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Uncovering business portfolio transformation processes:
Development of a metric to measure and quantify business portfolio transformations

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Abstract

Research on business portfolio restructuring has largely focused on antecedents and outcomes of single events such as acquisitions and divestitures, and on performance implications of diversification or refocusing strategies. Yet, longitudinal studies that investigate the transformation process of a business portfolio over time and its underlying strategic decision processes are rare due to a lack of an adequate metric that allows to measure and quantify major changes in a firm's business portfolio. The objective of this paper is to fill this gap through developing and proposing a systematic measurement system that allows to (a) identify firms that conduct a transformation of their business portfolio, (b) continuously measure the process and quantify the magnitude of a portfolio transformation, (c) measure both yearly and perennial changes in a business portfolio composition, and (d) determine a firm-individual transformation period with a clear transformation start date and end date. Furthermore, its practical applicability is illustrated based on a sample of the 100 largest European firms and with an in-depth analysis of Vivendi's business portfolio transformation from a construction to a media conglomerate. Concluding, further application areas of the metric as well as several directions for future research in this field are proposed.

Zusammenfassung

" Entwicklung einer Metrik zur Messung und Quantifizierung von Geschäftsportfoliotransformationen "

Die Forschung über Geschäftsportfoliorestrukturierung hat sich hauptsächlich auf Auslöser und Ergebnissen von einzelnen Transaktionen wie zum Beispiel Acquisitionen und Veräußerungen und auf Performance- Auswirkungen von Diversifikations- oder Refokussierungsstrategien fokussiert. Longitudinale Studien, die einen Transformationsprozess eines Geschäftsportfolios und die damit verbundenen Entscheidungsprozesse über einen Zeitraum untersuchen sind selten, hauptsächlich weil keine adäquate Metrik existiert, die es erlaubt Veränderungen eines Geschäftsportfolios zu messen und zu quantifizieren. Das Ziel dieser Studie ist es diese Lücke durch die Entwicklung einer solchen Metrik zu schließen. Diese erlaubt (a) Unternehmen, die eine Portfoliotransformation durchführen zu identifizieren, (b) kontinuierlich diesen Prozess und die Stärke der Portfoliotransformation zu messen, (c) sowohl jährliche als auch mehrjährige Veränderungen in einem Geschäftsportfolio zu mesen, und (d) eine unternehmensindividuelle Transformationsperiode mit einem eindeutig definierten Transformationsstart- und –endzeitpunkt zu bestimmen. Darüber hinaus wird die praktische Anwendung der Metrik anhand einer Auswahl der 100 größten europäischen Unternehmen und einer detaillierten Analyse von Vivendi's Geschäftsportfoliotransformation von einem Bauunternehmen hin zu einem Medienunternehmen illustriert. Abschließend werden weitere Anwendungsgebiete der Metrik sowie vielfältige zukünftige Forschungsgebiete aufgezeigt.

1 Introduction

Multi-business firms frequently have to readjust and restructure their portfolio of business units in order to adapt to technological and market changes and to increase their performance. These business portfolio restructurings can take on different forms from single acquisitions or divestitures, over diversification and refocusing strategies, to very complex and substantial restructurings that reflect "dramatic transformations […] involving the recreation of a qualitatively different organization, with a new purpose and form" (Byerly, Lamont & Keasler, 2003: 535). The importance of business portfolio management respectively restructuring varied over time in accordance with changing paradigms (Nippa, Pidun & Rubner, 2011). While the heydays of portfolio restructuring date back to the 1960s and 1980s when many multi-business firms undertook diversification and refocusing efforts, respectively, it is still an ongoing strategic issue of high scholarly and practical relevance (Pidun, Kruehler, Untiedt, Rubner & Nippa, 2010). Especially, coping with an increasingly competitive and rapidly changing environment requires firms to continuously challenge and reform their business models and portfolios in order to achieve a competitive advantage (Byerly et al., 2003; Liao, 2005). Some companies are even reinventing themselves by striking new strategic paths, as for instance illustrated by Preussag's transformation from a steel producer to a company entirely focusing on tourism (Dittmann, Maug & Schneider, 2008).

