laboratory equipment system consists of the table fume cupboards with side installations, so-called SI fume cupboards. Laboratory fume cupboards are used in order to be able to extract the concentrations and quantities of gases, steams, suspended particles or fluids from the internal workspace which may be created during experiments and analyses and which are harmful to humans.

3. Initial Situation and Motivation for this Project

Despite WALDNER's outstanding market position, there was a substantial need for improvement of the order success rate in the SI fume cupboard product group. Many offers/bids were prepared annually by WALDNER for SI fume cupboards. However, the success rate was only approx. <5%. The reason for this obviously was not a technical problem, but rather the competition was able to offer its fume cupboards at a substantially lower price. Thus, the order success rate of WALDNER in this segment was not satisfactory and offered substantial potential.

In order to counteract this situation, it was decided to rework the SI fume cupboard during a concentrated value analysis project and thus to significantly reduce the manufacturing costs. By so doing, the basis was supposed to be created for being able to substantially increase the sales unit figures and turnover in this segment in the future.

4. Task and Goals of the Project

Owing to the described initial situation, the task for the project was namely to rework the SI fume cupboard product group by means of value analysis. The goals of the value analysis-based reworking of the SI fume cupboard product group were:

- Reduction of the manufacturing costs (based upon a selected representative) in the amount of 35% of the current manufacturing costs.
- Designing new functionalities for the permanent delimitation from the competition
- If possible and beneficial, standardization of the affected components beyond the product program
- High transferability of the designed measures to all SI fume cupboards, simplification of the product structure and reduction of variants

5. Project Team – Success Factor for the Value Analysis Project

In order to implement the project, an interdisciplinary team was formed. When selecting the team members, the technical and personal suitability of the team members was considered. The divisions represented on the team were:

- Cost Accounting
- Design
- Purchasing
- Production
- Sales/Export
- Product Management

The team size of the core team included 10 team members + external moderation. The core team was available during the entire project. Depending on the phase, support provided by additional persons from other divisions was required. Team meetings, which took place upon a regular basis every 10-14 days, safeguarded the project's progress as well as promoted the exchange of information and the coordination of the next steps.

6. Structured Approach Through Value Analysis

The approach for the project focused on the work steps of the value analysis/the value management in accordance with VDI **[German Association of Engineers]** 2800/EN12973. The value analysis work plan thus served as the guiding principles for the project and helped one not to forget important contents and to prescribe a clear orientation and direction.

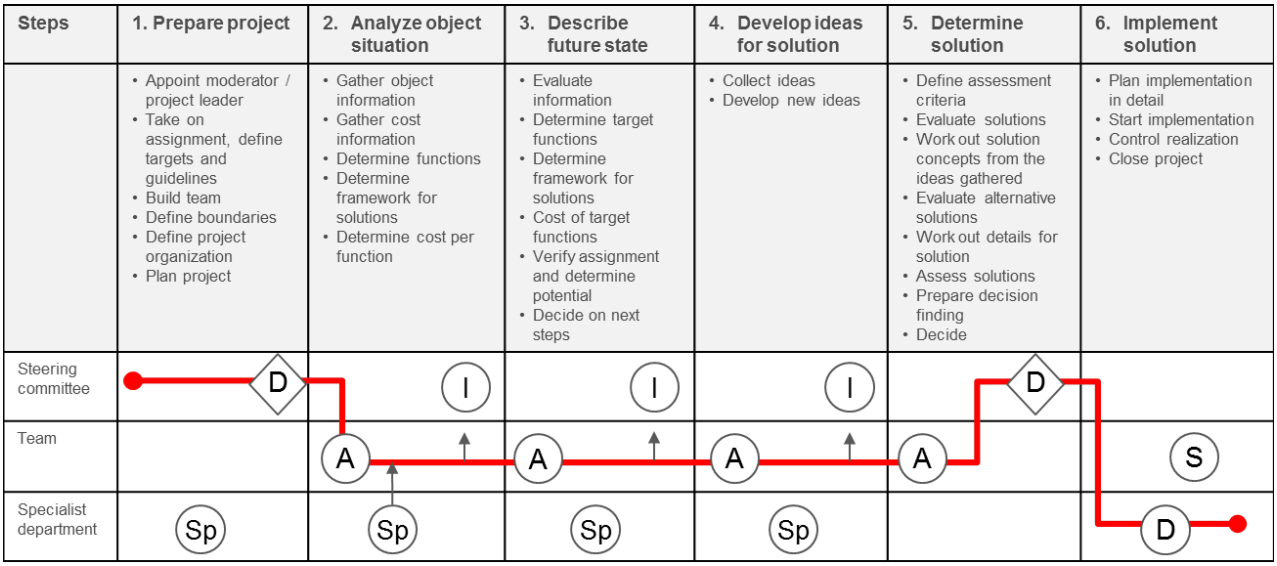

Figure 2: Value analysis work plan based upon VDI 2800–for the purposes of simplification, with 6 steps here

For better clarity and transparency, the complex project was broken down organizationally into 3 phases. After the end of each phase, the customer was consulted to discuss the project and a presentation was made to the customer about the project status.

