

Complexity Management Journal 02/2009



Even a Perfect Cut Does Not Last Forever –

Permanent Success Demands Constant Care
of the Product Portfolio

Content

3 Editorial

Main Topic:
Product planning design,
Variant management

Contributions

- 4 Even a Perfect Cut Does Not Last Forever–
Permanent Success Demands Constant Care
of the Product Portfolio

Norbert Große Entrup

- 10 Endless Debate or Quick Action?
Or: How Variant Management Can Help the
Manufacturing Industry

Gregor Tuecks / Hans R. Tanner

-
- 14 Success through Moderation –
How a Product Division Becomes Successful Once
Again During the Sales Crisis

Anno Kremer / Udo Hess (Baldwin Oxy-Dry GmbH)

- 18 Exploring New Frontiers – Obstacles, Cooperation
and Success

Anno Kremer / Udo Hess (Baldwin Oxy-Dry GmbH)

-
- 19 Complexity Management in a Nutshell

Hans R. Tanner

- 24 Legal Notice



Editorial

Product portfolios, just like a person's hair, grow naturally. However, nobody would think that only one single haircut would be sufficient for a perfect and neat life-long hairstyle. For the same reason, a product portfolio, with all its diversity, should receive similar care and attention. Periodic review is necessary to keep the portfolio in line with market requirements and thus, to lead to satisfactory results.

In this edition of the Complexity Management Journal we discuss how a constant and critical examination of your product portfolio will promote sustainable success. In addition, the case study of Baldwin Oxy-Dry illustrates how targeted measures can result in a revenue increase even during tough times.

If you have questions or need more information, please let us know.



Jörg Starkmann
CEO, Schuh Complexity Management, Inc.



Stephan Krumm
CEO, Schuh Group



Even a Perfect Cut Does Not Last Forever – Permanent Success Demands Constant Care of the Product Portfolio

Norbert Große Entrup

Schuh & Company offers a holistic approach to structure product complexity: ranging from defining strategic objectives, to managing the life cycle performance and the involvement and intrinsic motivation of all employees. Managing variety is comparable to getting a haircut. Once a year or just for special occasions is simply not enough. Not staying on top, leads to lost opportunities.

Every manufacturer wants to serve its customers by providing them with new products that they want. At the same time, new products allow companies to enter new markets. Manufacturers often consider even the most exotic customer requests when developing new products. Consequently, the product diversity in a company's traditional business segments increases steadily and eventually becomes almost unmanageable. The tendency towards more frequent design changes and shorter life cycles makes the situation worse.

When taking a look at the history of business ventures, most often a picture of a healthy company with stable growth and balanced product portfolio will emerge. On closer examination of the more recent history and the current state of the company, it becomes obvious that growth slowed and eventually came to a halt. Company management then tried to penetrate niche markets with

new products in order to generate more revenues. In addition, the product portfolio was expanded (new products, additional services, etc.). In the past the number of production facilities and sales organizations increased through mergers and acquisitions, as well as through sales growth. Furthermore, rising quality requirements induced complicated technical solutions. Ultimately the complexity increased without apparent consideration for the implications such changes would have on the overall performance of the company.

Time and again attempts are made to minimize the increased product complexity with classical approaches such as ABC-analyses of individual product lines, standardization and modularization approaches, product profitability analyses (which do not normally account for the true costs of product variants), etc.

Over the years, Schuh & Company has accompanied a large number of projects to optimize product complexity. We repeatedly notice that the classical approaches are neither profound enough, nor do they generate permanent results. To stick with the analogy: after receiving a haircut, the hair is shorter but the styling is still not right. Both, the client and the stylist are not entirely satisfied.

Holistic Views Are Required

All efforts are in vain if a holistic view and approach are not applied. Based on our project experience over the past years, as well as current surveys on the topic of product complexity, we have developed an approach that surpasses the successes of previous methods.

Our approach consists of four dimensions that build onto and complement each other (Fig. 1).

The core dimensions of the approach are:

1. **Product strategy:** The goals and visions, which can be deduced from strategic business objectives and will have effects on the design of products, processes and organizational structures.
2. **Product differentiation:** The product differentiation can be deduced from external and internal design options and provides the basis for the design of the product architecture.
3. **Product architecture:** The product architecture is the implementation of external and internal design options into producible and economically successful units.
4. **Corporate Culture and Employees:** Change projects have to be supported by those affected. New approaches, self-supporting decisions, and the strong desire for successful transformation are important success factors for a long-term and effective optimization of the product complexity.

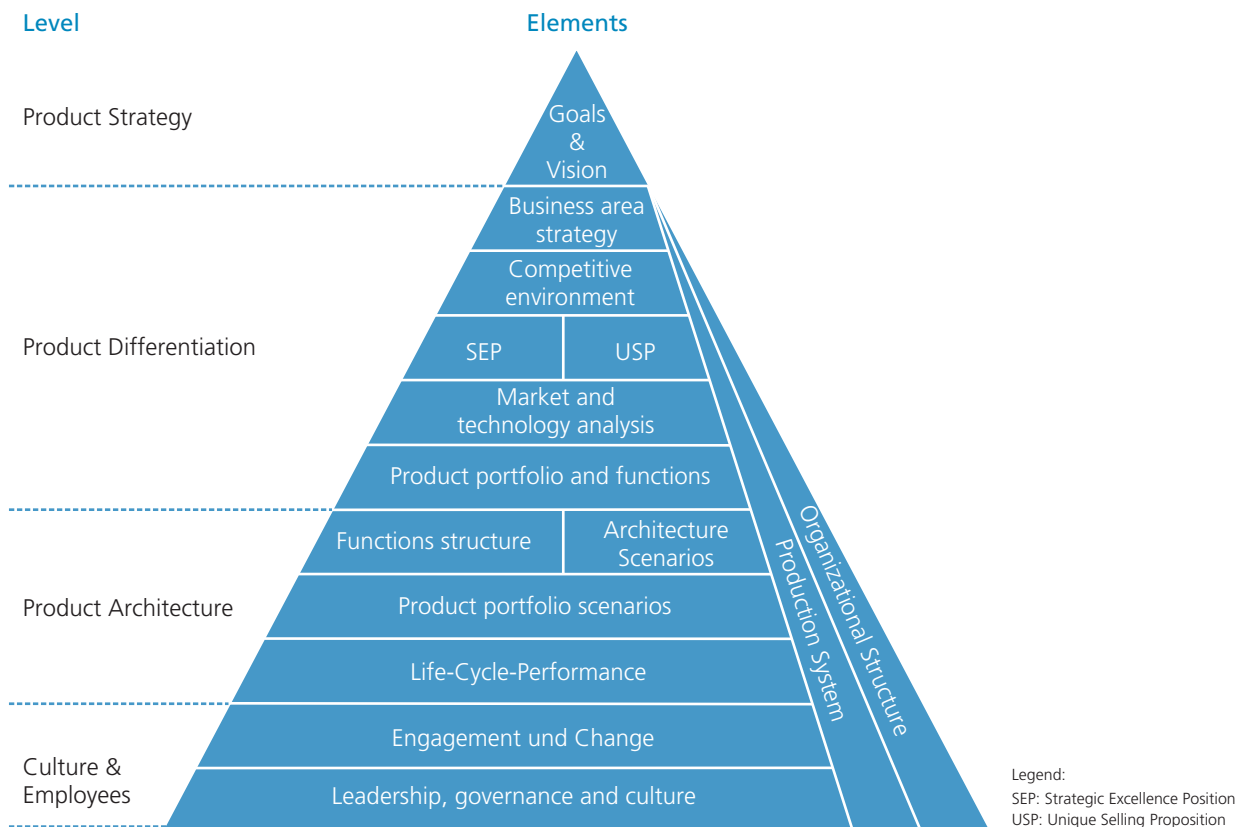


Figure 1: Levels to Ideally Shape the Product Complexity

An aligned organizational structure and an adequate production system form the framework.

1. Derive and Shape the Product Strategy

The product strategy has to be derived directly from the business strategy. Over the mid- and long-term it should determine how the products are to be positioned in the market in order to be successful. For this reason the product strategy has a strong influence over all product differentiation activities, the design of the production system, and the organizational structure. Thus, it has to be the starting point of all considerations.

The deduction of the product strategy from the business strategy calls for particular diligence. The building blocks of the St. Gallen Management Concept provide valuable support for this task. Using the model's three management levels (normative, strategic, and operative), it is possible to derive a product strategy that is as consistent as possible with the business strategy, thereby adequately, considering the aspects of an appropriate complexity strategy.

