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# A Modern Approach to Product Portfolio Management for the ICT-Industry

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***JEL classification*:** M3, L11

**Abstract:** *Portfolio management in general is a widely spread and highly accepted topic in the management literature and in practice. Its origins go back to Markowitz and the early 1950s focussing financial assets. Soon, this concept was broadly applied to multiple economic disciplines such as strategic management, marketing, product management, resource management, real estate management, innovation management and many more. Numerous portfolio management approaches, instruments and tools have been developed and are applied in practice a well. This paper provides basics and an overview of product portfolio management covering theory and practice. Specific attention is paid to process oriented approaches. A number of publications identify a significant gap between practical needs and academic support when it comes to solving practitioners' problems especially in highly dynamic environments such as the Information and Communication Technology (ICT) industry. This paper intends to bridge this gap by outlining a pragmatic approach to product portfolio management with a focus on the specific needs of the ICT-industry without loosing connect to worthy findings of academic research. Still, this approach needs to be adjusted to the individual situation of company, however, suggested processes and tools allow for such customization.*

**Keywords:** *Portfolio Management, Product Portfolio Management, New Product Development Process, General Electric / McKinsey Approach, GE/McKinsey Business Screen, Strategic Management, Management of Strategic Business Unit, ICT Portfolio Management, Offering Management in the ICT-Industry, ICT-Industry, TIME Industries*

## 1. INTRODUCTION

Product portfolio management has a long history in economics. Its origins go back to the financial theory of Harry Markowitz. In 1952 Markowitz developed an approach how to compose an optimal securities portfolio under uncertainty. Portfolio in this context means the sum of all financial assets of an investor.Over time the idea was transferred to strategic business units being part of a portfolio.[1] Very popular portfolio approaches in strategic management are the matrices of The Boston Consulting Group (also known as "BCG-matrix") or McKinsey (also known as "McKinsey Business Screen" or "McKinsey Matrix") or Cooper's New Product Development Management specialized on new product development. An overview of these as well as basics of product portfolio management is provided in section 2.1 and 2.2.

Next to theses tools there are a couple of less-well known approaches addressing the entire process from product development over day-to-day portfolio management up to portfolio elimination. Two resent representatives of these are discussed and evaluated in this paper in sections 2.3 and 2.4.

Additionally, insights into practical usage of portfolio management approaches or tools are provided on a most recent basis to get an understanding how and with what effects portfolio management is applied in today's business practice (section 3).

Building upon this analysis a practice-oriented approach is suggested incorporating a dynamic view and management of the actual product portfolio being regularly compared to what the future portfolio should look like. A number of tools already well established are suggested to manage this "As-is versus To-be balance".

Result is a pragmatic approach to product portfolio management to be understood as a basis for practitioners. It has to be adjusted to individual needs.

## 2. PRODUCT PORTFOLIO MANAGEMENT

### 2.1 Definitions and Basics of Product Portfolio Management

In a generic and pretty abstract sense a **product** is a physical good or a service that carries value for an individual or an organization and thus can be subject to market transactions.[2] The most important criterion to distinguish a product from an individual/stand-alone solution in the context of this thesis is repeatability.[3] A product is designed to satisfy the needs of *numerous* users with similar needs ("the market") whereas an individual solution serves "just" the specific needs of

[1] Markowitz (1952)

[2] Pepels (2013), p. 1. In this paper the terms product and service are used synonymously.

[3] There are numerous other product classifications in the literature. However, describing these in more details would go beyond the scope of this doctoral thesis. Details can be found e.g. in Pepels (2013), Grimm, Schuler, Wilhelmer (2014) or Herrmann, Huber (2013)

 

*one* customer. In simple words "lot size 1 = individual/stand-alone solution", "lot size n = product". Consequently, the observation horizon is much longer for a product.[4]Figure 1 illustrates this difference.

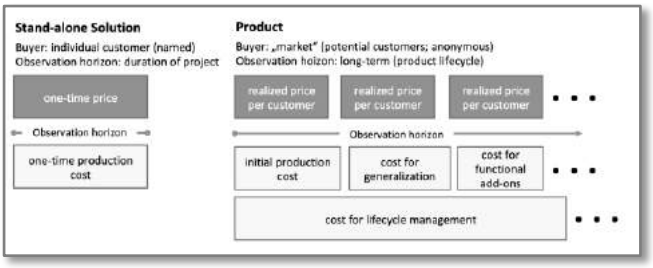


**Figure 1:** *Stand-alone Solution versus Product Source: Own figure according to Grimm, Schuller, Wilhelmer (2014)*

In this sense a project (approach) (or the process to come to a certain outcome) can also be a product depending on the ability to serve multiple customers. For example, a project (methodology/approach) to develop an IT-system is a product once it is used for many customers. The same applies to pre-configured/standardized services such as application management for certain software packages.[5]

The characteristic of repeatability obviously has significant implications especially for the management of a product compared to that of a single solution, e.g. financials of the respective business cases, complexity of the solution design, differences in marketing and sales activities and lifecycle management and the corresponding costs. The latter is very important in the ICT-industry[6] due to the dynamics of the market. Lifecycles can be as short as 6-12 months for e.g. mobiles or smart phones or 2 years for software until the next release is available to the market.[7]

Although the definition of "product" as used in this paperseams quite intuitive it can be very difficult in practise to exactly differentiate what the actual product is. In a dynamic market like the ICT-market new products or variants are introduced quickly, some products are offered directly to the market and at the same time as part of a combined product or service. Sometimes, one and the same product or service is offered with a different branding and accordingly a different tariff structure. In practise this leads to different approaches how to differentiate products. For example, one could define a product by the customer's perception: A product is what the customer perceives as a product (customer-oriented classification). Or the outcome of a specific production process is defined as "product" (production-oriented classification). Or – very pragmatic – a product is what has its own ERP product number.[8]

**Product portfolio** shall be defined as a combination or conglomerate of different but comparable products that are jointly investigated and interrelated with each other.[9] According to Amelingmeyer (2009) this thesis uses the term **product portfolio management** as the systematic and consolidated view of all products of a company (the product portfolio) in order to plan, prioritise, select, coordinate and control them. Thus, product portfolio management has to be established along the dimensions strategy, organization, processes and controlling in order to be successful.[10] This is important regarding the understanding of portfolio management in this thesis. As section 2.2 will show in more detail product portfolio management is dealt with in literature often more or less as a pure analytical tool with the advantage to especially display a portfolio in an intuitive and clear way (often using an internal and an external dimension displayed in a 2-dimensional matrix).[11] Especially, the portfolio matrices well known, like for example the already mentioned BCG-matrix are common and very popular "analytical tools".[12] In contrast, in this thesis product portfolio management is understood as a management process in order to constantly (re-) evaluate existing products or products currently being introduced, evaluate and prioritize new product options and to phase-out non-performing products. Thus, the main characteristics of product portfolio management is to base all analyses, decisions, measures, processes etc. on a simultaneous investigation of the whole product portfolio and NOT to look at single product "in isolation".[13] In times of increasing product portfolio proliferation this is a "must" in order to take all interdependencies, synergies, etc. within the portfolio into consideration.[14]

Due to its broad application portfolio management is dealt with in numerous disciplines of economics, foremost in strategic management[15], product