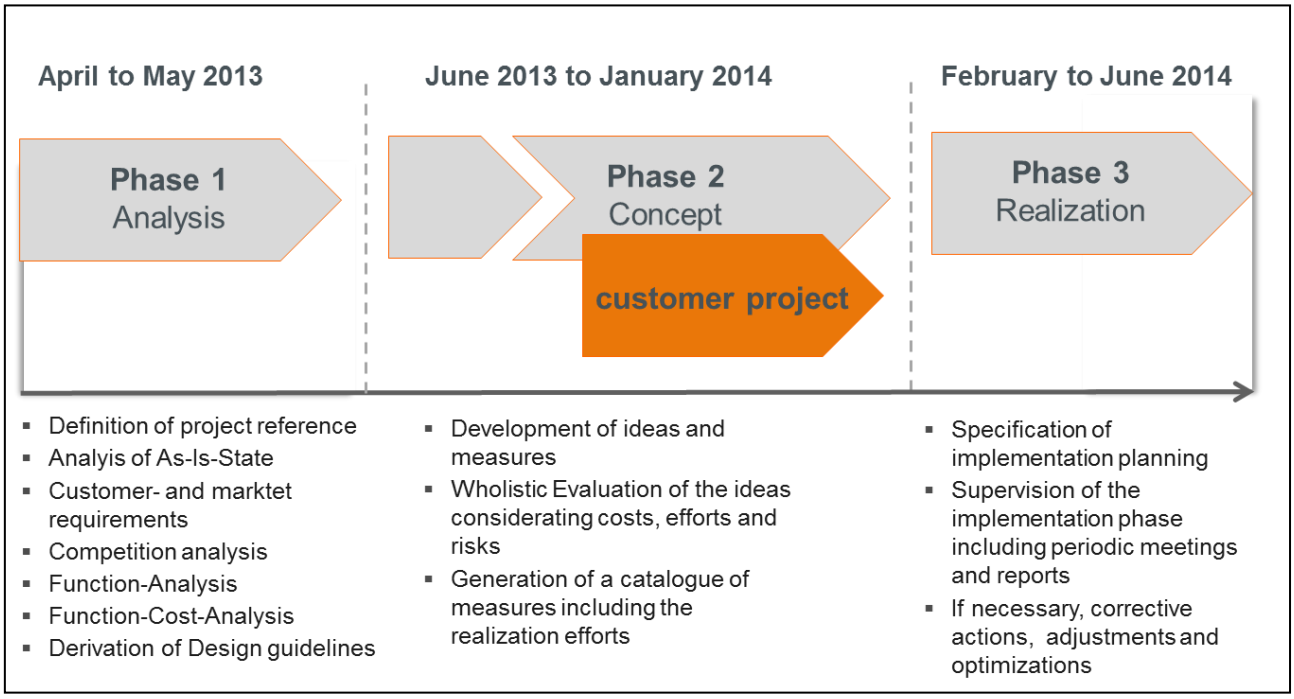

Figure 3: Phases of the project

During the course of the project, a customer project with a larger number of SI fume cupboards in the scope of service was started upon a parallel basis. In order to be able to successfully bid for this customer project, calculations were undertaken with target manufacturing costs which still had to be determined during the value analysis project.

7. Analysis Phase

7.1 Initial Basis for the Analytical Phase

During the analytical phase, a comprehensive overview of the CURRENT status of the SI fume cupboard was created. In order to simplify and concretize the work, a representative reference fume cupboard was selected. All analyses and cost analyses were undertaken for this reference fume cupboard without, in so doing, losing sight of the entire product group.

7.2 Designing a Market Perspective

During the initial step, it was a matter of understanding who the customer and user of an SI fume cupboard is and what requirements such customers and users have for SI fume cupboards. Based upon the QFD methodology, the team formulated and weighted criteria which the customer takes into consideration when researching the product and then making a purchasing decision.