Theory-based and empirical research in this area, however, primarily focuses on antecedents (e.g., Markides 1992; Wiersema 1995; Bigley and Wiersema 2002) and outcomes (e.g., Hoskisson & Turk, 1990; Schoenberg, 2006; Ambrosini, Bowman & Schoenberg, 2011) of such portfolio restructurings. Moreover, prior research predominantly dealt with portfolio diversification or refocusing strategies and with single events such as acquisitions and divestitures. Beyond mere acquiring or selling activities, business portfolio restructuring also involves strategically intended sets and combinations of acquisitions and divestitures with the goal to develop a new configuration of the corporation (Bowman & Singh, 1993; Bowman, Useem & Bhadury, 1999). Yet, research on the process-side of a portfolio transformation "as a sequence of events that describe how things change over time" (Van de Vende, 1992:169) as well as longitudinal study designs have largely been neglected by researchers so far - with rare exceptions such as Brauer (2009), who conducted process-related research on the involvement of corporate and divisional managers in the divestiture process. Consequently, a

continuous view of changes rather than a movement from one state to another as usually applied in literature (Weick & Quinn, 1999) is underrepresented so far (Pettigrew, 2001) and thus little is known about how firms differ with regard to planning and managing a portfolio transformation. In this respect, basic questions regarding transformation processes such as the following remain unexplored: What is the typical transformation magnitude of a business portfolio over a certain time period and how can a major transformation be distinguished from ongoing "regular" adaptations in a portfolio over time? How long does a transformation typically take? How do firms transform their business portfolio – in several small steps and continuously, in one major step or in a few significant steps every couple of years? Are transformations typically based on organic or acquisitive changes to the portfolio? Answers to such transformation process-related questions would be valuable to improve our understanding of business portfolio restructuring and more generally enhance corporate strategy research. To answer these questions adequately, however, a sophisticated metric is needed that is able to shed light on the process characteristics and especially allows to (a) identify firms that conduct a strong transformation of their business portfolio, (b) continuously measure the process and quantify the magnitude of a portfolio transformation, (c) measure both yearly and perennial changes in a business portfolio composition, and (d) determine a firm-individual transformation period with a clear transformation start date and end date. Measures that are applied in prior research in the field of portfolio restructuring are however not suitable to serve with an answer to those questions. Those measures predominantly measure discrete instead of continuous events and are usually applied to e.g. identify refocusing firms within a given sample, but are not able to describe the refocusing process concerning intensity and time duration and thus cannot fulfill these requirements. Therefore, the present study developed a metric that overcomes these shortages and contributes to a better understanding of business portfolio transformation processes.

In the following sections, the paper will review existing metrics and discuss their limitations, define requirements for an effective process metric, describe the functionality of the developed metric in detail and illustrate its key characteristics. In the following, the practical applicability of the metric will be demonstrated based on a sample of 100 firms and also based on one in-depth analysis of one firm. I will then conclude with a critical acclaim of the metric and options for future research and further development needs of such metrics.

2 Review and evaluation of existing metrics in portfolio restructuring research

In strategic management and especially portfolio restructuring research, many metrics have been developed and widely applied in order to predominantly identify firms that are actively engaged in portfolio restructuring efforts within a given sample, however not to evaluate the portfolio restructuring process itself – i.e. analyses of subsequent changes in the composition of a firm's business portfolio over a specific period of time and/or length of time of a restructuring event. The different evaluation criteria, measurement systems, and metrics applied will be reviewed with regard to their application for the restructuring types of *refocusing*, *diversifying* and *repositioning*. Furthermore their suitability for process-related research will be discussed in the *evaluation* subsection.