[4] Grimm, Schuller, Wilhelmer (2014), p. 5 et seq.
[5] See Herzwurm (2009), p. 27 et seq.
[6] ICT = Information and Communication Industry (combined IT and Telecommunication Market)
[7] Grimm, Schuller, Wilhelmer (2014)
[8] Amelingmeyer (2009), p. 5 et seq. or Schepp, Herold, Schmahl (2009), p. 128 et seq.
[9] Wendt (2013), p. 99. A study amongst 500 enterprises in Germany showed that 3 out of 4 companies use the portfolio analyses to plan and steer their business (see Packmor (2009), p. 65).
[10] Amelingmeyer (2009), p. 7 et seq.
[11] See e.g. Pepels (2013), p. 530 et seq.
[12] Wendt (2013), p. 96
[13] Regarding this understanding see e.g. Landauer (2013), p. 6
[14] See Anand, Shachar 2004; Lei, Dawar, Lemmink 2008, van den Bulte 1992 or Wind, Mahajan, Swire 1983.
[15] Strategic management mostly uses portfolio management as a tool to evaluate and plan strategic

management[16], marketing[17] and finance. An overview of the different approaches is provided in the next section.

### 2.2 Overview of Product Portfolio Approaches

Basically, (product) portfolio concepts/approaches can be divided into 2 major categories:

1) Concepts with a portfolio-analysis focus ("portfolio analysis tools") and
2) Concepts with a focus on the managerial process.

Figure 2 provides an overview with selected examples for the second category along a generic process of strategic management and different abstraction levels regarding the investigated objects.

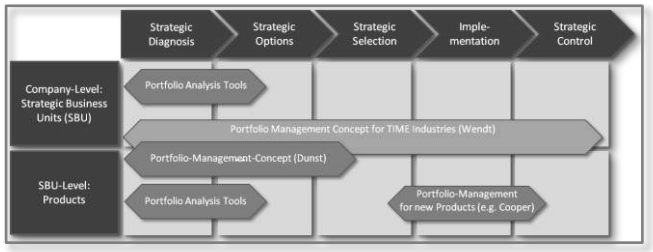


**Figure 2:** *Classification of portfolio management concepts*

#### *Portfolio analysis tools*

Portfolio analysis tools can be applied both on a company- and SBU-level. As already mentioned above, on a company level the investigation objects are SBUs. On the SBU-level products are in scope of the investigation. As the term already suggests portfolio analysis tools focus on the diagnosis/analysis (phase). Nonetheless, most portfolio analysis tools also explicitly or implicitly contain strategy recommendations and thus go beyond pure analysis. However, portfolio analysis tools hardly ever describe how a future target portfolio should look like, nor do they touch upon the implementation or even control (they way how to get there and how to check the implemented result).[18]

Portfolio analysis tools can be further distinguished in market-, resource- and value-based approaches. According to the development of strategic management since the 1960s different perspectives have been highlighted over time. A strong market perspective was introduced in the 1960s, a resource focus was added from the later 1970s onwards being accompanied by a value emphasis since the 1980s.[19]

Despite the huge number of portfolio analysis tools, they are all pretty similar in terms of the methodological approach.[20] The basic prerequisite for a portfolio analysis is a separation/segmentation of the SBUs or products as precise as possible. Secondly, two criteria have to be selected to describe the SBUs or products (qualitatively). In most cases an internal and an external criterion is used for this.[21] These criteria are selected on the basis of a cause-and-effect relation being of strategic relevance for the SBUs or products. For example, the BCG-matrix uses as external criterion the market growth and as internal criterion the relative market share (own share relative to the biggest competitor). The underlying cause-and-effect relation of strategic relevance for the market growth is the product-/market-lifecycle model showing "typical" developments of especially the market growth depending on the maturity state of the product/market. For the relative market share the underlying cause-and-effect relation is the experience curve effect providing a potential unit cost reduction of 20-30% with each doubling of the output.[22] All SBUs or products are then displayed in a 2-dimensional matrix stretched from the 2 axes internal and external criteria. The SBUs or products are displayed as circles ("bubbles") in the matrix whereas the size of the circle can represent a third dimension, for example revenue, ROI, cash flow, etc.[23] Within the matrix/bubbles a fourth dimension might be added eventually leading to a more "challenging" reading/perception of the

options within product-market scenarios (see e.g. Hahn (2006), p. 218 or Macharzina, Wolf (2010), p. 247).

[16] Product management is focusing more the single product or service in contrast to portfolio management looking at all products simultaneously. However, there is an overlapping area. Most authors of product management descriptions look at the sum of all products, too. Normally, they do not use the term "portfolio" but "product programme" or "product palette", see e.g. Hermann, Huber (2013), p. 1, Pepels (2013), p. 429 et seq.

[17] Devinney, Stewart, Stocker (1985), p. 110

[18] Wendt (2013), p. 106 et seq.

[19] Wendt (2013), p. 108 et seq. For a very detailled overview of market-, resource- and value-oriented portfolio approaches see also Packmor (2009), p. 65 et seq.

[20] For an introductory overview see especially Wendt (2013), p. 105 et seq., Harland (2009), p. 110 et seq., Packmohr (2009), p. 65 et seq. and Schepp, Herold, Schmahl (2009), p. 133 et seq. A detailed description incl. critical appraisal can be found e.g. in Pepels (2013), p. 503 et seq. or Macharzina (1999), p. 259 et seq.,

[21] Numerous analysis tools use multiple criteria rahter than „just" 2. However, most tools consolidate alle criteria into 2 „resulting" dimensions in order to display them in a 2-dimensional matrix.

[22] Welge, Al-Laham (1999), p. 344 or Macharzina (1999), p. 264 et seq.

[23] See for example Macharzina, Wolf (2010), p. 263.

resulting picture.[24] The last and most important but also most difficult step is to distinguish areas in the 2-dimensonal matrix (often 4 boxes). In order to do so borderlines along both axes have to be defined. The easiest way to define those borderlines is to simply take the medium between the highest and lowest value. In contrast to this proceeding in the case of the BCG-matrix the relative market share axis is usually separated at the value 1 (meaning that the market share of the SBU/product being investigated is as big as the one of the biggest competitor). For the axis displaying the market growth either the median or 10% are suggested cut-off criteria to separate the fields of the matrix.[25]

Of course, once a resource perspective is applied the investigated objects are normally no longer SBUs or products but technologies, capabilities, production processes, etc. A representative well known of this category is the technology portfolio of Pfeiffer et al. Pfeiffer et al. analyse R&D-activities or potential activities and technologies in general. The investigated objects are in this case production and process technologies (and if required also bought-in parts). These objects are positioned in a matrix stretched by the axis "resource strength" (internal dimension) and the axis "technology attractiveness" (external dimension). Both dimensions each are configured from 4 sub-dimensions. The result is a 9-box-matrix. For each of the boxes Pfeiffer suggests generic investment recommendations.[26]

***Concepts with a focus on the managerial process***

In contrast to the analysis tools portfolio concepts with a focus on the managerial process go beyond the mere diagnosis/analysis. They provide a methodology and describe a process how to generate a desired result – the optimal portfolio! Extremely condensed and simplified one could describe this difference like the difference between a picture and a movie. Of course, this is exaggerating but it helps to highlight the difference.