2. Product Differentiation as a Prerequisite for an Ideally Designed Product Complexity

The served markets have different product requirements. Thus a suitable approach is necessary when determining the product differentiation (Fig. 2)

Schuh & Company, together with the University of Aachen developed a workshop series for that purpose. Using these workshops including some necessary preparatory analyses, the prerequisites for a complexity-optimized product differentiation are available. The main goal is to completely match the product variety demanded by the market.

3. The Product Architecture

When designing the complexity-optimized product architecture, four additional steps are employed:

- Defining the functional structure
- Configuring architecture scenarios
- Defining of product portfolio commonalities
- Ensuring the life-cycle-performance

It is important to stick to the basics for the product architecture design. The goal is the implementation of the market-required product programs and functions. However, in many cases the industry tends to lean towards "Happy Engineering", meaning there is no implementation that could not be realized in a more elegant and polished way. Therefore, a clear focus on true requirements as well as continuous monitoring of the engineering task using quantitative instruments such as the utility analysis is necessary.

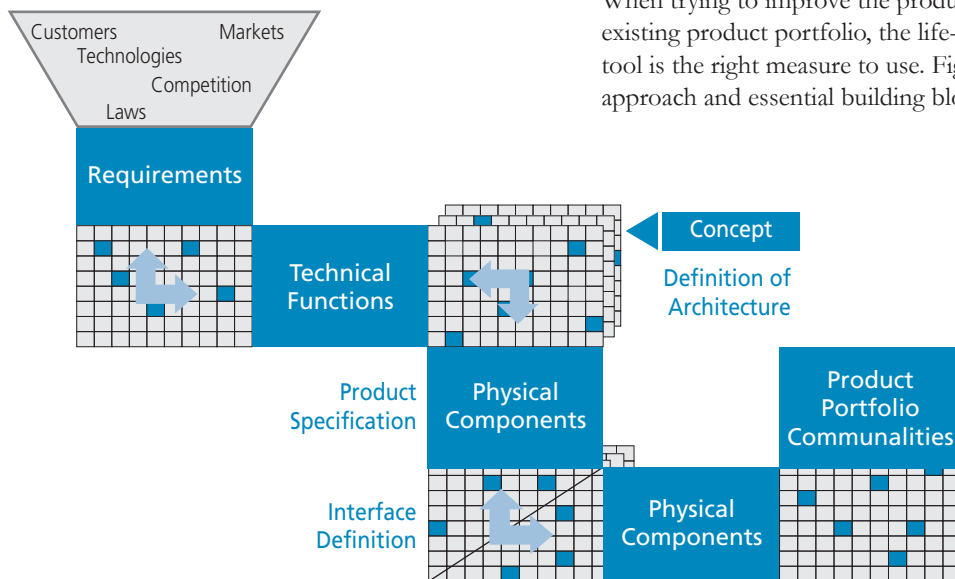


Figure 2: Six Steps to Product Differentiation



To design the appropriate functional structure and to create and evaluate architecture scenarios, Schuh & Company has developed unique software tools. At the start of the process, the required product functions are translated into physical components with the help of a matrix and under consideration of the architecture scenarios (Fig. 3). Here, the “Complexity Manager” software comes into play. The tool allows for matching the functional structure with modules for additional visualization and optimization. Once the optimum is reached during the planning stage, the next step requires the implementation of the physical components. In this phase, the Complexity Manager also provides support for visualization and optimization of the parts variety effects in production and the supply chain.

Based on these decisions the product portfolio commonalities are configured. These govern the utilization and re-use of components and modules in the overall product portfolio. Likewise, KPIs are determined that are necessary to achieve a high life-cycle performance.



When trying to improve the product complexity of an existing product portfolio, the life-cycle-performance tool is the right measure to use. Figure 4 depicts the approach and essential building blocks for this effort.

Figure 3: The rules of the product architecture have to be designed in accordance to customer requirements, without conflicts, and continuously maintained

4. Corporate Culture and Employees

Over and over we experienced that barriers in culture, cooperation, and leadership appear when developing a new product line or when increasing the life-cycle-performance of an existing one. These barriers tend to inhibit the development of a sustainable, complexity-optimized product portfolio.

Complexity optimization projects should be seen as change management projects at the same time. An active and sensible involvement of the organization and its employees is therefore of major importance in order to

overcome certain barriers such as: "The existing variety of products was developed for the good of the company," "Why should it now be optimized when all the money for development and implementation has already been spent?" "After all, there are always customers who are looking for those specialty products!"

Taking expert knowledge about the human and change situations into consideration, an approach was developed that can be adjusted for the cultural environment of each company. Only when this is achieved, a sustainable product complexity can be achieved.

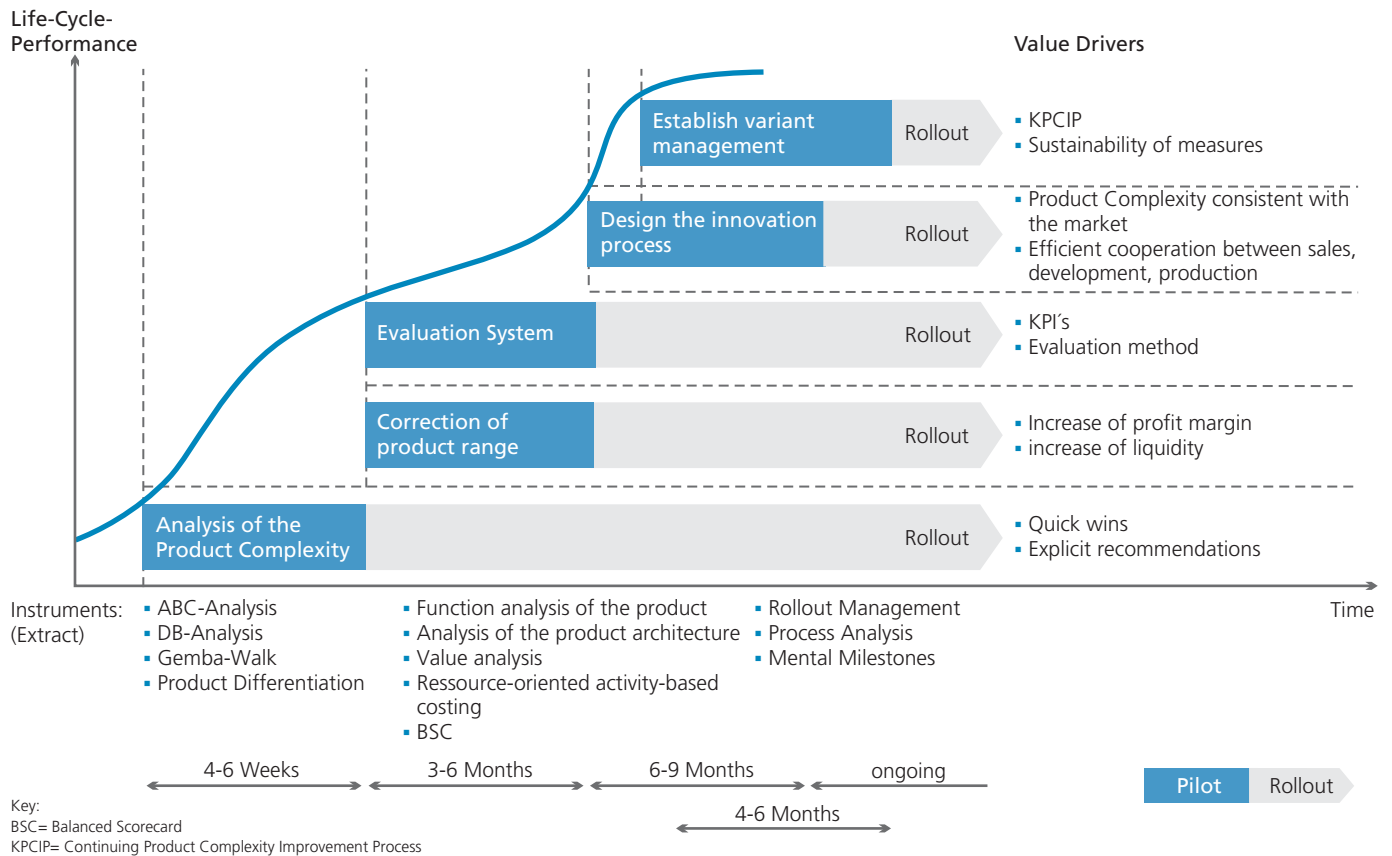


Figure 4: Building blocks to reach high performance life cycle management

The Scope

The product program complexity does not remain in an optimal state on its own, it is always growing. It is just like with your hairstyle: not getting a cut for a few weeks, or even months, leads to an unfavorable hairstyle. A new cut is necessary which overall requires more efforts than constant care. Furthermore, opportunities to meet interesting people might be missed because of the unfavorable look. For the product portfolio, it is necessary to create an appropriate management framework to keep it within scope. Responsibilities need to be assigned to carry out a continuous optimization. Some of the methods and organizational measures involved are described in the article “Endless Debate or Quick Action” in this issue of the Complexity Management Journal.