Refocusing. Refocusing firms have been identified by measures such as the divestment of more than two businesses (e.g. Hoskisson, Johnson & Moesel, 1994; Johnson, Hoskisson & Hitt, 1993), the divestment of at least 10% of their asset base (e.g. Hoskisson & Johnson, 1992) and/or reduced levels of diversification either determined by changes in categorical measures such as Rumelt's categories (e.g. Markides, 1993, 1995) or continuous measures such as the entropy index (e.g. Markides, 1992, 1993; Bigley & Wiersema, 2002). Combinations of different criteria with an additional consideration of the intensity of divestitures are rather rare. Hoskisson et al. (1994) and similarly Bethel & Liebeskind (1993) apply for instance three different variables to determine divestiture intensity: First, the number of business divested. Second, the percentage of sales divested which gives information of the intensity and size of the divested unit and also allows comparing different intensities among firms. And third, the time spent restructuring, which is based on announcements rather than on a metric that determines a restructuring period. Furthermore, Liebeskind, Wiersema and Hansen (1992) measure business portfolio reorganization by examining changes in production capacity at the four digit SIC code level.

Diversifying. Diversifying firms have been identified by measures such as the acquisition of at least two businesses as well as a 10% increase in diversification degree (e.g. Liao, 2004; Bergh, 1998) or the pure annual increase in the number of operating segments (e.g. Hyland, 2008). There are, however, only few studies that examine a strategic move towards a more diversified business portfolio at all, i.e. the relative increase in the degree of diversification and e.g. the performance outcomes of this intention – rare examples are the studies of Bergh (1998), Bergh & Lawless (1998), Liao (2004, 2005) and Singh, Mathur, Gleason & Etebari (2001). Most diversification studies focus on a comparison of performance of already

diversified firms and focused firms (e.g. Hoskisson & Hitt, 1990; Palich et al., 2000; Nippa et al., 2011), but not on the outcome of a firm strategy to get more diversified.

Repositioning. A repositioning strategy results from a drastic shift in a firm's corporate strategy that abandons former strategies and structures and aims to building-up a new core business and, thus, targets new markets and industries (Byerly et al., 2003; Decker & Mellewigt, 2010). Of the few studies investigating such a strategy at all, repositioning firms have been identified by announcements (e.g. Byerly et al., 2003) as well as with a change in the main industry classification code between the beginning and the end of the sample period (e.g. Decker & Mellewigt, 2010).

Evaluation. With no exception all reviewed measures are predominantly used to identify and classify a firm as refocusing, diversifying or repositioning within a given sample. They were applied with the proxies of asset increase or reduction, increase or decrease in diversification level or a shift in the main SIC code. Yet the measures themselves do not provide any information about changes in the portfolio composition, do not continuously measure these and quantify the magnitude of these changes over time. Although, for example, the diversification level can be measured continuously over a certain period, the measure itself lacks the ability of concurrently measuring other characteristics of a restructuring process such as the quantification of changes in a portfolio composition. Especially insights to a repositioning strategy process, due to its radical changes and often complex interplay of acquisitions and divestitures, would be of great interest. The applied measures, however, only show a shift in the main SIC code of a firm, but do not provide any information about the relevance and temporal sequence of acquisition and divestitures within the strategic change process, about the intensity of how much and which parts of the business portfolio have been changed and how long this process takes. Rare examples that e.g. quantify divestiture intensity are the studies by Hoskisson et al. (1994) and Bethel & Liebeskind (1993). Furthermore the reviewed measures are not able to determine the exact time period of a restructuring effort, but only yield the information that a certain firm has restructured during a sample period. Finally, prior measures do not capture turnover between portfolio businesses when a firm concurrently acquires and divests businesses of similar size as there would be no change in the overall size of the company, although the focus might have shifted completely (Liebeskind et al., 1992). Thus, analyzing and describing such a process in terms of changes in the composition of a firm's business portfolio and determination of the time duration of a restructuring event

requires a different metric which has to fulfill basic process related requirements as defined in the next section.

3 Requirements for a process-related transformation metric

To enhance the understanding of portfolio transformation processes and overcome the limitations of previous metrics applied in the field of portfolio restructuring research discussed above, an advanced metric has to fulfill specific requirements. These requirements refer to both the technical specification and functionality of the metric itself and the goals that have to be fulfilled by the metric when applying it in practice.