The portfolio management concept of Dunst[27] for example was developed to optimise the overall portfolio of highly diversified companies. It covers the diagnosis, option and selection process steps of the portfolio management process. On different abstraction levels (SBUs and product portfolios of SBUs) the competitive position, liquidity and financing needs are investigated and compared to the financing potentials of the whole company. Considering restrictive factors a target portfolio is derived from this analysis.[28]

Cooper and his colleagues focus another area. They have developed a comprehensive approach especially for new product development focusing the implementation and control process steps. The interrelation with the existing product portfolio incl. potential product modifications or phase-outs is not considered explicitly.[29] Another approach in the category is Wendt's portfolio management concept for the TIME-industries. Its aspiration level is to cover the complete portfolio management process as described in Figure 2 by providing a comprehensive framework especially designed to the needs of the TIME-industries.[30]

In the following,2 very recent types of concepts with a strong focus on the managerial process are described in more detail. A critical appraisal makes the description round at the end of each example. In many cases the pros and cons can be applied to the other representatives of the respective type of concept.

The two are:

1) The "portfolio management concept for TIME-industries" of Susanne Wendt as a holistic approach taking the whole management process, multiple evaluation criteria, the complete product-lifecycle and different organizational levels into account.[31]
2) The "active portfolio approach" described by Nina Landauer.[32]

### 2.3 Portfolio Management for the TIME[33] Industries

The concept "Portfolio Management for the TIME Industries" was developed by Wendt in 2013.[34] In order to establish a "holistic" portfolio management specifically designed to the specifics of the TIME industries Wendt suggests covering all four dimensions shown in figure 5.

[24] For suggestions see for example Aumayr (2013), p. 47 or Harland (2009), p. 106.
[25] See for example Pepels (2013) p. 539/540. Some authors even suggest 0% as a borderline for the market growth axis (e.g. Aumayer (2013) p. 47. This approach is pretty similar to the extended BCG-matrix as described for example in Pepels (2013), p. 544 et seq.
[26] Pfeiffer, Metze, Schneider, Amler (1989) p. 85 et seq.
[27] Dunst (1983)
[28] Wendt (2013), p. 116 et seq.
[29] Wendt (2013), p. 128
[30] Cooper, Edget, Kleinschmidt (2001)
[31] Wendt (2013)
[32] Landauer (2013)
[33] TIME = Telecommunication, IT, Media and Entertainment
[34] Wendt (2013), for the TIME-specific portfolio management concept see especially p. 197 et seq.

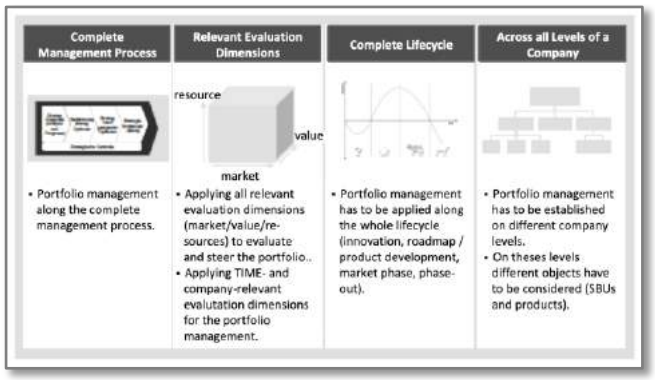


**Figure 3:** *Dimensions of the wholistic portfolio management concept*

*Source: Wendt (2013) (translated by the author)*

The first dimension is the ***strategic management process*** applied to portfolio management. This process covers 5 steps:

1) Strategic portfolio analysis,
2) development of portfolio strategies (options),
3) selection of portfolio strategies,
4) implementation and
5) strategic monitoring and portfolio control.

Wendt demands to cover all steps equally weighted. The existing portfolio management approaches tend to focus one or the other process step in a detailed way but none is covering it end to end. And, the implementation is covered hardly at all.[35]For example the BCG- or GE/McKinsey-matrices put emphasis on the strategic analysis and suggest generic strategies. How these are going to be implemented, managed and controlled is left open.[36]

The existing portfolio management approaches tend to focus one or the other process step in a detailed way but none is covering it end to end. And, the implementation is covered hardly at all.[37] For example the BCG- or GE/McKinsey-matrices put emphasis on the strategic analysis and suggest generic strategies. How these are going to be implemented, managed and controlled is left open.[38]

By taking a market, resource and value dimension (***relevant evaluation dimensions***) into account simultaneously, Wendt intends to overcome the shortcomings of these dimensions if being applied alone.[39] As per Wendt, only an integrated consideration of all three dimensions leads to a "holistic portfolio management". For example a portfolio strategy which is "perfectly" aligned in terms of product-market-fit is useless until the required resources are available.[40]

The third dimension is the (***complete) lifecycle***. For example, the portfolio management concept of Cooper and Wheelwright, Clark specifically focus the process of new product development (beginning of the lifecycle) – both, regarding the creation of an optimal portfolio of new products and the process to steer their development. A strategic analysis of the existing product portfolio and its interrelation with the a set of new products is not covered.[41] Nor is the "day-to-day" management/controlling included.

Last but not least, there is very little attention in the literature regarding the elimination of products. This is especially astonishing as it appears to be obvious that in light of limited resources product eliminations have to be seen as at least an appropriate option to optimize a portfolio.[42]

Last but not least, Wendt's portfolio management concept is applied **across all levels of a company.** The first level is the overall-company level. The objects of examination are SBUs. On the second level – the SBUs themselves – products or product clusters are in scope of the investigation. The existing concepts are preferably applicable for either the analysis of SBUs or products. A concurrent view of both levels and an integrated view is missing in the literature.[43]

The industry focus of this concept is realised by identifying 7 TIME-industry-specific characteristics. These characteristics are then reflected in the portfolio management concept by applying appropriate analyses and instruments to them. Figure 4 summarizes the TIME-specifics and their consideration in the portfolio management concept of Wendt.[44]

[35] Wendt (2013), p. 268
[36] Wendt (2013), p. 199
[37] Wendt (2013), p. 268
[38] Wendt (2013), p. 199
[39] Wendt (2013), p. 122 et seq.
[40] Wendt (2013), p. 90. The market and resource perspective are complementary, where as the value perspective is the monetary equivalent or reflexion of these perspectives.
[41] Wendt (2013), p. 118 et seq.
[42] Literature highlighting this shortcoming and also dealing with a structured elimination process/strategy is for example Homburg, Fürst, Prigge (2010), von der Oelsnitz, Nirsberger (2009), DeFanti, Busch (2009) or Avlonitis, Hart, Tzokas (2000).
[43] Wend (2013), p. 203
[44] Wendt (2013), p. 212 et seq.