Being Sustainably Successful – Four Recommendations

For the product complexity to stay optimally configured over an extended period of time, four basic aspects should be considered:

1. The product strategy has to be in line with the business strategy.
2. The product complexity has to be clearly aligned with the market and customer requirements.
3. The transfer of product functions into physical components has to follow a logical system. The goal is to have a superior life-cycle-performance.
4. The corporate culture and employees are to be involved adequately.

Contact

Norbert Große Entrup

Phone: +49 2405 459 02

norbert.grosse-entrup@schuh-group.com

Endless Debate or Quick Action? Or: How Variant Management Can Help the Manufacturing Industry

Gregor Tücks / Hans R. Tanner

It should not come as a surprise that many American manufacturers are experiencing serious declines in sales revenue during the current recession. Undoubtedly, the sales volumes of the previous series of record years are going to be a fact of the past for a while. Many of the more than 2 million American manufacturing companies are experiencing life-threatening cost and liquidity problems, Chrysler and GM just being the most prominent examples, but by far not the only model cases. In this article we will discuss methods of variant management that can help do both, mastering short term cost and liquidity problems, as well as setting the path for the time after the crisis, when revenue growth will inevitably kick in again.

Most likely you are now thinking: “Not another article on crisis management”, “These guys are yet another company claiming to be competent in crisis management!”, “Yet another company claiming to be competent in crisis management”, or “This is all old news”. And YES, you are right, but what we are proclaiming here are things that we have been implementing successfully and sustainably together with our clients over the past twenty years. The current upbeat tone during this recession should not fool you; it is still imperative to deal with appropriate product planning and design that considers variant management. Because even when the first signs of recovery begin to emerge, this might not be a fast one.

With classical mass manufacturing shifting to low labor countries and foreign locations over the past few years, many domestic manufacturers now have a rather high product diversity coupled with relatively high value creation. Trying to satisfy individual customer requirements typically increases the number of variants and drives down the average manufacturing lot size. The current crisis is adding momentum to this trend as it gives more power to the few remaining buyers.

Of course, most entrepreneurs have already reduced their manufacturing and personnel costs over the course of the years. Along with a higher need for customization in a downturn market, reduced staffing can lead to significant bottlenecks along the engineering and manufacturing processes. To overcome them and ensure

the profitability of shipped products, stringent product variant and complexity management can be of greatest benefit.

Variant Management Controls the Positioning of Products

In order to optimize the future profitability of products, a continuous review of all products and processes is required. In the short run and as long as the market remains in a downturn, there may be no avoiding offering your entire product line for sale in order to cover your fixed costs and keep your entire labor force busy. However, now is also the time to think about what to offer in the mid and long-term.

The first step is to quickly identify those markets, customers and products that are clearly profitable. This also means identifying which markets to exit, which customers to cut, which products to eliminate out of the portfolio, and which products to strategically develop further. This may even include adjustments to the sales and distribution channel, i.e. getting rid of dealers and agents not contributing a good share of sales. In a second step, the company growth can be planned and developed based on a consolidated cost and revenue basis that is founded on sustainable products (Fig. 1).

For both steps a practical and lean methodological framework is necessary in order to consequently do the

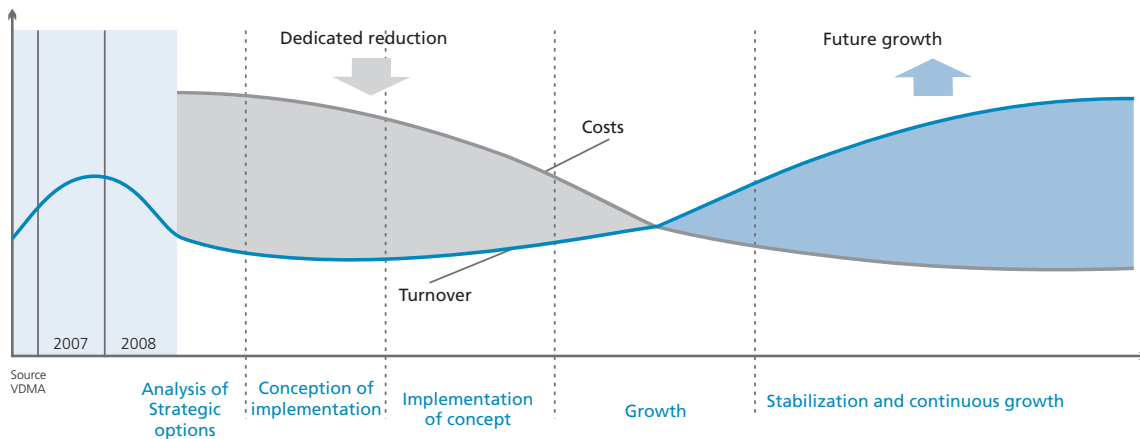


Figure 1: Steps for product and process positioning

right things. Our vast experience in working with and implementing these topics can help you hit the mark and gain a deciding timely advantage in comparison to your competition.

In a typical project as described in the Baldwin case study (see article Success through Renunciation), we re-evaluate your product and market strategy in the first weeks and identify exact measures for improvement. Your company's strategic positioning and core competences along with the value stream of all market segments are examined. At the same time market demand in conjunction with internal projects for new product development and innovation is examined. In addition, we verify whether procurement alliances are a possibility resulting in further optimization of the profit by using economies of scale for standardized products and services. This strategy also helps to reduce investment risk and at the same time give the company a chance of being actively involved in shaping sustainable trends.

Reassessments Are the Basis for Decisions

A thorough analysis of your product portfolio in the form of a Feature Tree provides a good evaluation of the market performance of your products. Scenario techniques are then applied to derive decision-relevant information (Fig. 2) that avoids eliminating products across the board instead, those products and vari-

ants that will perform above average in the future are identified. At the end of this process, all products are classified as either "sustainable", "questionable" or "eliminate".

By making a quick and precise selection of a reassessment scenario with tangible measures, an implementation can free-up capacities right away and immediately lower inventory in production.

Special attention is then paid to product variants marked for elimination that will return no profits in the short-term (e.g. new product launches), but may potentially mutate into profit-makers over a certain period of time. To analyze them further, a cost adjusted assessment is performed on both, the product and process-level, employing methods like value analysis, product comparisons or creativity techniques. Of course, an important prerequisite for the product assessment is a realistic target price, comprehensively determined based on market characteristics and customer requirements.

Once the future range of products is determined, the following step optimizes the remaining products and variants in order to allow for maximum customizability at minimum cost. In other words, to implement an overall product architecture that provides the necessary level of flexibility to adapt to customer needs while keeping the internal complexity (i.e. number of SKU's and different process flows) under control. The typical tools to be

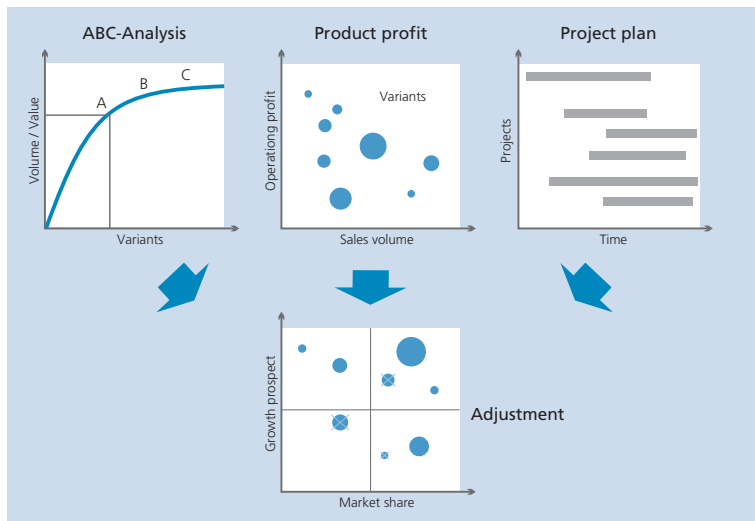


Figure 2: Systematic adjustment of the product portfolio ensures profit

used in this phase are functional analysis, modularization, optimization of pre-assemblies, and change of the assembly sequence. Using a model showing the technical implementation of all product variants, a Variant Tree, along with some simulations, usually is most beneficial for streamlining the technical complexity of a given product family. The resulting development and manufacturing costs are usually analyzed using costing methods that provide a cause-fair assignment of cost to each variant, e.g. activity based costing tools.