Requirement 1: Precisely measure and quantify the degree of a portfolio transformation. The metric has to be able to detect changes in the portfolio where the total size remains equal after a restructuring because a firm can e.g. concurrently acquire and divest businesses of the same size (Liebeskind et al., 1992) and thus transforming its business portfolio without changing the total size of the portfolio. Furthermore, as the driver behind a business portfolio transformation should be a strategic change, the metric should only measure real changes in the composition of a portfolio and differentiate between a portfolio transformation and a portfolio extension, by e.g. acquiring exactly the same composition of business and thus only double the size of the portfolio but not changing it in a strategic way. Therefore, and to address these two points – which have been limitations to prior metrics – the measurement of a portfolio transformation has to be based on changes in the portfolio composition of a firm (e.g. in terms of divisions or reportable segments). Furthermore, the metric has to be able to quantify these changes and thus evaluate the degree of a portfolio transformation in order to compare different firms according to the magnitude of their transformations.

Requirement 2: Measure Portfolio transformations on a continuous basis and distinguish between annual and perennial changes. The metric has to be able to continuously measure and quantify changes in the composition of a portfolio and thus allowing longitudinal studies of the development of a portfolio transformation over time (Pettigrew, 2001). Furthermore, changes have to be measured on a year to year basis, but also on a long-term basis in order to quantify long-term changes over a whole period and analyze the impact of annual changes on long-term changes within the composition of a portfolio. To avoid incorrect measurements, the metric has to be non-transitive, i.e. that the addition of annual changes during a period does not necessarily equal the total change from year one to the final year of that period

within a portfolio composition. The non-transitivity then avoids adding-up annual changes that might jump back and forth year by year, and thus do not change anything within the portfolio in sum over the long-term as the changes neutralize themselves year by year. This requirement ensures to filter out simple fluctuations and not to misinterpret it as real transformations. Additionally the continuous measurement is necessary to detect different patterns of transformations in order to analyze when major parts of the portfolio are being changed during the transformation period – and thus give new process-related insight on the time order of transactions and the temporal sequence and interplay of acquisitions and divestitures.

Requirement 3: Capture organic and inorganic transformations. The metric has to allow the identification and measurement of both organic and inorganic transformations. Thus it cannot be based on, for instance, asset reductions or acquisition and divestiture intensities, as these are not able to differentiate from organic changes within a portfolio. Therefore, in line with *requirement 1*, the measurement of a portfolio transformation has to be based on changes in a firm's business portfolio composition.

Requirement 4: Determine a firm-individual transformation start and end year (transformation period). Prior metrics have been applied to detect changes in e.g. diversification degree or total assets at the beginning and at the end of a sample period without determining when exactly that change took place and how long it took to achieve this change. As the metric however aims at measuring and quantifying a portfolio transformation, the measurement has to be done over a defined time period. Thus, a process-view of portfolio transformations requires a defined start and end year of a transformation, so that the transformation is accomplished within a defined transformation period and cannot be ongoing. Therefore, beyond measuring and quantifying a portfolio transformation, the metric has to allow determining a firm-individual transformation period based on objectively derived criteria. This strongly enhances the process-view of transformations as it allows e.g. to compare different transformations according to the duration of the transformation.

Requirement 5: Identify portfolio transformations. The metric has to allow for the identification of portfolio transformations within a given sample like the other applied metrics did, and thus be able to identify and quantify portfolio transformations at the same time.

Based on these defined requirements, it arises that all of the reviewed metrics in the prior chapter are only able to fulfill parts of the defined requirements, yet not all of them concurrently.

4 Methodology – Development of a transformation metric

The functionality of the metric is explained and developed in three steps. First, the illustration of the technical specifications of the metric and its basic functionality, i.e. how a transformation is generally being measured (*requirements 1 – 3*). Second, the determination of a so-called period-parameter which results in the determination of a firm-individual transformation start and end year and thus a transformation period (*requirement 4*).Third, the determination of a so-called transformation cut-off-parameter which allows the identification of portfolio transformations within a given sample of firms by defining a cut-off criteria that distinguishes firms that conduct a major portfolio transformation from those only experiencing some fluctuations in the portfolio composition (*requirement 5*).

1. Technical specifications and basic functionality of the metric. According to the defined requirements, the metric allows to measure changes in portfolio compositions in terms of shares of segment sales over time, i.e. between the years t and T (T>t).