| TIME Specifics | Consideration in the Portfolio Management Concept |
|---|---|
| Dynamic industry development/ uncertainty reg. future developments | -Identification of drivers for market developments<br>-Prognosis of market developments<br>-Development of target portfolios to simulate the effect of different portfolio strategies |
| Interdependence between technological progress and product-/market-development | -Inclusion of technology analysis into the strategic analysis<br>-Consideration of technologies and innovations within the portfolio analysis |
| Systems-character and connection of products / blurring boundaries between SBUs | -Avoidance of rigid structures and boundaries during the analysis<br>-Consideration of business models<br>-Clustering of "logical" portfolio objects (products/groups of products) |
| Consideration of potential product overlaps and substitution potentials | - Analysis of substitution potentials |
| Heterogenious competition | -Inclusion of all relevant players into the industry-structure-analysis<br>-Analysis of substitution potentials<br>-Analysis of strategic groups and cooperations |
| Importance of alliances | -Analysis of strategic groups and cooperations<br>-Analysis of resources, funds and core competencies<br>-Consideration of the partner portfolio<br>-Active make-, buy- or cooperate-decision during the development of portfolio strategies |
| Complexity and networking within the value chain | -Analysis of strategic groups and cooperations<br>-Analysis of the value chain and supplier relations |

*Figure 4: Consideration of TIME-specifics in Wendt's portfolio management concept*
*Source: Wendt (2013) (translation by the author).*

Critical appraisal

The big advantage of Wendt's approach is its *comprehensive view* and its *dynamic understanding* of portfolio management. The latter makes it very much suitable for especially highly dynamic markets like the TIME- or ICT-industry. In a convincing way it is argued that instead of optimising each SBU or even each product cluster alone only a simultaneous view at the portfolio as a whole is able to bring the user of this approach anywhere near to an "enterprise-wide optimum". And instead of reducing portfolio management to a 2-dimensional matrix description at a certain point in time a dynamic and continuous management alongside the whole management process and the whole lifecycle of the products is suggested. The result is a comprehensive **framework** for portfolio management with a broad variety of tools suggested for each process step or analysis dimension.

However, this comprehensiveness is – at the same time – somewhat disadvantageous: In practise, it will be very difficult to support all suggested analyses of course (like market, resource/technology and value dimension or the numerous suggested portfolio analysis options: strategic fit, sustainability, risk potential, cannibalization and/or synergy potential, gap analysis, resource intensity, etc.[45]). A recommendation which analysis to prefer or even practical examples in which situation to use which tool is missing or left with the reader/user to decide in the specific situation. And even if for each suggested dimension only one tool would be used for the analysis the way how to combine the conclusions driven from each analysis to an "overall conclusion" is missing. Last but not least it is also left open how the required integrated view of especially an SBU- and SBU-product-portfolio-view is done practically beyond the pure recommendation to do so[46].

### 2.4 The "Active Portfolio Approach"

Before an overview of the practical application of product portfolio management will be provided in the next section an approach pretty similar to Wendt's shall be presented briefly. It is the "active portfolio approach" suggested by Nina Landauer in 2013.[47] This approach is based upon several other works. Describing all these in detail would go far beyond the scope of this paper. Thus, only the main idea is depicted.

Active portfolio approach means at its core that the product portfolio always has to be seen "as a comprehensive whole".[48] It is important to realize and consider the interdependencies of portfolio-related tasks and decision making processes rather than seeing them as "isolated" tasks/processes. This – of course – applied also to all the elements of a portfolio.[49] Such portfolio thinking and mentality has to be adopted throughout the organization and even has to become a part of corporate culture to realize its full impact.[50]

The most important constraint in portfolio decision making is the resource constraint. This idea has its theoretical roots in the resource based or resource-advantage theory.[51] Also Cooper, Kleinschmidt and Edgett highlight the resource restrictions in new product development. Coming from that angle the main task of portfolio management is understood as an allocation challenge of limited resources rather than a content-related decision making for individual products or product groups.[52]

## 3. PORTFOLIO MANAGEMENT IN PRACTICE

There is a lot of research on the practical application of product portfolio management available.[53]

In light of the described development and popularity of portfolio management in strategic management it is not surprising that already back in 1990 Coenenberg, Günther found out that especially *portfolio analysis*

[45] See for example Wendt (2013), p. 237. In the context of decision criteria to select from strategic portfolio options see also p. 250 et seq. or Landauer (2013).

[46] See for example Wendt (2013), p. 238, p. 250 or p. 253.

[47] Landauer (2013), p. 69 et seq.

[48] Barki, Pinsonneault (2005)

[49] See also Kester, Hultink, Lauche (2009) or Bayus, Erickson, Jacobson (2003). The same idea is reflected also within the new product development works of e.g. Cooper, Edgett, Kleinschmidt (1999).

[50] Kester, Griffin, Hultink, Lauche (2011); Tikkanen, Kujala, Artto (2007)

[51] For the resource-advantage theory see Morgan, Hunt (1995).

[52] Landauer (2013), p. 71.

[53] For a more detailed overview see e.g. Wendt (2013), p. 95 et seq., Geßner (2009), p. 33 et seq. or Koob (2000) and the numerous citations in Landauer (2013).

*tools* are widely applied in practise (investigation of the maturity of strategic controlling in 283 German companies)[54]. According to Welge, Al-Laham 75% of 65 major German enterprises use portfolio analysis tools to support strategic management.[55] Research amongst 86 big Swiss companies showed a pretty wide acceptance, too: nearly 50% of the companies used the BCG matrix and more than 25% the GE/McKinsey business screen. [56] All this research focused the strategic management of mainly SBUs.

Next to the mere application of portfolio analysis tools van der Velten, Ansoff elaborated on the question *how* companies use portfolio management to steer their SBUs. They found 3 typical approaches in practise and describe the circumstances under which the respective approach is useful.[57]

For portfolio management of *new product projects* numerous studies investigate the correlation between using the techniques of portfolio management and the company's success. Cooper, Edgett and Kleinschmidt for example, found that so-called "portfolio adopters" in the American pharmaceutical industry significantly outperformed "non-adopters" with regard to their stock performance over a period of 7 years.[58]

A study performed by Killen et al. found a strong correlation between the strict application of the formal portfolio process incl. its tools and the success of new product development. A second very interesting finding of that investigation was that although widely used in practice the application of financial metrics is less important to a successful portfolio management than the usage of for example "bubble diagrams". [59] Especially in light of the pretty strong criticism on the 2-dimensional portfolio analysis tools this is surprising.

An investigation amongst 53 companies of the manufacturing industry in Germany regarding the usage of portfolio management processes and tools for new product projects showed very similar results. A formalised approach (stage-gate-process), strict evaluation criteria and a constant check on strategic alignment and a risk-balanced portfolio of new product projects are highlighted as success factors.[60]

The cited studies very much focus either on portfolio analysis tools, like the GE/McKinsey matrix (or "bubble diagrams" in general) as a supportive tool in decision making processes or on the product development process, like the portfolio management for new products of Cooper et al.