To exploit the full potential of improvements of the product structure, usually some adjustments of the processes are necessary as well. Thereby the focus lays on a purposeful orientation along the value creation chain. Following Lean Management principles, the goal is to eliminate waste by removing processes that are not well structured or inefficient. Such processes may exist in both, the direct labor area as well as in the business processes, e.g. custom engineering, administrative order processing, etc. The clearly stated goal for all optimizations is always the production and delivery of economically sound products to ensure the long-term success of the company. Typical methods used for process optimization include value stream analysis and the examination of drivers of unnecessary process variants. All necessary activities of sales, purchasing, product engineering, production planning, logistics, manufacturing and assembly, shipping, and other administrative task can be leaner, e.g. by eliminating unnecessary loop-backs and idle time.

Well optimized processes provide a further reduction of proportional as well as fixed costs. Furthermore, a significant acceleration of order processing is likely achieved. This results in reduced order lead time, possibly higher on time delivery rate as well as a higher level of liquidity due to less capital employed in raw materials and semi-products.

Typical results as realized in a large number of projects show:

- A 5% - 20% reduction of production costs of complex components
 - A 10% - 40% reduction of delivery times
 - A 20% - 50% increase of on-time deliveries
 - A 10% -30% reduction of inventory
 - A 5% - 20% reduction of overhead costs
- Thus, an overall improvement of the marginal return between 10% - 30% can normally be achieved

After implementing the above described methods, your company has an entirely new cost base that enables you to tackle the next steps in a more focused manner. Now the focus lies on aligning the internal complexity in a way to ensure your company's long-term success.

Attack Is the Best Defense

After implementing the above described building blocks, your company has an entirely new cost base that enables you to tackle the next steps in a more focused manner. This is the perfect starting point for aligning the internal complexity in a way that ensures your company's long-term success.

True to the slogan "Developing is like swimming against the stream, if you stop, you drift off course" it is now important to follow the course that is set for the future by continuously re-applying the above building blocks.

To generate additional growth, the product and services offering is expanded in a designated manner by selected positioning of new variants, products or services in existing markets and /or an introduction into new markets. The key here is to adjust the growing variety of your offerings efficiently and sustainably with the help of strategic product and process planning methods (e.g. market and technology scan, business segment planning) and "lean innovation" activities.

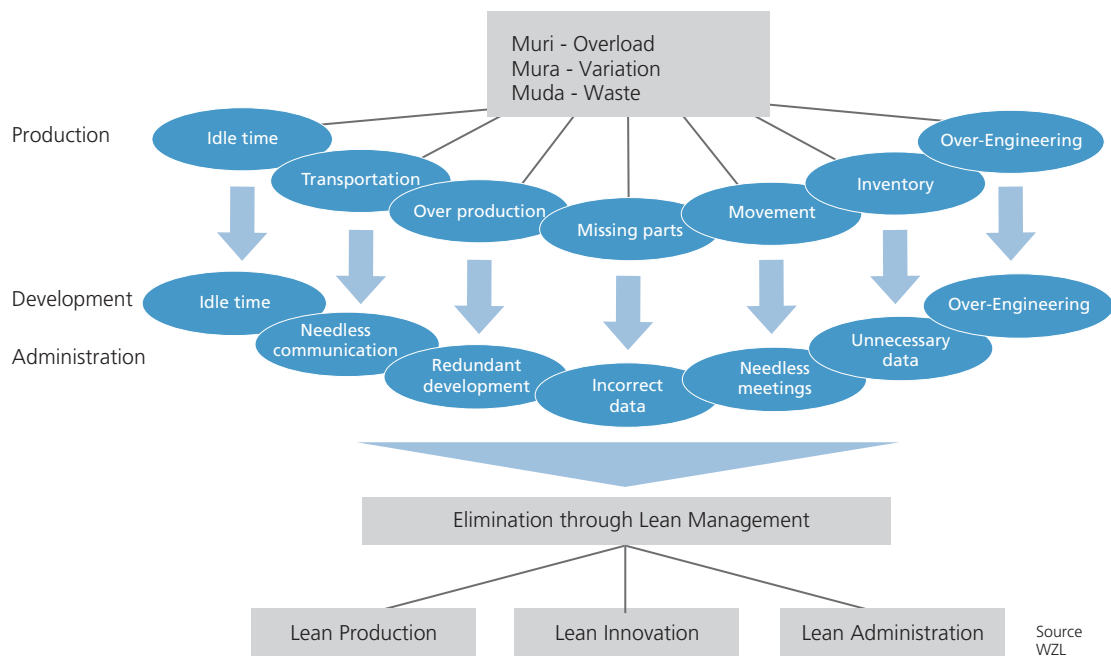


Figure 3: Nobody pays for your waste

Striving for Perfection

In conclusion, the goal is to keep the direct and indirect processes in your company simple and without waste despite growth and targeted variant build-up as well as continually improve them. Ultimately you want to do more than just survive this crisis. Against the background that no perfect solution exists, only the pursuit thereof, a constant questioning of existing solutions for improvement is achieved. Avoid falling back into self-defeating old habits and patterns.

A constant control of your implemented “lean” activities is a prerequisite for a sustainable, successful and strong firm (Fig. 3). Utilize the opportunity that a time of crisis offers to you by creating transparency of your products, processes and structures. The above introduced approaches and solutions make an implementation-oriented and pragmatic contribution to give your company the needed momentum to survive the current crisis.

Contact

Gregor Tuecks
 Phone: +49 2405 459 02
gregor.tuecks@schuh-group.com

Success through Moderation – How a Product Division Becomes Successful Once Again During the Sales Crisis

Anno Kremer / Udo Hess (Baldwin Oxy-Dry GmbH)

The first signs of an emerging sales crisis in 2008 triggered Baldwin's management to take a closer look at their FTS (Fluid and Temperature Systems) product division. One product family in particular appeared to not deliver the desired contribution to operating income. Additional options of product improvements were therefore considered in order to increase revenue. At the same time, the decision to shift part of the production to Asia was made with the intention of being present in growth markets and possibly reduce production costs. However, the last product revision with regards to modularity and interfaces was performed to be a fit for the German production and therefore, not suitable for production and logistical requirements after the relocation to China. As a result, Baldwin searched for help and support and found it in Schuh & Company.

Clarify the Basics First – Is Proceeding Worthwhile?

One fundamental question needed an answer first: Does it even make sense to continue offering the product line? To come to a conclusion, the current and so far less successful product concept was reviewed with regards to its coverage of all market requirements. It turned out that the product was actually planned relatively well and the available variants fit the market demands. A more thorough analysis of the product architecture however revealed that the product architecture did not

match the market requirements and was not suitable for the planned production in Asia (Fig. 1). Together with members of product management, technology, production and purchasing, different solution scenarios were developed and evaluated with regards to their effects on costs. A shift of production to Asia was shown to produce a slight improvement of the cost situation, but only an additional product revision with adjustments of the architecture and construction to fit the requirements of production and purchasing in Asia would help the product yield desired profits.

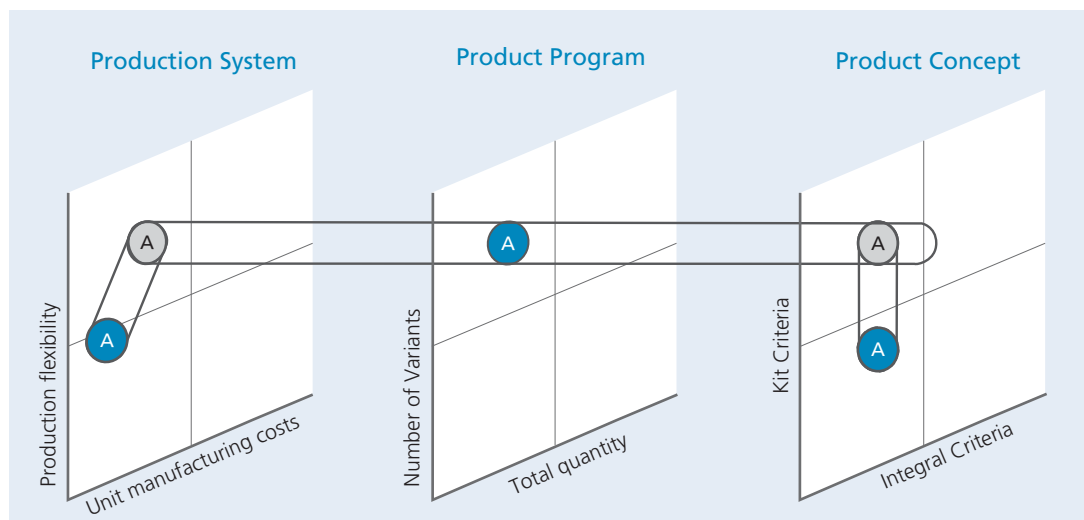


Figure 1: Program, Product and Production Have to Fit Together

The necessary capacity in the development department for this unplanned re-design had to be produced. The creation of additional capacity was out of the question so that the available development capacities had to be re-assigned. It quickly became clear that this could not work without the elimination of some of the currently offered product variants.