If $s_{k,t}$ $\left(s_{k,T}\right)$ is the share of sales of segment k (k = 1,…, n) in year t (T), the change of segment k's share of total sales can be measured by defining the overlap between segment k's share of sales in t and T, $OL_k\left(t,T\right)$. The overlap is then defined as

$$OL_k\left(t,T\right) = \min(s_{k,t}\,;\,s_{k,T})$$

The minimum function ensures that the smaller share of both years' sales is counted for as 'what amount of share in segment sales in year T has already existed in year t?'. The overlap between years t and T for the whole business portfolio (all segments) of a firm, $POL(t,T)$, can then be defined as the sum of all n segment overlaps and thus leads to the portfolio overlap

$$POL(t,T) = \sum_{k=1}^{n} OL_k\left(t,T\right) \quad \text{with } 0 \leq POL(t,T) \leq 1$$

A value of one means that all segments have identical shares of total sales for both years t and T, whereas a value of 1 means that all segments in T have not existed in year t. As the

research interest focuses on changes in the composition of a firm's business portfolio between t and T rather than unchanged elements (= the overlap), the transformation of a firm's business portfolio, $\text{TFM}(t, T)$, is defined as 1 minus the portfolio overlap. The transformation of a firm's business portfolio between t and T can then be expressed as

$$\text{TFM}(t, T) = 1 - \text{POL}(t, T) = 1 - \sum_{k=1}^{n} \min \left(s_{k,t} ; s_{k,T} \right)$$

A simple example may help to illustrate the metric. Consider a hypothetical firm with two operating segments whose shares of the firm's total sales in year t are equally distributed with $s_{1,t} = s_{2,t} = 50\%$. In year T, the firm has expanded its portfolio from two to three operating segments, and has put more emphasis on segment 1 relative to segment 2. Consequently at the end of the year, s1 represents 70%, s2 represents 20% and the new segment s3 represents 10% of total firm sales. Thus, the portfolio overlap (POL) as the sum of all segment overlaps s1 = min (50%; 70%), s2 = min (50%; 20%) and s3 = min (0%; 10%) amounts to 70% of sales in T that already existed in t and consequently to a transformation of the business portfolio of 30% between year t and T.

2. Identification of transformation period (period-parameter). To identify the largest transformation magnitudes and determine the transformation period for a given firm within a given sample period of S years, all possible time slices d (d = 1,2,,..,Y), i.e. all possible year to year combinations (from one year time slices between year 1 and 2, year 2 and 3 etc. up to Y-1 year time slices between year 1 and Y), need to be tested for the respective transformation magnitude per firm. The test is thus being done ranging from one year transformations up to a maximum of Y year transformations (Y = S-1 in case every possible time slice is being tested). Testing a maximum of Y year transformations during a sample period of S years leads to

$$Y * \left(S - \left(\frac{(Y + 1)}{2} \right) \right)$$

time slice tests per firm. After having identified all possible transformation magnitudes, one needs to reduce this number of transformations in the next step to only consider the maximum transformation of each time slice d.

Let $\text{TFM}(d)$ be the maximum transformation magnitude of each time slice d (d = 1,2,…,S-1) within a given sample with the transformation duration of d years between year i and year j (d

= 1,2,…,S-1; i = 1,2,…,S-1; j = 1,2,…,S), S the sample period, n the number of segments, $s_{k,i}$ the share of segment k in year i and $s_{k,j}$ the share of segment k in year j. TFM(d) is then defined as:

$$\text{TFM(d)} = \max \left\{ 1 - \sum_{k=1}^{n} \min \ (s_{k,i}\ ; \ s_{k,j}) \ \middle| \ j = i + d; j \leq S; i \in \{1, \dots, S - d\} \right\};$$