A quite recent, very broad study on the application of product portfolio management for consumer goods not limited to new product development or the use of analytical tools was published by Nina Lindauer in 2013. It includes 265 companies within the 4-years-period 2007 to 2010. The study covers huge parts of the Western hemisphere (e.g. USA, UK, Germany, France, The Netherlands and Belgium) and 18 groups of goods within different branches (e.g. automotive, food & beverages, textile, chemical, consumer electronics, software).[61]

The vast majority (>90%) of companies investigated publish information on their product portfolio in their annual reporting at least once between 2007 and 2010. On average decisions regarding the product portfolio have been mentioned 5,6 times. Nearly 2 thirds (62%) inform regularly and as an established part of their annual report. With reference to Tuggle, Schnatterly, Johnson[62] Landauer draws the conclusion of a positive correlation between attention in the annual reporting and the time spent in top management meetings for product portfolio management issues.[63] Even if such correlation is questioned by the author additional interviews with senior management are underlining the principal relevance of product portfolio management in the investigated sample.[64]

Another result of this study is the finding that nearly 2 thirds of the companies are describing measures to **enlarge** the product portfolio and half of the companies take actions to **modify** it. However, only very few companies report on the **elimination** of products.[65] This seems to be the practical reflection of what has already been pointed out in the previous section: There is a gap in portfolio management literature regarding the elimination of products. This "under-representation" of product elimination is especially interesting as in light of limited resources it is obvious that keeping a product portfolio pretty tight can also be an appropriate means to optimize its value.[66] Although some publications are pointing out this shortcoming already it seems that there is still only little adoption in practise. However, additional

[54] Coenenberg, Günther (1990) and Coenenberg, Günther (1990a). Already back in 1982 Haspeslagh found that 36% of the Fortune-1000- and 45% of the Fortune-500-companies in the US use portfolio management. However, the definition of what"portfolio management" exactly is is not quite clear. (Haspeslagh (1982)

[55] Welge, Al-Laham (1997)

[56] Aeberhard (1996)

[57] Van der Velten, Ansoff (1998)

[58] Menke (2013), p. 35

[59] Killen, Hunt, Kleinschmidt (2007), p. 1868 et seq.

[60] Meyer, Rauen, Tilebein, Gleich (2009), p. 216 et seq.

[61] Landauer (2013)

[62] Tuggle, Schnatterly, Johnson (2010)

[63] See Landauer (2013), p. 60.

[64] Landauer (2013), p. 61 et seq.

[65] Landauer (2013)

[66] For studies on the product elimination see Homburg, Fürst, Prigge (2010) or Varadarajan, DeFanti, Busch (2006).

interviews Landauer conducted with portfolio executives indicate that besides the relatively little attention for product eliminations as per her study and as per the literature there is already at least an awareness of its importance amongst practitioniers.[67]

Apple founder Steve Jobs brought it to the point:

"Deciding what not to do is as important as deciding what to do, (…) that's true for companies and it's true for products."[68]

When Apple's stock price reached its all time high in August 2012 to become the most expensive/valuable company ever there have been numerous publications recapitulating that as one key success factor for this development Jobs rigorously focused Apple's portfolio after having re-joined the company in 1997.[69]

Based upon the findings described above Landauer conducted a second investigation again covering a broad spectrum within the consumer goods industries. However, this study covers Germany only. Based on the feedback of 104 very experienced managers the investigation shows a strong positive correlation between innovative output and success [70] of the companies. [71] This alone is not overwhelmingly surprising as other studies also have proven the high importance of innovation for revenue and profitability. Barczak, Griffin, Kahn for example found out that on average 28% of the revenues and profits of a company are generated by products aged less than 5 years[72] and there is a general agreement in the economic literature on the importance of innovation for companies' success[73]. More interesting is the second finding of Landauer's follow-up study: An "active portfolio approach" leads to significantly higher innovative output and even **directly** influences the success of the applying companies.[74] "Active portfolio management" in this context means foremost to always look at the portfolio as a "comprehensive whole". All decision makingprocesses have to be seen as interdependent rather than a sequence of singular decisions regarding isolated products. Such idea of portfolio management has to be established throughout the whole company in order to be successful. An active portfolio approach requires a simultaneous and comprehensive understanding as well as a permanent overview regarding all interdependent elements within a product portfolio.

Nippa presents a research covering 4 decades of corporate portfolio management. In terms of this paper this would "only" cover the SBU-level as of figure 2. However, findings appear to be very relevant in the context of this discussion as well. As one fundamental question on a strategic corporate level Nippa investigates to what degree corporate portfolio management (the management of a diversified corporation) is performing better or worse compared to the market. In other words: Is there any evidence that internalization is providing superior economic value over market-based coordination. Three potential correlations between degree of corporate diversification and its performance – positive (more diversification leads to more performance), negative (the opposite) or inverse u-shape (positive but decreasing correlation up a certain level and thereafter negative correlation) – have been investigated empirically over the last 4 decades. Interestingly, there are numerous studies supporting each of these correlations although contradicting one and another! Result is that there is no empirical evidence from Nippa's point of view for the superiority of corporate portfolio management. Nippa also found that – paradoxically – academic research on corporate portfolio management is not reflecting the apparent practical need of strategic management acknowledging that still a lot of mergers and acquisitions leading to diversification are business reality. Consequently, he draw the conclusion that academia is challenged to provide concepts and tools how to ensure success of corporate portfolio management.[75]

„While quite willing to criticize the approaches developed by these consultants, scholars have done a rather poor job of creating alternatives for what is clearly a critical corporate need." (Nippa, 2011, p. 28).

Next to this "overall conclusion" Nippa also critically challenged the main critics on corporate portfolio management instruments.[76] Critics are very similar to the ones being outlined in this paper already. Only one area of criticism Nappa evaluated as "true" still is the lack of important variables such as risk and corporate capabilities. This leads to the demand of "updating" and

[67] See e.g. Homburg, Fürst, Prigge (2010), Varadarajan, DeFanti, Busch (2006) or Avlonitis, Hart, Tzokas (2000).

[68] Cited as per Steve Jobs' authorized biography by Isaacson (2001), p. 336.

[69] E.g. New York Times (2012)

[70] Landauer uses explicit definitions for the "innovative output" (German: "Innovationsleistung") and "success". The innovative output is measured on an ordinal scale from 1-7 (e.g. "we constantly launch innovative products"). For "success" the individual, subjective judgement of the panel members as used as a measure. Reported figures in the annual reporting would not be appropriate to measure the influence of portfolio management as other influencing factors would distort it. See Landauer (2013), p. 86 et seq.

[71] Landauer (2013), p. 91 et seq. and 105 et seq.

[72] Barczak, Griffin, Kahn (2009), p. 10 et seq.

[73] E.g. Sorescu, Spanjol 2008 or Pauwels, Silva-Risso, Srinivasan Hanssens (2004)

[74] Landauer (2013), p. 91 et seq.

[75] Nippa (2011)

[76] Nippa (2011), p. 23 et seq.

operationalizing the existing tools/instruments to actual needs.[77]

Applied to the "lower-level" product portfolio management needs it is obvious that both major conclusions apply to this level, too.

Firstly, also for product portfolio management a consequent, rigid, up-to-date approach to portfolio management is required to support the obvious need to manage complex product portfolios especially in a more and more dynamic environment such as in the ICT-/TIMES-industry. In light of digitization affecting almost every industry today one might conclude that this is true for many more industries, too.

Secondly, considering the "right" variables especially risk and capabilities is obviously true on a product level as well. Next to these there might be additional variable to be identified in specific situations. In the ICT-industry one can imagine for example ability to quickly introduce new products, ability to partner across the industry and to establish high-performing eco-systems, ability to apply own strengths to new markets, etc.

As the holistic portfolio management approaches of Wendt and Landauerare still relatively new empirical research on its application or even success is not available yet.

