REDESIGNING PRODUCT PROGRAMS - FOCUSING ON VARIETY, COMPLEXITY AND COMMONALITY

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1. Introduction

During the last couple of decades there has been a change towards more and more customized products within many industries. Since customers are different, with different needs and criteria for choice, it has become more and more necessary for companies to offer a spectrum of models and variants to satisfy various customers. Market demands have increased, and products' market life spans decrease. New products or new variants must be introduced more frequently than they used to. Product assortments in companies are growing, which often leads to increased internal complexity.

On the other hand production and other internal stakeholders want less complexity and more economies of scale. It can be a challenge to satisfy marked demand and at the same time make money. To survive many companies are shifting from mass production strategy to a variety strategy. The result of this conflict is increased turnover, but unfortunately reduced profit margin. [Schuh 1999]

Continuous product development activities, is a necessity for companies that want to be in the forefront of development, and focus on multiproduct development instead of development of single product is vital. One of the challenges for companies with high internal complexity is how they can achieve mass production benefits and at the same time offer a variety of products. Managing complexity with product modelling or configuration is one way another solution is reducing complexity through means like standardisation, product platforms and modularization.

We are focusing on what we call a product program. A product program is a planned product portfolio for a company, which considers both internal and external impacts of the products. The model for improving product program complexity presented in this paper contains a framework, methods and tools for reducing complexity, increasing commonality and increasing external variety.

2. Product Program Characteristics

One of the reasons why product variety has been a problem for many companies is that the new products are not planned and considered in relation to the rest of the product assortment. This is why the product assortment should be planned and coherent with the strategies of the company. The product program should have positive effects on both the internal and external relations. Only by fulfilling and co-ordinating these criteria consider it to be a product program. Product program characteristics have been identified as variety, commonality, complexity and architecture [Andreasen 2001].

2.1 External variety

Is it necessary for the company to offer "everything"? We do not think so. But it is necessary to offer

exactly what the customers want. The company needs to focus on differentiating attributes in order to offer distinct products and avoid cannibalisation. Variety should be related to the market strategy and market segments.
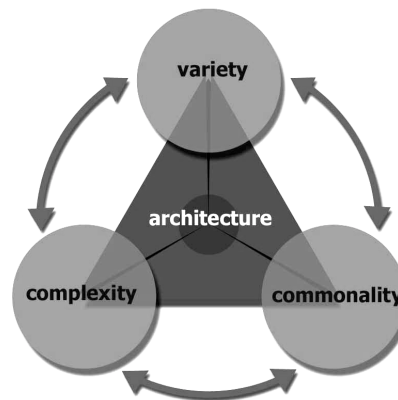

Figure 1. Product program characteristics [Andreasen 2001]

Positive variety is defined as "variation that is customer- driven and, as such, directly linked to verifiable customer interest or demand; adds value and increases sales but does not add unwarranted costs."[Galsworth 1994] What companies should strive for is not just product variety, but positive variety to increase sales and profit.

2.2 Internal Commonality

Commonality can be introduced in the product itself, but also in activities or processes connected to the company. Reuse, for example in the manufacturing process, can lead to reduced complexity and reduced costs. Not all components should be reused if it is important for the customers that they are distinct.
A platform is defined as a collection of values that share something common for a product. This could be commonalty in components, processes, knowledge or staff and relationship. [Robertson and Ulrich 1998]

2.3 Organisational and product complexity

Because of the increasing variety and product complexity, a lot of companies experience increasing organisational complexity. This complexity results in extra, unwarranted costs, both indirect and direct, which is difficult to spot in traditional accounting principles.
Reducing organisational complexity can be done through standardisation and commonality principles such as product platforms.

2.4 Product Architecture

Product architecture is defined as "(1) the arrangement of functional elements; (2) the mapping from functional elements to physical components; (3) the specification of the interfaces among interacting physical components." [Ulrich 1998] An architecture can be modular (one to one mapping between function and components) or integral.
Modularization is a way of organising the product architecture in order to achieve positive effects both internal and external.

3. The redesign process

We have realised a need for a systematic approach for redesign processes, focus on internal commonality and external variety. A model to improve and develop an existing product program has therefore been developed. This model is both guidelines for development or redesign projects,

containing simple solutions and methods. The intention for this model is through a methodical way increase internal commonality and at the same time increase external variety.

Compared with traditional models for integrated product development, these model focuses especially on product program characteristics. This means according to the model, focus externally on variety, internally on commonality and complexity and focus on the product architecture. These different focuses are separated in the first phases, but should be considered throughout the process.
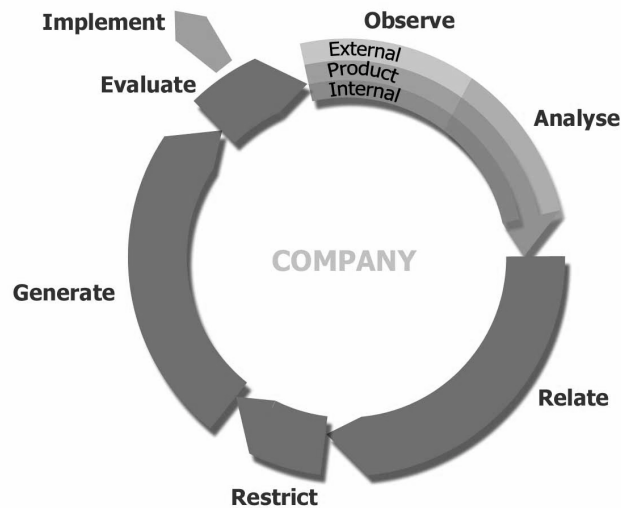