Buying decision criteria	VA/VE Fume hood	**1 = unimportant** **10 = very important** **(or pairwise comparison)**

Nr.	Customer requirement	Weight	Rermark
1	short delivery time	9	
2	Material: steel	9	
3	low energy consupmtion	8	mainly on airflow
4	Safety/volume retention	8	regarding national requirements
5	Sustainability	8	"green" material
6	Styling, Haptics, Ergonomy	7	
7	easy installation at site	7	
8	choosable interior lining	7	used materialls in the interior
9	good after sales service	7	short time availability of spare parts
10	broad product range	7	vorrangig auf Tiefe bezogen
11	buy online	7	
12	Remote maintenance (link to building control	7	
13	Independent from manufacturer of flow control	7	
14	low total height	6	only for "walk-in"-type
15	personal advice	5	
16	free choice of colours	1	defined chart of color range

Figure 4: Decision-Making Criteria for the SI Fume Cupboard and their weighting

In this regard, above all the input from “customer experts” at the company is important. They are typically the employees working in the Sales, Marketing and Product Management Divisions. But the perspective of, for example, service employees should also be taken into consideration because they also have direct contact with the customers on various levels. Due to the interdisciplinary team composition, this customer perspective already existed on the team. However, it was necessary for this project to have several discussions and coordination meetings in order to attain complete and above all acceptable results.

7.3 Change in Paradigms: From Wood to Steel

WALDNER’s laboratory furniture has always consisted of products made of wood. This raw material has proven itself with corresponding coatings in the laboratory segment, is very well-respected in WALDNER’s main market (Europe) and has been very successful there. The SI fume cupboards from WALDNER are products which build upon the success of the laboratory furniture and thus consist somewhat of wooden materials (e.g. side parts, rear panel…). Consequently,

- all internal processes at WALDNER,
- all production devices as well as
- the employees’ mind-set

focus on the use of wooden materials.

When formulating the decision-making criteria from the customer’s perspective, it has nonetheless been discovered that the customer in the markets outside of Europe has a completely different perspective of usable raw materials in SI fume cupboards. In the project team’s opinion, this customer demands a fume cupboard made of steel materials. Particularly in exporting, the customer does not accept wooden materials.

This point was intensively discussed by the project team: On the one side, there were team members who argued that the customer will thus not buy the WALDNER fume cupboard specifically because it contains wooden materials in it. On the other side, there were team members who opined that, if a corresponding sales price is attained, an SI fume cupboard made of wooden materials can also be competitive and wood is in no way functionally inferior to steel in this usage context.

After some coordination meetings with this team, the team arrived at the following decision: Even if the reasons for the exclusive use of steel in the SI fume cupboard do not appear to be 100% rational, this customer requirement nonetheless has a high weighting and must as such correspondingly be taken seriously. **If the new SI fume cupboard is supposed to be successful on the market, then it must be made of steel and not of wood.**

7.4 Findings Obtained From the Competitive Analysis

The findings formulated in Section 6.2 were able to be confirmed by the competitive analysis: All competitors construct their fume cupboards out of steel.

When comparing the competing products, it was not a matter of copying the ideas of others, but rather of objectively evaluating one's own product and those of the competition based upon the prescribed criteria and thus to depict the possibilities for product positioning in the market environment.

Competition analysis Krehl&Partner THE VALUE MANAGER

Criteria		Competitors									
Eingabe Erfüllungsfaktoren / Auswertung		Weight	Waldner SI	Competitor 1	Competitor 2	Competitor 3	Competitor 4	Competitor 5	Best practice	Need for action	Differenzierungs-chancen
Styling, Haptics, Ergonomy	1	7	21	21	7	21	14	14	21	0	0
free choice of colours	2	1	1	0	3	1	2	0	3	2	0
easy installation at site	3	7	7	14	21	21	21	14	21	14	0
low energy consumption	4	8	24	24	8	8	8	16	24	0	0
Safety/volume retention	5	8	24	24	24	24	24	24	24	0	0
short delivery time	6	9	0	27	27	27	27	27	27	27	0
choosable interior lining	7	7	14	21	21	14	21	14	21	7	0
good after sales service	8	7	7	7	7	21	7	7	21	14	0
low total height	9	6	12	18	18	18	18	18	18	6	0
broad product range	10	7	0	0	21	14	0	7	21	21	0
Sustainability	11	8	8	8	8	8	8	8	8	0	16
buy online	12	7	0	0	21	21	0	14	21	21	0
personal advice	13	5	15	15	15	15	15	15	15	0	0
Remote maintenance (link to building control	14	7	7	0	0	0	0	0	7	0	14
Independent from manufacturer of flow control	15	7	7	14	14	14	14	14	14	7	7
Material: steel	16	9	27	27	27	27	27	27	27	0	0
Maximum		9							27	27	16
Total Customer Value			174	220	242	254	206	219			

Figure 5: Competitive comparison

The evaluation of the competitive comparison shows an overall customer benefit for each competitor (=total of the degree of fulfilment for all defined criteria). Together with the information obtained as well as from additional data, e.g. market price and market share, the following customer benefit price portfolio can be created.