## 4. OUTLINE OF A NEW PRODUCT PORTFOLIO MANAGEMENT APPROACH

The previous sections provided an overview of product portfolio management approaches. The analysis and discussion (especially the third section regarding empirical research) have shown a number of significant shortcomings especially when it comes to the management of a portfolio in highly dynamic markets like the ICT- or TIME-industries.

Major shortcomings are

1) Reflection of high market dynamics
2) Insecurity regarding the "right" dimension of any portfolio evaluation dimensions
3) Lack of holistic coverage along the complete lifecycle
4) Lack of focus on relieving existing portfolio (phase-out of products)
5) Practicability in terms of data availability and practical implementation

As a reflection of these a draft of a portfolio management concept is suggested as outlined in the following figure 5 specifically designed to the needs of ICT- or TIMES-industries.

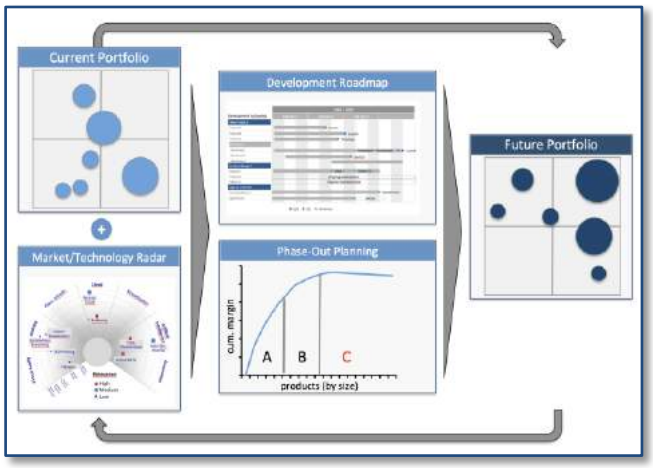


**Figure 5:** *Outline of a Portfolio Management Concept for ICT Products and Services*

The overarching principle of this concept is a **dynamic** view on the portfolio. As outlined in the previous sections the majority of existing portfolio concepts are more or less static. Due to the dynamics of ICT products and services an equally dynamic approach is necessary. Therefore, portfolio management in this concept is understood as a **process** rather than a one-off strategic analysis. This is indicated through the feedback arrows in figure 5. One could also compare this approach with a constant controlling circuit where executed changes are checked against expectations and corrective actions are being taken if necessary. As part of the dynamic view the selected tools need to be practicable in terms of data availability, effort to constantly generate the necessary information, operational complexity and possibility to take corrective actions short-term. Numerous critics of well-known portfolio management tools highlight this aspect. A distinctive quote of Cooper/Edgett/Kleinschmidt brings this to the point: "The sophistication of these methods far exceeds the quality of the data!"[78] So, obviously a major challenge to realize such dynamic process-oriented concept will be to operationalize the outlined tools as practicable as possible without loosing accuracy.

The following describes the 5 major tools depicted in figure 5 in more detail:

In most cases a portfolio management will not be built "greenfield". Thus, everything starts with the view/management of the **"Current Portfolio"**. In the area of ICT-products there is a very strong tendency of convergence. Thus, it is highest importance to always look at products simultaneously or at least to carefully have an eye on products/services already showing or having the potential to converge. Of course, the bigger an ICT-portfolio becomes the more difficult this becomes and the more IMPORTANT this becomes. A manager of a big ICT-portfolio compares this like the situation on a very small airport compared to a very

[77] Nippa (2011), p. 23 et seq.

[78] Cooper, Edgett, Kleinschmidt (2001), p. 46

large international one. Having a small ICT-portfolio allows for decisions based on "gut-feeling". This works as the complexity is relatively small and one or a few people do have the complete overview. However, a big ICT-portfolio is like a big airport. Even for the best pilots it is not possible to operate a plane safely on such airport without additional tool that allow for comprehensive management of all planes, activities, etc.[79]

Due to the immense market dynamics of ICT-productsand the continuously happening convergence it is not practicable to constantly define and monitor specific market segments. Thus, it is already very difficult to monitor market growth as an external dimension, however, still somewhat practicable. To constantly monitor the relative market share is simply not practicable. Thus, for ICT-products it appears much more practicable to choose contribution margin as internal dimension. So, market growth and contribution margin are suggested as portfolio dimensions. The size of the displayed products/services bubbles should represent the current revenue to reflect economic significance. Despite this suggestion most relevant dimensions of a 2- or even more-dimensional management-/controlling-system might be applied in individual cases. Of course, in practice there are numerous exceptions to be considered. During market ramp-up contribution margin will naturally be low so for very new products in a portfolio this has to be considered. On the other side there might be quite "old" products contributing low margins however, needed to be kept in the portfolio due to strong interdependencies to other products especially for existing customers.

At the same time mainly but not exclusively the external environment needs to be continuously monitored with a specific focus on technologies. The **"Market and Technology Radar"** is a permanent reflection of technical but also market developments (external but also of course internal) happening in specific areas that need to be defined according to the ICT-portfolio in question. This includes competitors, customers, the market in general and any public or private institutions driving innovations.

The synthesis of the current portfolio and the market and technology radar "defines" the **"Future Portfolio"**. As this is a highly strategic decision this is of course also very much influenced be corporate strategy. Thus, it is essential that portfolio decisions can only be made with top executive "buy-in". It is also obvious that qualified portfolio decisions need multi-disciplinary input.

The "bridge" between the current and future portfolio has to be built upon the **"Development Roadmap"** and the **"Phase-Out-Planning"**. Both are actually "sides of the same coin", obviously. And one might argue to combine the two in a joint "road-mapping" for product introduction and retirement. However, literature review has shown that a) product phase-out is clearly a shortcoming of portfolio management in general and b) practitioners often highlight the absence of management attention to this point. One of the most concise quotes in this context is from Steve Jobs: "Deciding what not to do is as important as deciding what to do, (…) that's true for companies and it's true for products."[80]

It is proposed to use Cooper's new product development approach as described above briefly for driving the development roadmap. This approach has proven to be the most advanced and successful process for new product development over the last couple of decades. With regards to a tool for Product-Phase-Out it is suggested to use a "simple" ABC-analysis of all products in the portfolio. Of course, this is not sufficient as "the one and only" decision making criteria. There might be for example new products being "not yet" profitable. Or, there might be even "old products" that have to be kept as part of the portfolio because the respective customers buying highly profitable products might still desire these. Nonetheless, this "simple" analysis appears to be appropriate as it puts very high economical pressure on "low-margin-products" or even "loss-makers". Literature review has shown that eliminating products or services is a highly un-popular decision-making process. By nature, many managers might even – consciously or unconsciously – try to avoid such decisions. Therefore, this rather "harsh" tool is proposed.

## 5. CONCLUSION

Product portfolio management in general is widely established in theory and in practice and companies might profit from using it. There is a strong focus on analytical tools and the introduction of new products in practise as well as in the literature. Eliminating or modifying products, incorporating risk, considering high market dynamics and especially practicability on the other hand are clearly "under-represented". This fact was the main driver and motivation to develop this paper more focusing the managerial process and proposing a new approach to product portfolio management specifically designed to the needs of highly dynamic markets such as the ICT-market in need of an integrated view.