Parting from Products – Painful but Necessary

Consequently, the first step was to put the complete assortment of the product division to the test. As most of the time is the case, the overhead calculation pointed towards customer specific products with attractive margins. It was clear to everyone that the numbers did not correspond to reality. How the overhead costs could be split cause-fair amongst the products, however, was unknown. Together with members of development, construction, production, purchase, service and spare-parts service the generated expenditures of individual products were observed in more detail. Besides expenditures created by the development department, direct costs like complaints and rework were also explicitly assigned to each product.

A clear picture about the real contribution to operating income of every product was created step by step. During the initial overhead cost calculation, the standardized products with larger lot sizes did not look as badly as before, but the customer specific products considerably lost their appeal. As it turned out, some of the customer specific products were real profit killers that consumed large development efforts which had high warranty costs (Fig. 2).

As a result, a product evaluation checklist was developed considering purely economic aspects. Together with sales, product management and management this list was evaluated and adopted with regard to practicability and strategic feasibility. Of course, not all suggested products could be eliminated; however, approximately a fifth of the products offered at that time were eventually dropped.

Cancelling the products freed up the necessary capacities in development rapidly. At the same time, the resulting 10% turnover reduction called for process adjustments. Without an adjustment, the product line revenue would deteriorate dramatically. Through the resource adjustment, short-term revenues were improved (Fig. 3).

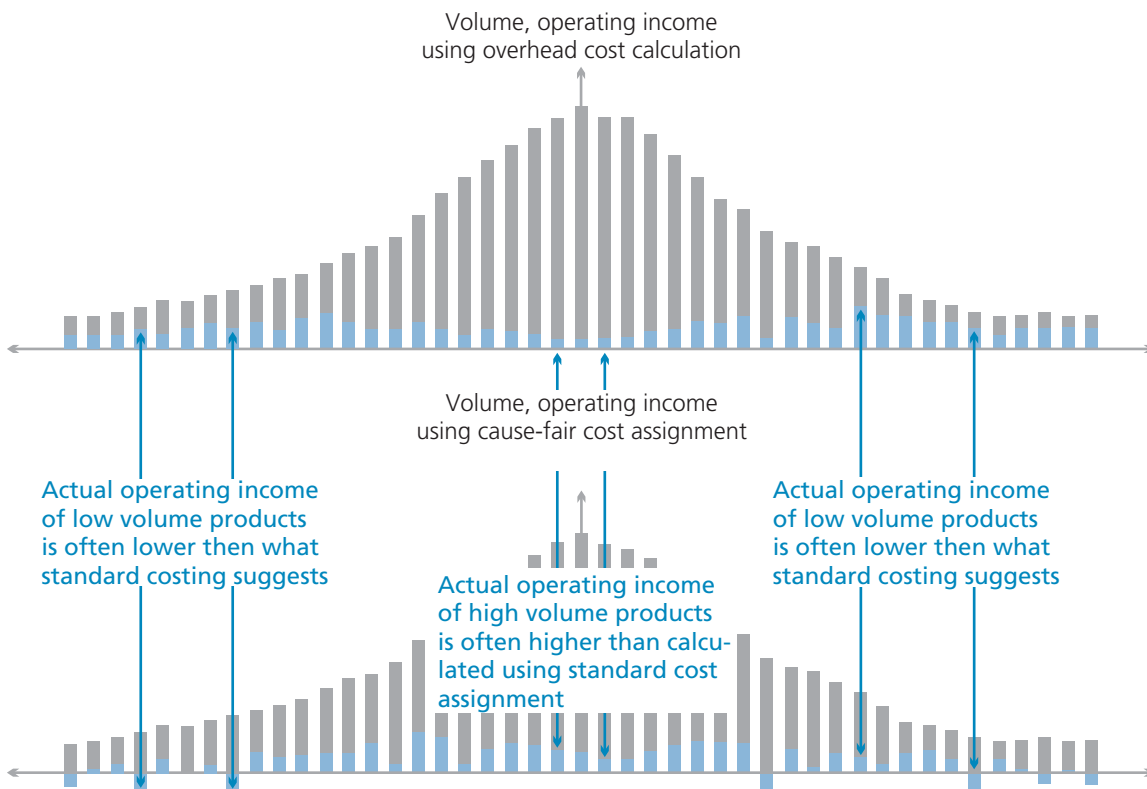


Figure 2: The cause-fair allocation of operating income and cost displays a different picture of product variety

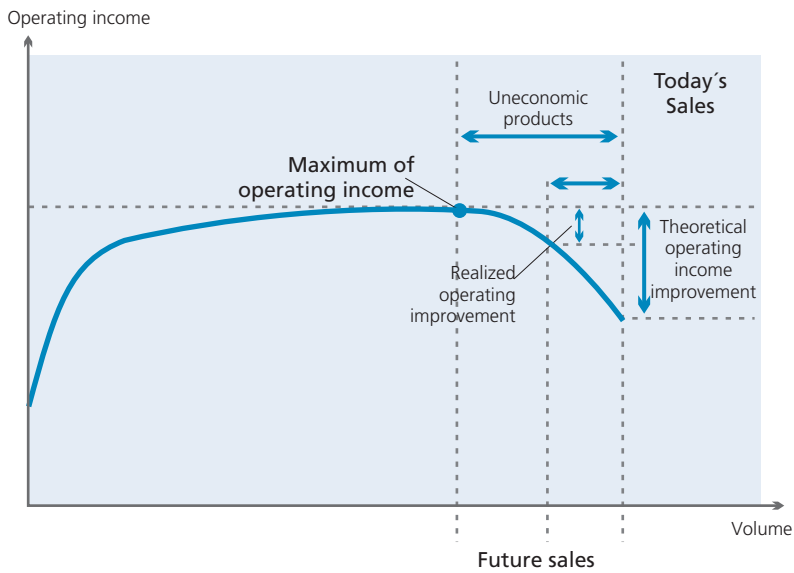


Figure 3: Improvement of operating income through targeted elimination of products and corresponding resource adjustments

With the resources that were made available in development, the topics of a new product architecture and cost optimization were tackled. Based on the initial analysis, it was already known that the market did not demand a high variance for the two high-volume products within the product range. At the same time, these items were facing extreme price erosion. The previous product architecture was designed to serve the different performance and equipment classes out of a „kit“ in a flexible and scalable manner. Likewise, the development and production efforts for the variants should be kept to a minimum. If these are the two target values, then the current product architecture was executed appropriately. On the other hand, the kit concept did not realize the aspired financial economies of scale in a satisfying scope to achieve satisfactory profits. It was proven yet again that modular kits only make sense when extreme cost or performance requirements apply to a large part of the product line (Fig. 4).

For the development team, which had been committed to the development of kits for years, challenging the previous product architecture generated uncertainty. This behavior was understandable and not Baldwin specific. Human nature dictates that a first reaction will be to prove that the new suggestion will not work. A surge of technical obstacles and the predicted rejection by the customer are thrown in front of the “rebel”. Therefore,

it is crucial to communicate the need for change before the start of loathed developments and gain acceptance of the new development objective to win with a „simple and cost-effective solution“. This understanding was also shared by management, project management and the development manager. Thus, a one-day workshop was held with all developers and designers of the business area. On the one hand, the aim of the workshop was to declare the product strategy for the product division. On the other hand, the decision and the potential of manufacturing a large part of the standardized products in Asia in the future was emphasized as well. Before the workshop it was already certain that a development project to reduce the production costs should be started soon. Together with this knowledge and the background of the event, it was necessary to build onto this momentum and carry it through the development phase. The development kick-off involved all parties to promote team building and equip everyone with consistent information right from the start. At the same time, the goals and requirements were once again discussed, analyzed and substantiated. First, creative ideas for a solution were developed. Since requirements are decisive for the product architecture design and the component development, they were also an imperative part in reaching the set target costs.