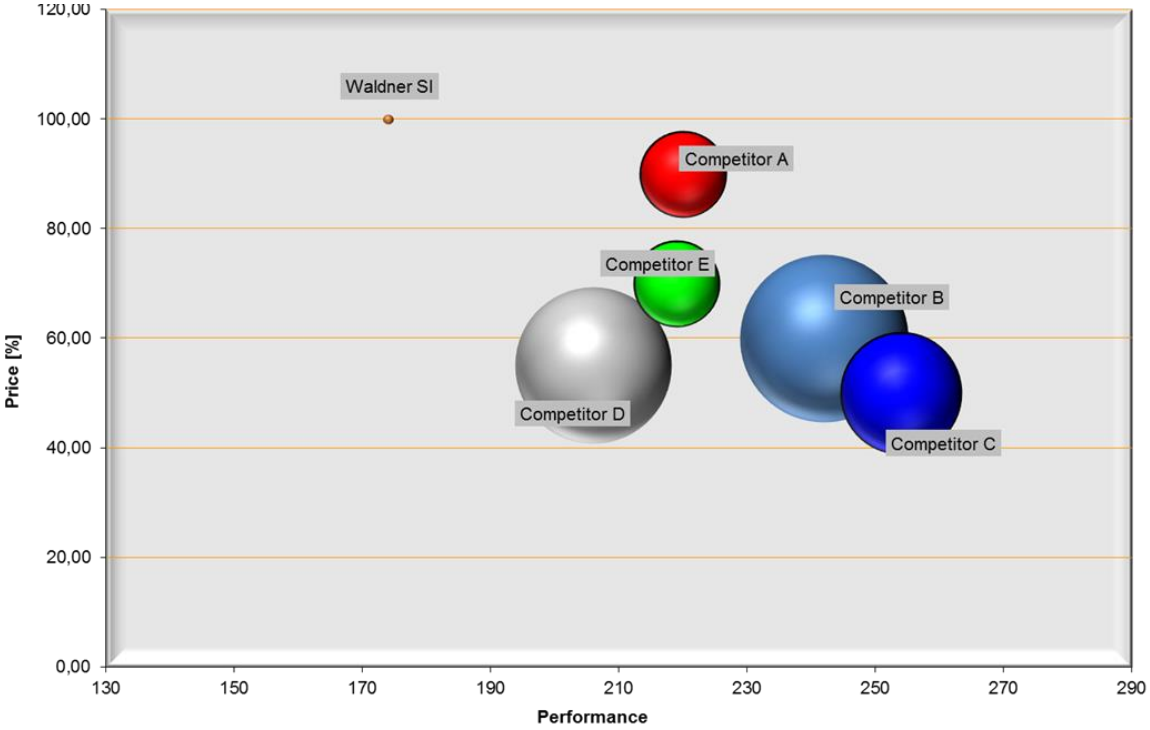

Figure 6: Customer benefit price portfolio

The evaluation of this chart shows the reasons for the currently poor order success rate for the SI fume cupboards:

- In comparison with the competing products, the WALDNER fume cupboard offers the lowest customer benefit.
- The WALDNER fume cupboard is offered at the highest sales price in the market.
- Fewer important criteria from the customer's perspective (e.g. design) are fulfilled by the current product very well. The purchasing decision-making criteria from the customer's perspective (e.g. steel fume cupboard) are not fulfilled by the current product.

7.5 Functional Analysis

An important step and one of the essential features of a value analysis project is the functional analysis. In this regard, the functions (=the effects) of the product are described and visualized in a suitable model (e.g. function tree). The goal of the functional analysis is to achieve a change in the mind-set of the team members and, by so doing, to generate better access to innovative and a larger number of solutions. Through the functional analysis, the mind-set of existing solutions is systematically dismantled and, so to speak, a new horizon is formed.

The value analysis team initially collected the functions of the SI fume cupboard and then structured them together to form a function tree. It was time-consuming to undertake this step on an interdisciplinary team, but absolutely necessary in order to create a collective understanding and a collective basis.