A holistic view on portfolio management (in the sense of a simultaneous view on all portfolio items regarding all analyses, processes, decisions and especially resource allocations) improves the success of innovations and even has a direct positive effect on the overall success of the applying companies. Even though

[79] See Landauer (2013), p. 67

[80] Cited as per Steve Jobs' authorized biography by Isaacson (2001), p. 336.

studies might underline this effect it remains difficult and complex to establish such portfolio approach as Nippa's research shows, even though concentrating on the corporate level.[81] This paper suggests a synthesis of academic/theoretical aspiration and practicability. The result is a pragmatic approach to product portfolio management still carrying the need to be adjusted and modified by all users in business management. The proposed processes and tools allow for an individual customization and integration into already existing processes and tools in corporate reality. For example, the criteria to position/evaluate certain products or product groups might vary from company to company. Also, the phase-out criteria might be different. Last but not least there will be a lot of exceptions and constraints to be considered in the phase-out-planning. Key to success will be more a rigid and consequent application and execution along fundamental principles rather than an ultimate sophistication of processes and tools.

## REFERENCES

Aeberhard, Kurt (1996): Strategische Analyse. Empfehlungen zum Vorgehen und zu sinnvollen Methoden-Kombinationen; Bern (1996).

Amelingmeyer, Jenny (2009): Gestaltungsfelder und Herausforderungen des Produktportfoliomanagements; in: Schmahl, Christian M.; Gleich, Ronald (Eds.): Produktportfoliomanagement; p. 3-22; Lichtenberg 2009.

Anand, Bharat N.; Shachar, Ron (2004): Brands as Beacons: A New Source of Loyalty to Multiproduct Firms; in: Journal of Marketing Research, Vol. 41, No. 2, p. 135-150.

Ansoff, Igor H. (1965): Corporate Strategy; New York 1965.

Aumayr, Klaus (2013): Erfolgreiches Produktmanagement – Toolbox für das professionelle Produktmanagement und Produktmarketing; Wiesbaden 2013.

Avlonitis, George J.; Hart, Susan J.; Tzokas, Nikolaos X. (2000): An Analysis of Product Deletion Scenarios; in: Journal of Product Innovation Management, Vol. 17, No. 1, p. 41-56.

Bach, Norbert (2009): Strategische Produktportfolioplanung auf der Basis von Nachfrage-, Potential- und Positionslebenszyklen;in: Schmahl, Christian M.; Gleich, Ronald (Eds.): Produktportfoliomanagement; p. 41-64; Lichtenberg 2009.

Barczak, Gloria; Griffin, Abbie; Kahn, Kenneth B. (2009): PERSPECTIVE: Trends and Drivers of Success in NPD Practices: Results of the 2003 PDMA Best Practices Study; in: Journal of Product Innovation Management, Vol. 26, No. 1, p. 3-23.

Barki, Henri; Pinsonneault, Alain (2005): A Model of Organizational Integration, Implementation Effort and Performance; in: Organization Science, Vol. 16, No. 2, p. 165-179

Bea, Franz Xaver; Haas, Jürgen (2009): Strategisches Management; Stuttgart 2009.

Bordley, Robert (2003): Determining the Appropriate Depth and Breadth of a Firm's Product Portfolio; in: Journal of Marketing Research, Vol. 40, No. 1, p. 39-53.

Coenenberg, Adolf G.; Günther, Thomas (1990): Der Stand des strategischen Controllings in deutschen Unternehmen; Erftstadt (1990).

Coenenberg, Adolf G.; Günther, Thomas (1990a): Der Stand des strategischen Controllings in der Bundesrepublik Deutschland: Ergebnisse einer empirischen Untersuchung; in: Die Betriebswirtschaft 50 (1990), Vol. 4, p. 459-470.

Cooper, Robert G. (2010): Top oder Flop in der Produktentwicklung – Erfolgsstrategien: Von der Idee zum Launch; Weinheim 2010.

Cooper, Robert G.; Edgett, Scott J.; Kleinschmidt, Elko J. (2001): Portfolio Management for New Products; Cambridge 2001.

Cooper, Robert G.; Edgett, Scott J.; Kleinschmidt, Elko J. (1999): New Product Management: Practices and Performance; in: Journal of Product Innovation Management; Vol. 16, No. 4; p. 333-351.

Cooper, Robert G.; Kleinschmidt, Elko J. (1988): Resource Allocation in the New Product Process; in: Industrial Marketing Management, 17 (3), pp. 249-262; 1988.

Cooper, Robert G.; Kleinschmidt, Elko J. (1986): An Investigation into the New Product Process: Steps, Deficiencies and Impact; in: Journal of Product Innovation Management; 3(2); pp. 71-85.

Devinney, Timothy M.; Stewart, David W. (1988): Rethinking the product portfolio: A generalized investment model; in: Management Science, Vol. 34; No. 9; p. 1080-1095.

Devinney, Timothy M.; Stewart, David W.; Shocker, Allan D. (1985): A Note on the Application of Portfolio Theory: A Comment on Cardozo and Smith; in: Journal of Marketing, Vol. 49; No. 4, p. 107-112.

Dunst, Klaus H. (1983): Portfolio-Management: Konzeption für die strategische Unternehmensplanung, Berlin 1983.

Gerpott, Torsten (2006): Strategisches Technologie- und Innovationsmanagement; Stuttgart 2006.

Geßner, Christian (2009): Produkt- und Projektportfoliomanagement – Stand der Literatur; in: Schmahl, Christian M.; Gleich, Ronald

[81] Nippa (2011)

(Eds.): Produktportfoliomanagement; p. 23-39; Lichtenberg 2009.

Grimm, Reinhard; Schuller, Markus; Wilhelmer, Raimund (2014): Portfoliomangement in Unternehmen – Leitfaden für Manager und Inverstoren; Wiesbaden 2014.

Hahn, Dietger (2006): Zweck und Entwicklung der Portfolio-Konzepte in der straegischen Unternehmensplanung; in: Hahn, Dietger; Taylor, Bernhard (Eds.) (2006): Strategische Unternehmensplanung – Strategische Unternehmensführung, p. 215-248., Berlin 2006.

Harland, Peter E. (2009): Das Portfolio als Momentaufnahme: Analyse und Visualisierung komplexer Entscheidungssituationen; in: Schmahl, Christian M.; Gleich, Ronald (Eds.): Produktportfoliomanagement; p. 101-126; Lichtenberg 2009.

Haspeslagh, Philippe (1982): Portfolio Planning: Uses and Limits; in: Harvard Business Review (1982), January-February, p. 58-72.

Herrmann, Andreas; Huber, Frank (2013): Produktmanagement – Grundlagen, Methoden, Beispiele; Wiesbaden 2013.

Herzwurm, Georg; Pietsch, Wolfram (2009): Management von IT-Produkten – Geschäftsmodelle, Leitlinien und Werkzeugkasten für softwareintensive Systeme und Dienstleistungen; Heidelberg 2009.

Kester, Linda (2010): New Product Development Portfolios – Identifying the antecedents and consequences of decision-making processes; Delft 2010.