Wanting to develop an acceptable yet inexpensive product, everything has to be questioned, covering fundamentals as well as small refinements. To stimulate creativity without remaining too abstract, similar products from other industries were examined. Thought provoking questions such as “Does the ventilation grill of a water treatment device for the printing industry have to be designed to be more complex than one for the food industry?” or “Is a rivet nut a must for the screw connection of a lid, or does a nut with two weld points suffice?” were asked. If the product were to be sourced locally later on, the question may not even arise since no cost advantage would materialize when using a simpler solution. However, since manufacturing and sourcing is taking place in Asia such details can make or break the plan. Today only a limited number of subcontractors master this area of industrial engineering. The crucial point in attaining the target costs and with that the continuation of the product, was to take a step back at the right time and to find a new balance between customer benefit and costs. On the one hand the functionality and reliability have to remain high; on the other hand the construction has to become simpler. From the beginning it was obvious, that it takes some time to rethink the

Economic objective	Measures	Reasonable product architecture
Little development efforts to generate variants	<ul style="list-style-type: none"> ▪ Increase of re-use ▪ Shifting of customization ▪ Sourcing 	<ul style="list-style-type: none"> ▪ Modular product architecture ▪ High degree of modularity
Low product costs for medium and high volume units	<ul style="list-style-type: none"> ▪ Interlinking of sub-systems/integration ▪ Product specifications at optimal costs ▪ Standardization of key components 	<ul style="list-style-type: none"> ▪ Modular product architecture ▪ Low degree of modularity
High performance Or minimal price with low variety	<ul style="list-style-type: none"> ▪ Focus on performance limiting components ▪ Focus on system optimization ▪ Sequential product design process 	<ul style="list-style-type: none"> ▪ Integrated product architecture
Short development time for variety development	<ul style="list-style-type: none"> ▪ Increase of re-use of sub-systems ▪ Early interface definition ▪ Focus on the development process 	<ul style="list-style-type: none"> ▪ Modular product architecture ▪ High level of modularity

Figure 4: Generic product architecture in related to development tasks

past approach, especially if it has been practiced in such a way for the past 20 years. At the same time everyone internalized that the development was only successful if the product fulfills the customer requirements, operates reliably and achieved all cost goals. The change and development process was initiated and would continue for some additional months. In the end, this process helped Baldwin to be one step ahead of the competition, which might have taken the necessary actions just a tad too late. However, Baldwin was able to find new perspectives for its success and rid itself of inefficiencies.

Contact

Anno Kremer

Phone: +49 2405 459 02
 anno.kremer@schuh-group.com

Udo Hess

Baldwin Oxy-Dry GmbH,
 Manager CCP



Baldwin Group Vision

„We develop, market, and service process control systems and consumables required to enhance the profitable competitiveness of our customers.“
 (Press Manufacturers, Printers and Publishers).

Where We Are

Baldwin is headquartered in Shelton, Connecticut, USA with production in Lenexa (Kansas), Friedberg (Germany), Malmö (Sweden), Tranås (Sweden), Tokyo (Japan), and Shanghai (China).

Products and Services

Automatic cleaning systems and related consumables, spray dampening systems, fountain solution, cooling, pumping, total fountain solution management systems, IR drying systems, press protection systems, inline glueing and web accessories. For product information see www.baldwintech.com.

Exploring New Frontiers – Obstacles, Cooperation and Success

Anno Kremer (Schuh & Company) in conversation with Udo Hess, project manager at Baldwin.
Mr. Hess explains the key phases for the project's success from his viewpoint.

Mr. Hess, looking back at the past six months, what was special about the project for you?

Until now I have been responsible for the launch and development of our global electronics and control platform, which for an electrical engineer is pretty obvious. With this product project, I also reached a new frontier. Particularly during the first phase in which we examined whether or not it was economically sound to continue the production of the product segment, the challenge was quite new. Before the project, I have never had to engage with the market to such an extent. I thought that we would quickly collect some numbers, which everyone has readily available, and that we would be done in a week. Unfortunately, this is not what happened. The ongoing changes in the markets did not make the task any easier either. Because of the cooperation with the consultants of Schuh & Company, however, we were able to quickly gather reliable figures. We can gradually add on to them and also use them going forward.

Furthermore, the workshop with all developers was a very important milestone for me. It took the whole project to a new level.

Have you worked with consultants before?

Yes, of course. I have had the opportunity on several projects in the past. However, I have to admit that after some initial skepticism, it was quite a bit of fun to work together. Both, I and the consultants, were able to leverage our abilities well. I was surprised, at how thoroughly and systematically the colleagues at Schuh & Company penetrated the material and details. I was not used to this from my previous consulting experiences where processes were mapped and documented, but the implementation of new structures remained mostly superficial.

How do you assess the efforts and the results of the project?

Especially during the first phase, the search for market data and other relevant information was very time-consuming. But without this tough work, we would not have been able to work so efficiently towards the end. We created a good information base, which allowed us to be able to answer critical questions on short notice. I think that the effort was worthwhile and will pay off for Baldwin in a very short period of time. Going forward, I would want to drive this kind of effort for every suitable project.

What were the greatest obstacles for implementation?

As most often is the case, the biggest obstacle was to convince our employees. The project questioned previous development guidelines like a "kit" and modularity for some products, and with that the work of the developers over the past years. That this is not accepted widely is obvious, nevertheless it was decisive for the [project's] success. The involvement of external consultants leveraged our awareness. They were able to question everything without bias and also address the radical need for change directly. Because management dealt with the assessments constructively and openly, it guaranteed a fast implementation. The urgency and desire for a consistent implementation quickly became obvious. With these ideas in mind, we relied on the workshop and created the necessary momentum to achieve quick and good results that will help us be successful in the long term.

Final question: Would you do it the same way in the future?

Yes, by all means. I have learned a lot and I am pleased about the achieved (intermediate-) results.

Complexity Management in a Nutshell

Hans R. Tanner

The Product Diversity Nightmare

It's been a while since Henry Ford's days of "any color, as long it is black"-approach to product diversity: Today's automobiles have possible assembly combinations, which easily exceed the number of cars that ever will be built. One of the current forerunners is BMW's 7 Series with about 10^{17} technical assembly combinations, closely followed by other brands. Looking into individual modules, diversity well beyond the market requirements is found everywhere: 144 different types of carpet modules for one single car model, 130 different types of interior lamps, 4800 different front seats, etc.

Over the last few years, product diversity has become a growing concern in other industries as well: 400 different types of packages for the same medicine, 800 different types of leathers to cover all models of a shoe manufacturer, not even to mention the many different types of bank accounts and insurance contracts available from the same provider.

Usually, every product variant is started with a good intention – to grow sales and maximize profits for the company in order to overcome current problems such as price competition in the existing markets, stagnating or even decreasing sales or in order to deal with over-capacities in the production processes. To deal with the situation, a company decides to introduce new products, most often some niche products nobody has been offering so far, hoping that the niche would protect the profit margins for a while (Figure 1).

What is often underestimated however are the effects of the added products on internal (endogenous) complexity: Development, engineering, purchasing, production planning and logistics, production, sales, marketing – all these departments have to deal with the new products, add new variants, develop, produce, or communicate them, just contributing to a cost increase due to complexity. Due to difficulties of attributing these additional costs clearly to the new products or variants, rather general price increases will normally follow to cover for

the additional costs. Needless to say that these general increases will further hurt the competitiveness of the original products, leading just into another spin of the vicious.

To successfully avoid this vicious complexity cycle, companies must understand the effects of every new product variant on their entire system and implement effective and efficient complexity management processes and tools.

The Effects of Product Complexity

Every new product variant, unless a replacement only, is likely to create some additional sales. In fact, as explained



Figure 1: The Vicious Diversity Cycle

above, in most cases it is already the idea to increase sales that leads to the creation of new product variants.

Curve A in Figure 2 shows how Product Variants and Sales Volume are correlated. The actual shape of the curve is different depending on the type of business a company is in. An extreme mass manufacturer will have a very steep curve because the majority of sales are accomplished with a narrow range of products. An extreme niche manufacturer on the other hand will have a flat curve, indicating that sales volumes can only be increased with new product variants. As a result of increased competition, the curve tends to become less steep; thus companies are adding product variants in order to outpace their competitors. Many companies have a curve as shown in the figure with about 20% of product variants providing about 80% of the sales volume.