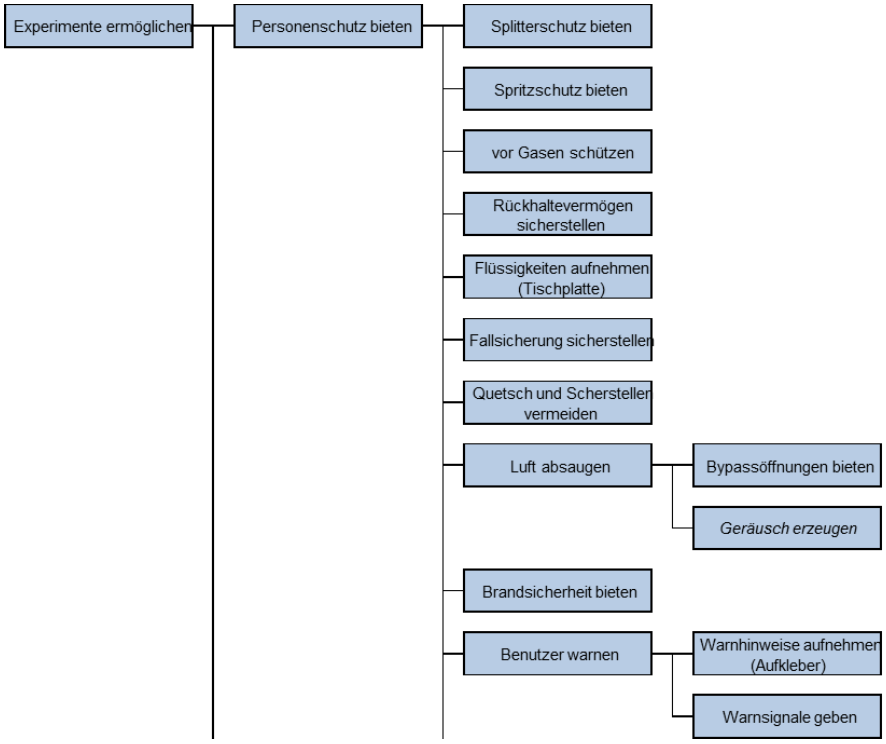

Figure 7: Current Function Tree (excerpt)

Already when creating the function tree, the initial approaches required improvement. Suddenly, functions of the SI fume cupboard emerged which immediately posed the question to the team: “Does the customer really need this?” Initial ideas were already found during this stage, placed in the pool of ideas and then later addressed again and evaluated. Naturally, these findings were integrated into the target function analysis.

When taking the customer requirements into consideration, the team subsequently undertook the definition of the target functions as well as their depiction in a function tree. In so doing, the main functions were essentially confirmed. Merely the functions which had been recognized as being unnecessary as well as undesirable were removed.

7.6 Function Cost Analysis

In order to detail the mind-set that is characteristic for a value analysis project in functions and in order to derive additional findings for product design, a cost analysis of the current and target functions was subsequently done.

With regards to the current functions, the cost allocation of the current manufacturing costs for the reference fume cupboard were undertaken for the functions with the aid of a functions cost matrix. In so doing, the overall manufacturing costs for the fume cupboard were made available in a corresponding level of detailing. The costs for the individual components/component groups were allocated based upon the respective percentage of the corresponding function.
The target function costs are often more difficult to determine because there are no concrete, detailed standards in this regard. For the project, the following approach was selected: The purchasing decision-making criteria that were defined at the beginning of the project were once again utilized in order to evaluate their influencing by the target functions. This results in the fact that the functions which are of more importance to the customer–thus for which the customer would also spend more money–receive a higher rating.
The results of the function cost analysis were depicted in the function cost diagram:

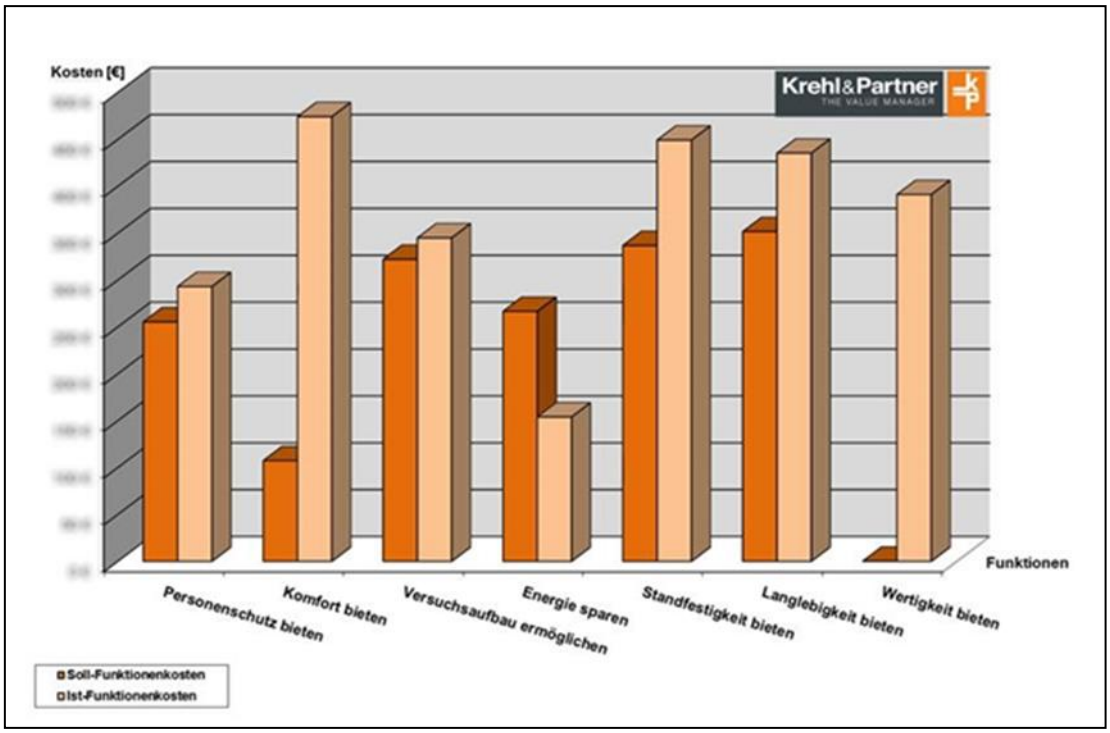

Figure 8: Function cost diagram (Target/Current)

This graphic shows, first of all, the functions with the highest costs in the current status. For the project, they were the functions of “offering comfort”, “offering stability”, “offering durability” and “offering value”. In order to prioritize the search for ideas for cost reduction, it meant first beginning with these functions because the greatest potential could be found here.

Secondly, this analysis shows which functions have the greatest differences in the TARGET-CURRENT comparison. In the concrete case, this occurs with the functions of “offering comfort” and “offering value”. In this case, the perception from the customer’s perspective is that these functions must entail substantially lower costs. In comparison with the current status, these functions entail solutions for which the customer is not willing to pay. In this regard, particularly the function of “offering value” must be emphasized which no longer occurs at all in the target status and thus, from the customer’s perspective, is not of primary importance. This is also confirmed by the comparison with the competitors’ fume cupboards (see section 6.3) which are generally inferior to the WALDNER fume cupboard with regards to design and value.

7.7 Design Guidelines for the Concept Phase

All findings from the analysis phase were formulated in 8 design guidelines for the following concept phase. These design guidelines were presented to and approved by the management:

1. Examining all solutions with regards to value and comfort.
2. Verifying the fulfilment of the valid norms (EN, ASHRAE). Not exceeding the norms.
3. Examining and fulfilling the country-specific directives (e.g. UL).
4. No use of wooden raw materials.
5. A "global fume cupboard" for all countries.
6. The fume cupboard must have no design features of SCALA.
7. Using the same parts is not a prescribed criterion.
8. Value creation at WALDNER Labor is not a prescribed criterion.

8. Concept Phase

8.1 Creativity and Searching for Ideas

During the following search for ideas, it was a matter of initially finding many ideas regarding product design and/or reducing manufacturing costs within the parameters of the defined design guidelines.

Based upon the forbidden use of wooden materials, the team had to first acquire knowledge of the processing of steel components, e.g. designing bent metal components. Thus, the horizon for new, previously-unknown solutions was substantially expanded.

The creativity-promoting approaches and successfully-used methods for this project were:

- Findings from the functional analysis
- Detailed analysis of the current SI fume cupboard (calculations, display room) => In this regard, it was helpful to not just examine the product based upon the sketches and CAD models, but rather to have the opportunity at all times to go on-site
- Analysis of the competing products
- External workshop => Design of bent metal components, development of know-how
- Time pressure from a customer project => For a large customer project that was started upon a parallel basis to the value analysis project, an ambitious cost goal was calculated and offered which currently was only then determined through value analysis. However, the project produced above all a rather high level of time pressures because the customer wanted to quickly equip its laboratories with prototypes (prototype creation by the end of 2013). However, these time pressures turned out to be helpful overall because all resources were bundled in order to attain one goal.

Ideas and measures were developed for all functions of the SI fume cupboard. During the phase of searching for ideas, these ideas were only then noted and not yet evaluated.