Kester, Linda; Hulting, Erik J.; Lauche, Kristina (2009): Portfolio decision-making genres; A case study; in: Journal of Engineering and Technology Management, Vol. 26, No.. 4, p. 327-341.

Killen, C.; Hunt, R.; Kleinschmidt, E. (2007): Managing the New Product Development Project Portfolio: A Review of the Literature and Empirical Evidence; in: PICMET Proceedings, 5-9 August 2007, p. 1864-1874; Portland (2007).

Koob, Clemens (2000): Portfoliomanagement und Wertorientierung; Herrsching, 2000.

Landauer, Nina (2013): Produktportfoliomanagement – Explorative Bestandsaufnahme und empirische Untersuchung der Erfolgswirkung; in: Schriftenreihe des Instituts für Marktorientierte Unternehmensführung (IMU), Universität Mannheim; Wiesbaden 2013.

Lei, Jing; Dawar, Niraj; Lemmink, Jos (2008): Negative Spillover in Brand Portfolios: Exploring the Antecedents of Asymmetric Effects; in: Journal of Marketing: Vol. 72, No. 3, p. 111-123.

Lennertz, Dieter (2006): Produktmanagement – Planung, Entwicklung, Vermarktung – Wie sie mit innovativen Produkten den Unternehmenserfolg steigern; Frankfurt am Main 2006.

Macharzina, Klaus; Wolf, Joachim (2010): Unternehmensführung. Das internationale Managementwissen; Konzepte – Methoden – Praxis; Wiesbaden 2010.

Macharzina, Klaus (1999): Unternehmensführung: Das internationale Managementwissen; Konzepte – Methoden – Praxis; Wiesbaden 1999.

Markowitz, Harry M. (1952): Portfolio Selection; in: Journal of Finance, vol. 7 (1952), no. 1, p. 77-91.

Markowitz, Harry M. (2008): Portfolio Selection – Die Grundlagen der optimalen Portfoli-Auswahl; München 2008.

Menke, Michael M. (2013): Making R&D Portfolio Management More Effective; in: Research Technology Management, September-October 2013, p. 34-43.

Meyer, Sven; Rauen, Hartmut; Tilebein, Meike; Gleich, Ronald (2009): Ergebnisse einer explorativen Befragung des VDMA zum Portfoliomanagement; in: Schmahl, Christian M.; Gleich, Ronald (Eds.): Produktportfoliomanagement; p. 209-240; Lichtenberg 2009.

New York Times (2012): Apple Sets Stock Market Record – With Asterics; The New York Times August, 21st 2012.

Last Internet retrieval 24.2.2015: http://query.nytimes.com/gst/fullpage.html?res=9F0CE0DC173AF932A1575BC0A9649D8B6

Nippa, Michael (2011): Zur Notwendigkeit des Corporate Portfolio Management: Eine Würdigung der wissenschaftlichen Forschung der letzten vier Jahrzehnte; in: Freiberg Working Papers, No. 2011,02; Freiberg 2011.

Packmohr, Sven (2009): Ansatz zur Entwicklung einer Portfolioplanung in der digitalen Ökonomie; in: Schmahl, Christian M.; Gleich, Ronald (Eds.): Produktportfoliomanagement; p. 65-80; Lichtenberg 2009.

Pauwels, Koen; Silva-Risso, Jorge; Srinivasan, Shuba; Hanssens, Dominique M. (2004): New Products, Sales Promotion and Firm Value: The Case of the Automobile Industry; in: Journal of Marketing, Vol. 68, No. 4, p. 142-156.

Pepels, Werner (2013): Produktmanagement – Produktinnovation – Markenpolitik – Programmplanung - Prozessorganisation; München 2013.

Pfeiffer, Werner; Metze, Gerhard; Schneider, Walter; Amler, Robert (1989): Technologie-Portfolio zum Management strategischer Zukunftsgeschäftsfelder; in: Pfeiffer, Werner (Ed.) (1989): Innovative Unternehmensführung, Planung, Durchführung und Kontrolle von Innovationen; Göttingen 1989.

Reindel, Susanne (2009): Produktportfoliomanagement bei der Lufthansa Cargo AG – Einbindung in die Geschäftsprozesse und Strukturen; in: Schmahl, Christian M.; Gleich, Ronald (Eds.): Produktportfoliomanagement; p. 179-198; Lichtenberg 2009.

Schepp, Ralph; Herold, Robert; Schmahl, Christian M. (2009): Produktportfoliomanagement in der Telekommunikationsindustrie – EBIT versus Innovation?; in: Schmahl, Christian M.; Gleich, Ronald (Eds.): Produktportfoliomanagement; p. 127-160; Lichtenberg 2009.

Sloboda, Alexander (2009): Portfoliomanagement in der Energiewirtschaft am Beispiel EnBW; in: Schmahl, Christian M.; Gleich, Ronald (Eds.): Produktportfoliomanagement; p. 199-208; Lichtenberg 2009.

Sorescu, Alina B.; Chandy, Rajesh K.; Prabhu, Jaideep C. (2003): Sources and Financial Consequences of Radical Innovation: Insights from Pharmaceuticals; in: Journal of Marketing, Vol. 67, No. 4; p. 82-102.

Tikkanen, Henrikki; Kujala, Jaakko; Artto, Karlos (2007): The marketing strategy of a project-based firm: The Four Portfolio Framework; in Industrial Marketing Management, Vol. 36, No. 2; p. 194-205.

Van der Velten, Thorsten; Ansoff, Igor H. (1998): Managing Business Portfolios in German Companies; in: Long Range Planning 31 (1999), no. 6; 879.885.

Varadarajan, Fajan; DeFanti, Mark P.; Busch, Paul S. (2006): Brand Portfolio, Corporate Image and Reputation: Managing Brand Deletions; in: Journal of the Academy of Marketing Science; Vol. 34, No. 2, p. 195-205.

Von der Oelsnitz, Dietrich; Nirsberger, Ina (2009): Marktaustrittsentscheidungen im Rahmen des Produktportfoliomanagements; in: Schmahl, Christian M.; Gleich, Ronald (Eds.): Produktportfoliomanagement; p. 81-100; Lichtenberg 2009.

Welge, Martin K.; Al-Laham, Andreas (1999): Strategisches Management – Grundlagen, Prozess, Implementierung; Wiesbaden 1999.

Welge, Martin K.; Al-Laham, Andreas (1997): Stand der strategischen Planungspraxis in der deutschen Industrie. Bericht über eine empirische Untersuchung; in: Zeitschrift für betriebswirtschaftliche Forschung, 49 (1997), no. 9, p. 790-806.

Wendt, Susanne (2013): Strategisches Portfolio-Management in dynamischen Technologiemärkten – Entwicklung einer Portfoliomanagement Konzeption für TIME-Unternehmen; in: Becker, Wolfgang; Weber, Jürgen (Eds.): Unternehmensführung & Controlling; Wiesbaden 2013.

Wind, Yoram; Mahajan, Vijay; Swire, Donald J. (1983): An Empirical Comparison of Standardized Portfolio Models; in: Journal of Marketing, Vol. 47, No. 2, p. 89-99.

Wind, Yoram; Robertson, Thomas S. (1983): Marketing Strategy: New Directions for Theory and Research; in: Journal of Marketing, Vol. 47, No. 2, p. 12-25.