Besides the positive effect of increased sales, increasing product complexity also has a number of negative effects, summarized in Figure 2 by the Complexity Cost curve B. The reasons for growing complexity costs are manifold. On the sales side it becomes more expensive to explain the customer the differences between individual products and to consult the customer in choosing the right product. More training for the sales force is required, more money must be spent for brochures and product flyers. On a technical level, there are more products that must be developed, requiring more parts that must be designed or evaluated, more suppliers that have to become part of the game, etc. Finally, there are higher costs involved with production itself because more different products have to be planned and processed through manufacturing and the distribution channel.

Once a certain complexity is reached, the sum of all these costs is more than likely to outweigh the additional revenues of an increased sales volume, the company is in a situation where every new variant still will slightly increase the sales volume, but will decrease overall profit at the same time.

Obviously, the optimal point to be is where the difference between complexity dependent revenues and costs is maximized (Point C in Figure 2). That's the Point of Operation where the total profit for the company is maximized.

Maximizing Total Profit

Looking into the graphs of Figure 1, there are four different possibilities to maximize total profit. Each approach thereby requires its distinct set of methods and procedures:

- Repositioning the 'Point of Operation': Change the level of product complexity to an optimized working point (usually: reduce complexity)
- Change the shape of the revenue curve in order to generate more sales with fewer variants
- Shift the complexity cost curve to the right (horizontal shift) to make sure the external complexity can be provided at lower levels of internal complexity
- Shift the complexity cost curve downwards (vertical shift) by reducing the costs of handling the internal complexity.

Repositioning the 'Point of Operation': Adjusting the External Diversity

The majority of companies have a product diversity that is to the right side of the point of maximized profit shown in Figure 2. Performing a classical ABC analysis often reveals that less than 20% of the products are contributing 80% or more of the total sales volume and quite often there is also a significant number of products accounting only for a fraction of a percent of total sales.

Analyzing product sales and eliminating these 'micro-volume' products is already a good starting point, however, it does not always provide the intended improvements. Maybe it is not possible to eliminate the products from the system because of long-term contracts or the necessity to provide spare parts. Possibly, sales may claim that

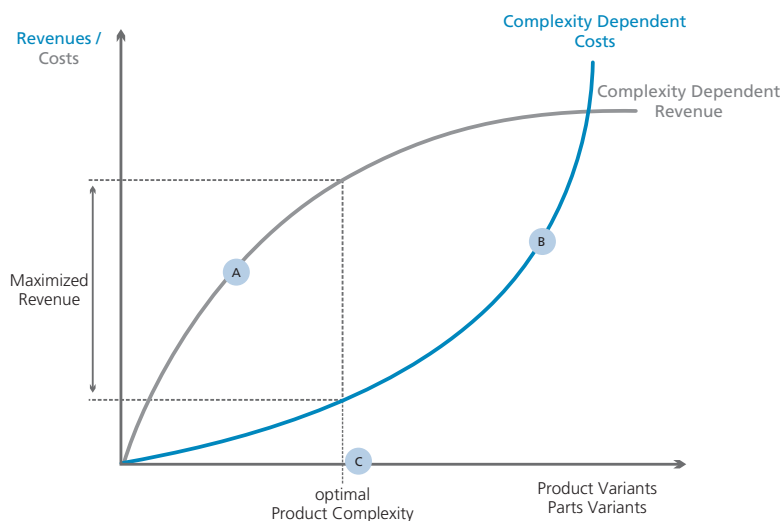


Figure 2: Complexity dependent revenues and costs

eliminating a certain product would reduce complimentary sales of a high-volume product, or Management (and stock market analysts) may not like the idea of reducing sales altogether, etc.

Changing the Shape of the Revenue Curve

Eliminating existing low volume variants is no problem if it is possible to further shift sales towards the already well selling variants. In terms of the complexity-dependent revenue curve (B) in Figure 2, this means a curve that raises steeper and ends sooner. Methods to reshape the revenue curve are primarily marketing and product management related. The primary focus is on better matching customer requirement clusters with product feature packages. A closer match will increase the number of potential buyers for a certain product package, thereby reducing the total amount of variants needed to satisfy a given number of buyers.

An often-unrecognized opportunity in this area is available for parts manufacturers supplying a relatively low number of parts to only a few large customers as typically found in the automotive industries. Here, the supplier is usually involved in the product development cycle of the customer, in many cases nowadays the supplier is even in charge of the development. Consequently, the supplier has a realistic opportunity to influence the buyer's requirements. In this situation it may become possible to sell the same parts to several OEM's or at least make sure that the variant sold to buyer B is very close to the variant sold to buyer A.

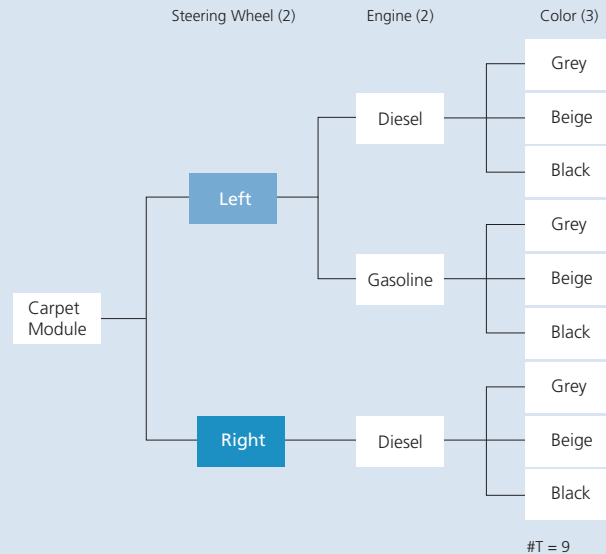
Horizontally Shifting the Complexity Cost Curve

A horizontal shift of the complexity cost curve means to reduce the internal technical diversity of parts while maintaining the diversity available on the market. This can be achieved through a distinct set of methods, namely parts standardization, parts integration, and postponement of individual steps within the assembly sequence.

Parts standardization means using a part everywhere instead in selected variants only, thereby greatly reducing the number of variants. An example is notebook computers that nowadays always are equipped with a built-in network card, even though the customer may not need it. It is simply cheaper to have the required network chip standardized in every new computer.

Example: Volkswagen Golf

The carpet module of the 5th Generation Volkswagen Golf was planned to have 144 variants including colors. From a market point of view only 9 variants were really needed to satisfy customer requirements as shown in this Feature Tree:



All other variants were technically induced. Even though planning was almost completed, it was still possible to reduce the diversity to 18 variants. As a result, the logistics concept for this module could be simplified, resulting in annual cost savings of several million dollars.

Parts integration means the combination of two different parts with individual functionality into a single part with combined functionality, thereby again greatly decreasing the total number of variants. A good example for parts integration is what is seen regularly in consumer electronics: There used to be cell phones, digital cameras, and PDA's. After integration, we see a cell phone with built-in camera. Best of all, it can be used as PDA as well. Of course the new device is significantly less expensive than the total price of the three previous devices, primarily because of reduced complexity as a result of the integration.

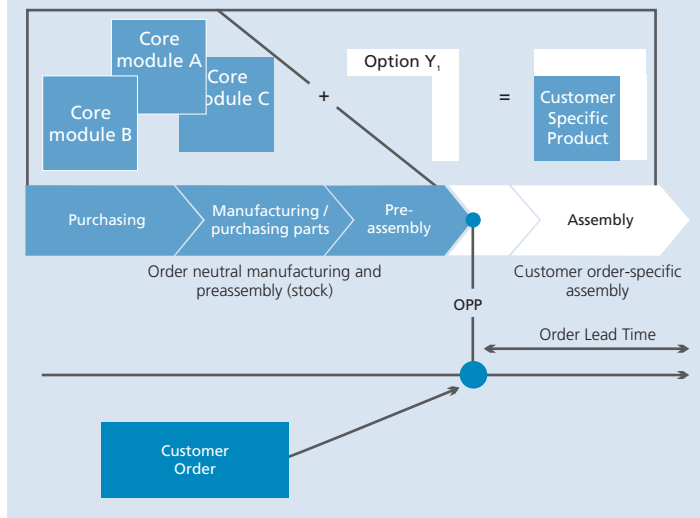
Postponement can be distinguished in Product Postponement and Interface Postponement. Product postponement stands for changes in the assembly sequence

Keywords Explained: Modular Architecture and Platform Concepts

Modularization means structuring of a product in order to reduce dependencies between individual elements (modules) of the product and to reduce interface diversity between them.

Platform Concepts aim at unifying certain components, interfaces, and product functions in order to make parts and modules reusable in several product families.