8.2 Evaluating Ideas

Overall, during this phase, the team formulated 142 ideas and measures in order to reduce costs and/or improve functions. These measures were assessed in a multi-stage evaluation process. This evaluation process follows the “from vague to refined” approach and included the following steps:

1. Rough evaluation of the created ideas: During this stage, a rough and fast assessment was undertaken as to whether this idea was goal-oriented or not. In this regard, the possibility of combining the idea with other ideas was examined. The goal of this step was to reduce the list of ideas/measures to the most worthwhile ideas.
2. Detailed evaluation of the filtered most worthwhile ideas: During the second stage, a refined evaluation of the ideas was undertaken with regards to cost potential, risk, investment expenditures/costs, amortization timeframes, etc. For this step, greater expenditures were required because various tabulations, calculations, designs and additional detailed work were necessary.
3. Summary via the combining of ideas: Because, up to this stage, multiple various solutions were also permitted for a function or a component, it was now necessary to formulate a corresponding product concept by combining the ideas.

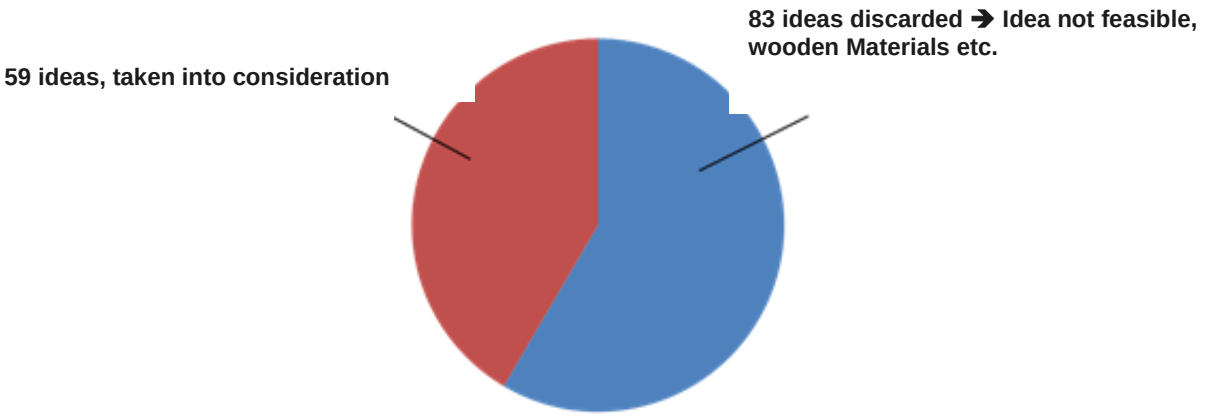

Figure 9: 142 ideas overall: Breakdown after multi-stage evaluation

8.3 Idea Highlight: Cost Optimization of the Counterweight

The project team did very good work and developed many new and creative ideas. On this point, reference should be made as an example to only one special idea highlight:

The sash of the fume cupboard can open upward like a sliding window. Via toothed belts, corresponding counterweights are affixed to the rear panel of the fume cupboard. In order to avoid the misalignment of the sliding window, an additional synchronic bar is required on the return pulleys. Drop guards on both sides ensure the deceleration of the sliding window if a toothed belt tears during an open window position.

When the team worked for the first time on the optimization of and cost reduction for this function and the affected components, the tenor was: “Nothing more can be improved here, we just optimized it and realigned it to new weights”.

Due to the perseverance of the moderation and the external pressure–including to reduce costs here, quite new solutions were ultimately indeed found. In this regard, it was once again helpful to analyze the competing products which, in this case, had placed value primarily on functionality and not on appearance which obviously was absolutely satisfactory for the customer.
The new solution found now has a central weight which consists of a simple angled weighted casing and multiple model-dependent weighted steel plates, whose number varies based upon the grid size of the fume cupboard. This solution foregoes, among other things, a synchronic bar and drop guards; in the new solution, they are already included in the design of the guideway of the toothed belts; and collectively result in a cost reduction of 40% over the current status.

Figure 10: Sliding Window Positioning: Old Solution and New Solution in Comparison

9. Realization and Project Results

9.1 Realization Phase

The formulated product concept was presented to and approved by the management. Through the customer project being implemented upon a parallel basis, the first prototype was already being developed during the concept presentation and thus was no longer mere “empty” theory.

The additional implementation through the introduction of serial production was realized during the regular developmental process. In so doing, the detailing of the various product variants and grid sizes for the new modular product system was undertaken. The serial release of the new SI fume cupboard was able to be undertaken in July 2014.

9.2 Outstanding Project Results Through Value Analysis

Overall, through the value analysis project, the manufacturing costs for the SI fume cupboard were able to be reduced by >35% (based upon the reference fume cupboard). The goal set by the management was thus even exceeded. The CURRENT savings were able to be documented and confirmed through real calculations undertaken based upon the fume cupboards available in the ERP system.

Including the implementation, the project encompassed a timeframe of somewhat more than one year. Comparable projects at WALDNER with similar degrees of complexity had previously always required a timeframe of more than 2 years.