Figure 2. Model for redesigning product programs

The model is divided into 6 different phases, each containing different tools, and depending on the performance. The tools itself is nothing new, just a collection of related methods. The methods are inputs in a specific phase, considered from our view and needs, not considering the main purpose for the methods.

3.1 Observe

The first step in this process is to observe and visualize/describe the existing product program. We want to observe the products itself (components, modules, architecture etc.) but also the internal and external circumstances (production activities, market segments etc.).

The observe phase is considered as a state of the art, where only available/written information is of interest. This information, which is part of the strategies, is available in annual- and progress reports, bill of materials and marketing material like product assortment lists and catalogues.

The outcome should be big sheets of paper, which visualises and describes existing product program, but also emphasises the aspects which needs further analysis.

3.2 Analyse

In the same way as the phase above, this phase is divided into internal, product and external considerations. The intention is to go thoroughly into aspects which is seen as defective from the previous phase. It is important to mention that exactness in these two phases, is essential to make correct recommendations.

3.3 Relate

The three considerations that were separated in the previous phases are related in this phase. According to figure 1, product program characteristics [Andreasen 2001], there is a relationship between product program characteristics. To focus on e.g. external variety itself, without concerning on other product program characteristics, do not consider it to be a "product program". All relevant information from previous phases are input.

3.4 Restrict

In addition to product program characteristics, a product program is attached to a timeplan. Requirements which regards product program development, should contain top level strategies (e.g. corporate identity) but also future-oriented guidelines due to product program characteristics, in addition to more traditional project depending specifications. [Figure 3] The guidelines should have limited duration of e.g. 5-10 years.
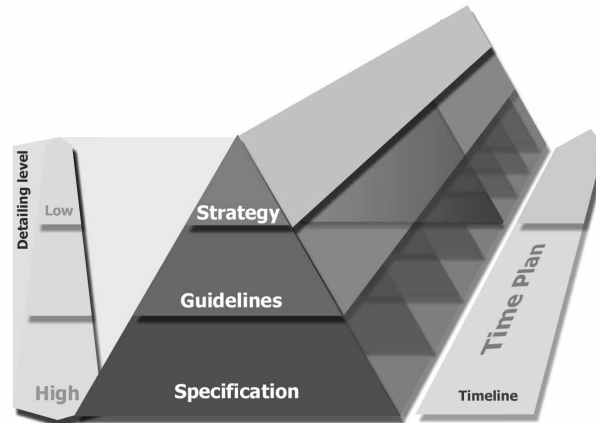

Figure 3. Future-oriented plan for synchronising new products

3.5 Generate

The outcomes of the generation phase are new concepts of products or improved processes based on the guidelines and strategies developed in previous phases. Due to product programs characteristic these concepts do not need to be noticeable amendments for the customers, but e.g. merely internal improvements.

3.6 Evaluate

This phase contains the same measures and visualising methods as in the first stages, and are used to compare situations before and after. An evaluation, through fulfilled restrictions or not, it is determined whether the concepts are ready for implementation or have to go one more lap.

3.7 Tools and methods

In table 1 different tools and methods are presented. We have implemented and tested some of these tools in connection to the model. This is not a complete list, but some of the methods that can be found in the literature.

Table 1. Examples of different tools applied to each phase

Phase:		Tools:	References:
Observe	internal	Variant tree ("Variantenbaum")	[Schuh 1999]
	product	Part index	[Galsworth 1994]
	external	Product characteristic "Merkmalbaum"	[Schuh 1999]
Analyse	internal	Commonality plan	[Robertson ea. 1998]
		VAT (Variety effectiveness process analysing tools)	[Galsworth 1994]
	product	Product family master plan (PFMP)	[Mortensen ea. 2000]
	external	Differentiation plan	[Robertson ea. 1998]
		Competitor analysis	
Relate		Relationship matrices	[Robertson ea. 1998]
Restrict			
Generate		Traditional concept generating tools	
		MFD (Modular Function Deployment)	[Ericson ea. 1999]
Evaluate		QFD, evaluating indexes	

4. Conclusion and further research

In this paper we have presented a model for improving existing product programs. The model itself is just a guideline, including tools and methods for support. To develop product program and achieve the benefits explained in the paper, a product program mindset (according to product program characteristics) is needed.

Our intention for this paper was to present a case story from a kitchen manufacturer, where we have used this model to support a process of improving the product program for this company. Due to confidentiality issues the experiences of this project can not be presented in this paper.

The model seems like a plausible approach to develop and improve product programs. This research is only implemented in one case study and need to be implemented on several projects to get some more general results.

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