The cost cutting benefits of both of these methods comes from post-poning the order penetration point within the overall order processing procedure. This allows for using mass manufacturing principles along bigger parts of the logistics and manufacturing processes and only dealing with the specifics of the individual customer order very late in the process.



that allow mounting of variant driving parts only as late in the sequence as possible. Interface postponement means the same principle, but this time certain steps are even postponed from one assembly location to another in order to reduce the number of product variants that have to be handled by logistics between two locations. The perfect example for product postponement is paint distribution: By adding color concentrate only at the point of sale, the manufacturer keeps the diversity of the voluminous product down to one variant (white) and provides the entire diversity of several hundred colors through a simple mixing process.

These basic methods can be leveraged in higher level concepts like modular product architectures, platform

concepts, and mass customization concepts. All these concepts use the above methods as building blocks and share the common goal of shifting the complexity cost curve to the right, enabling a company to provide a certain product diversity on the market with fewer parts and modules.

Vertically Shifting the Complexity Cost Curve

A vertical shift of the complexity cost curve means to reduce the resource consumption for the provision of a given level of parts and product diversity, primarily through improvements in all processes along the entire product life cycle. There are numerous methods of concepts and approaches available: Continuous Improvement, Quality Management Systems, Six Sigma, Business Reengineering etc. only to name a few. If applied well, all these concepts should allow for an annual reduction of costs involved with producing a certain amount of unavoidable diversity.

Complexity Management and Product Life Cycle

Interesting enough, most companies, when becoming aware of the diversity problem, try to master complexity by cutting costs and increasing efficiency as described in the paragraph above. While there is nothing wrong with doing this, it is only 'curing symptoms instead of killing the virus' and therefore the achievable cost reduction potential is very limited as shown in Figure 3.

Therefore, in order to successfully manage product diversity, methods of Complexity Management should form an integral part of the entire product life cycle.

This should start with a careful definition of what's needed on the market in order to be successful, thereby identifying and avoiding every product variant without significant contribution to the total sales amount of the company. Variant targets should be established in that phase, providing benchmarks for the diversity along the entire product life cycle.

During the realization phase (product development and engineering), goal-oriented application of parts standardization, integration and postponement, possibly within the context of higher-level concepts such as modularization or mass customization, should be used to provide the required external diversity with as few internal

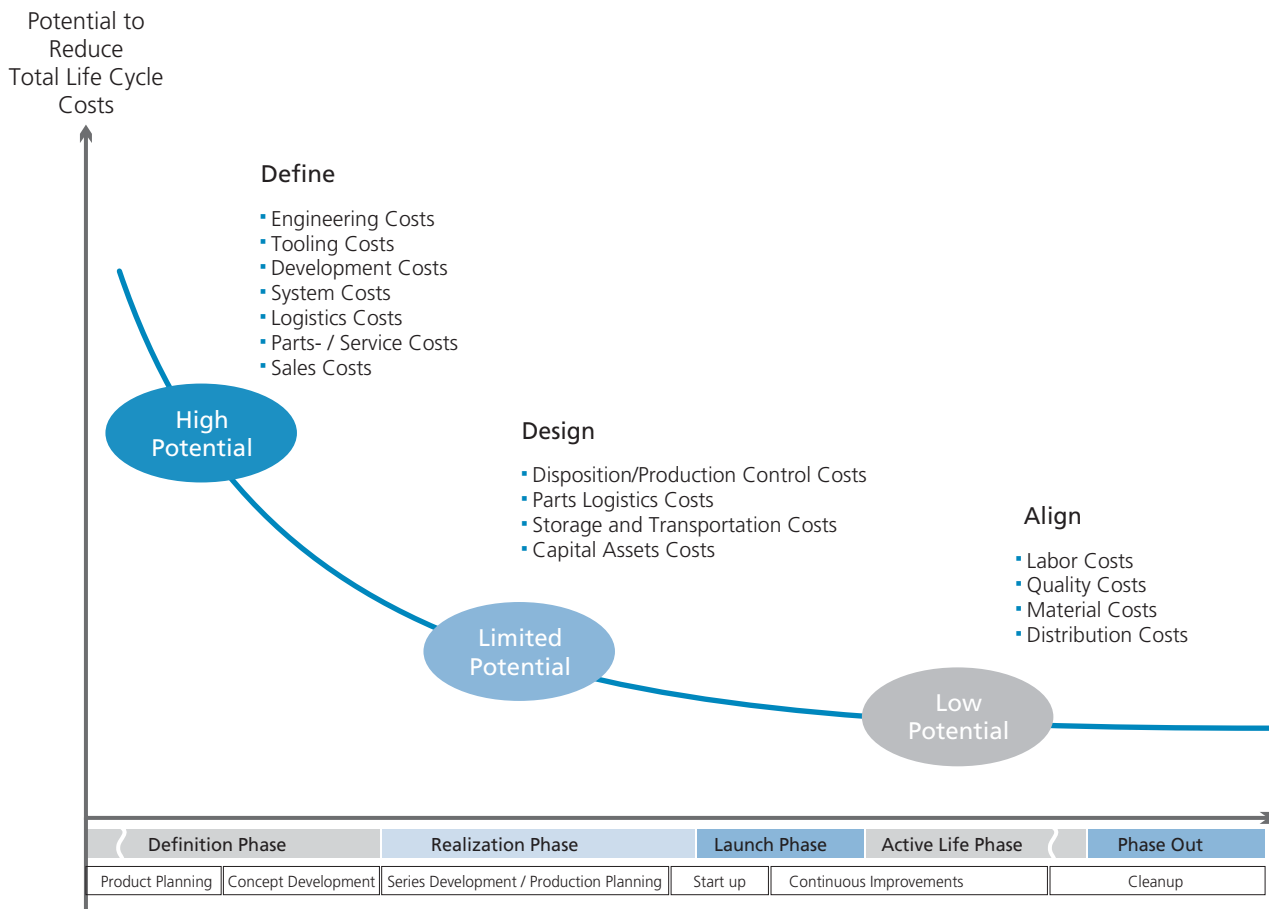


Figure 3: Complexity Management and Product Life Cycle

technical variants as possible. Again, every part and module variant that can be avoided or eliminated allows to reduce the production and logistics costs during the active life phase of the product.

should pursue a more holistic approach, making complexity management a priority along the entire product life cycle, using some of the methods outlined in this article.

Conclusions

Product complexity is an issue that an increasing number of companies have to address in order to survive. As many examples show, most of the complexity in current product structures is not really needed in order to satisfy customer requirements, they are rather the result of a lack of a compelling strategy regarding product diversity. Consequently, the possibilities to increase total profit are significant. However, to exploit them, it is not sufficient to just attack complexity at the 'tail end', the production and logistics departments, where diversity is experienced in its highest intensity. Rather than that, a company

Contact

Stephan Krumm, Ph.D.

Phone: +49 2405 459 02

stephan.krumm@schuh-group.com

Company

Schuh & Company focuses on providing solutions and methods for managing the ever-increasing complexity of today's enterprises products and processes. With this approach the company established itself as implementation-oriented problem solver in the industry. Today the company consists of about 40 people committed to ensure your company's success through their work as strategy and organizational consultants, as well as management coaches.

Schuh & Company is headquartered in Aachen, Germany, with subsidiaries in St. Gallen, Switzerland (since 1991), and Atlanta, GA, USA (since 1998).

In 1999 Schuh & Company started the Complexity Academy initiative. The program provides valuable hands-on knowledge through its conferences and workshop events.

Offices

Schuh Complexity Management, Inc.

3625 Greenside Court
Dacula, GA 30019, USA
Phone: +1 770 614 8394
Phone: +1 678 730 2728
E-Mail: info@schuh-group.com

Schuh & Co. GmbH

Monnetstraße 9
52146 Wuerselen, Germany
Phone: +49 2405 459 02
Fax: +49 2405 459 300
E-Mail: info@schuh-group.com

Schuh & Co. Komplexitätsmanagement AG

Langgasse 13
9008 St. Gallen, Switzerland
Phone: +41 71 243 60 00
Fax: +41 71 243 60 01
E-Mail: info@schuh-group.com

Legal Notice

The Complexity Management Journal is published six times per year by Schuh & Company.

Schuh Complexity Management, Inc.

3625 Greenside Court
Dacula, GA 30019, USA

Phone: +1 770 614 8394
Phone: +1 678 730 2728
E-Mail: info@schuh-group.com
Internet: www.schuh-group.com

Editorial Board:

Bettina Driessen

Layout:

Kezban Ergin

Photos:

Pages 1, 4, 7: © iStockphoto.com/josh webb

Reprints, also partial ones, are permitted when citing the source and after consultation with the editorial board. We request a copy of the reprint.