The essential factors for this project success were:

- Work in and as a well-assembled interdisciplinary team
- External moderation
- Competing products available
- Training before beginning the project (methodology, approach)
- Integration of suppliers
- Removal of individual team members from the daily business
- Methodical, structured approach

9.3 Repositioning of the Optimized SI Fume Cupboard in the Market Environment

Upon the completion of the project, the positioning of the new SI3 fume cupboard in the market environment was reevaluated. During the course of the project, new findings about competitors' products were obtained which required small-scale adjustments in comparison with the initial evaluation.

By redesigning and redeveloping the SI3 fume cupboard, a new product positioning was naturally also derived for this fume cupboard.

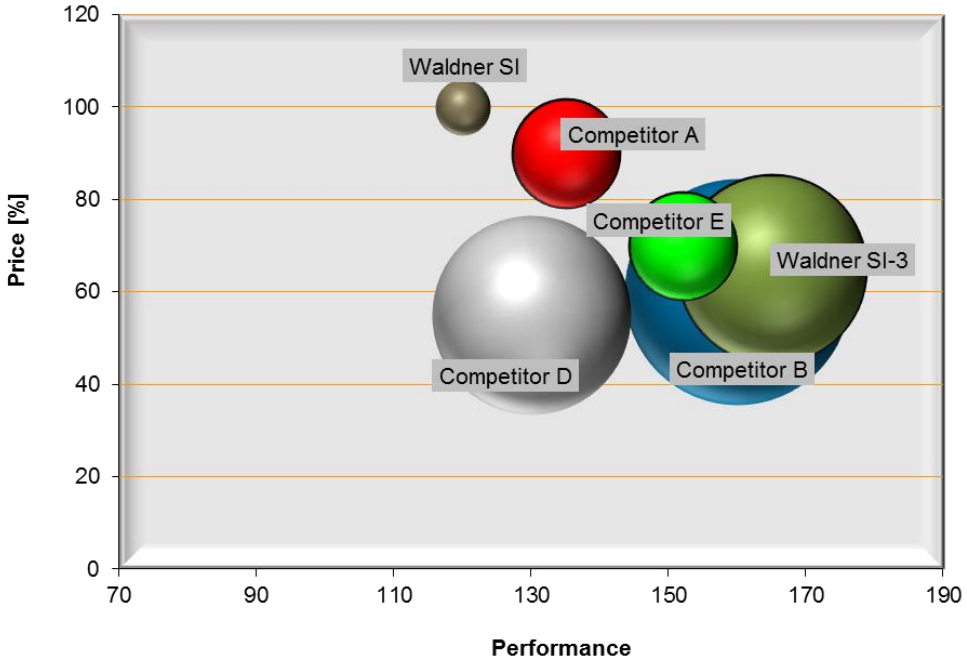

Figure 11: Repositioning of the SI3 Fume Cupboard in the Market Environment

The benefit to the customer from the reworked product is now somewhat higher than with the main competing products whereby the optimized cost structure at WALDNER now offers a new high variability in pricing. Thus, the SI3 fume cupboard can now be offered at an absolutely competitive market price. Through this repositioning, the basis was created for gaining additional market shares.

10. Summary

The implemented project shows in an exemplary fashion the possibilities which the consistent utilization of value analysis at a company can offer:

Through the interdisciplinarily-formed project team, a comprehensive and uniform analysis of one's own product and the project task was obtained. This resulted in past mind-sets and behavioral patterns having to be abandoned and completely redeveloped. With regards to the theme of raw materials, before the project4, it would have been inconceivable to seek out an alternative to wood. In this case, despite many objections, a change in paradigms has taken place. The focusing on customer requirements and the competing products has also supported this change.

An additional feature of value analysis is the constant scrutinizing of all existing solutions. This was also practiced during the project regarding how the example described in the article of the optimization of the counterweight is depicted in detail. Also here, before the beginning of the project, no alternative solution would have been conceivable which results in a cost savings for this function. An open approach and existing external pressure during the implementation of this detailed solution have resulted in a cost savings of >40% and thus positively contributed to the overall results.

Through the project, a substantial reduction of the manufacturing costs of more than 35% was attained. In addition, however, the customer benefit of the SI fume cupboard was also substantially increased. In the comparison with the competitors, only the new SI fume cupboard sets the standard and offers an outstanding opportunity for WALDNER to increase its market shares in this segment.

For WALDNER, it was the first time that the value analysis method was used so consistently during a product development. The feedback of the affected persons was not just positive due to the outstanding project success. The structured methodical approach and the interdisciplinary teamwork were particularly praised and regarded as being very positive contributions to the project.

Figure 12: The Redeveloped SI3 Fume Cupboard in Use