$$d = 1, \dots, S - 1$$

After having determined the maximum transformation of each time slice d, TFM(d), with the respective start and end years i and j, one needs to select one of these d transformations as the final one and select one specific time slice. Only selecting the largest transformation of all time slices d however could lead to the selection of a transformation time slice whose magnitude is only marginally stronger, but the transformation period is much larger than the second strongest one. Therefore a second criterion needs to be applied: The larger time slice is only selected if its transformation is significantly larger. For a transformation to be significantly larger it has to add an additional yearly transformation magnitude that exceeds an objectively defined percentage value. As the metric is applied to a sample of firms, it is obvious to select a parameter that can objectively be derived from the characteristics of this sample. Therefore potential objective parameters can be the average or the median value of the transformation magnitudes of the full sample. The parameter has been selected to be 50% larger than the median annual transformation magnitudes of the full sample as this parameter fulfills three important requirements: First, it is an objective parameter; second, the median itself is very robust against outlier which is beneficial compared to average values; and third, 1.5 times the median of the whole sample is large enough and more adequate than just the median as it requires 50% more transformation in this additional year than half of the whole sample does per year. In this way, a transformation period for each firm can objectively be defined.

Let d_f be the time slice with the transformation magnitude that fulfills this criterion, Y be the maximum number of time slices and MS 1.5 times the median of the annual transformations of the full sample, then d_f is defined as:

$$d_f = \{d \mid \max\{\text{TFM(d)} + \ (Y - d) * \text{MS}\}; d \in \{1, \dots, Y\}\}$$

As illustrated in Figure 1, the formula compares the maximum transformation of each time slice d (TFM(d)) plus the additional parameter MS times the years which are between the largest time slice Y and the respective time slice d. Consequently, this time slice d is selected as the final time slice d_f which exhibits the maximum additional-parameter-adjusted transformation magnitude in year Y. After having determined the time slice with the maximum relative transformation magnitude, $TFM^*(d_f)$ is then defined as the final selected and maximum transformation magnitude.

Figure 1: Illustration of determination of final and maximum transformation
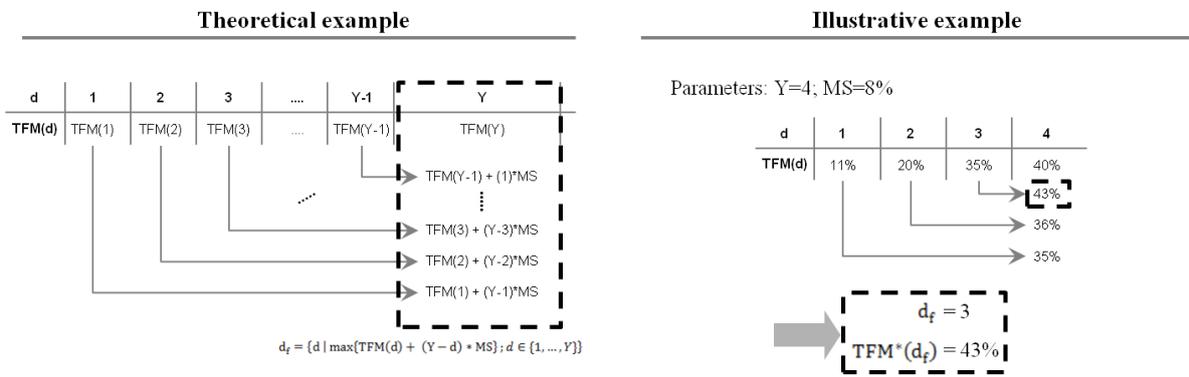
*3. Identification of a business portfolio transformation (transformation cut-off parameter).* The definition of the cut-off parameter is necessary to distinguish firms that conduct a major business portfolio transformation from those that only experience some normal portfolio adaptations within a given sample of firms. As there is no objective criterion in the literature on how to define a transformation and distinguish it from normal portfolio adaptations, the study proposes to apply a graphical solution similar to the application of the elbow criterion for cluster analyses. When plotting the distribution of the transformation magnitudes of all sample firms on the x-axis against the percentage of firms that reach the respective magnitude on the y-axis, the elbow represents a point that results as an angle in a graph due to a drop in the marginal gain as illustrated in Figure 2 (see e.g. Mooi & Sarstedt, 2011). Thus, this point represents a potential cut-off point as this point separates the firms according to their transformation magnitudes.

If such a cut-off is defined, all transformation magnitudes must be larger than this cut-off, otherwise those firms are not defined as conducting a business portfolio transformation. Defining a cut-off (CO) that is larger than zero thus requires the following constraint:

I. $TFM^*(d_f) \geq CO$

Figure 2: Determination of transformation cut-off parameter
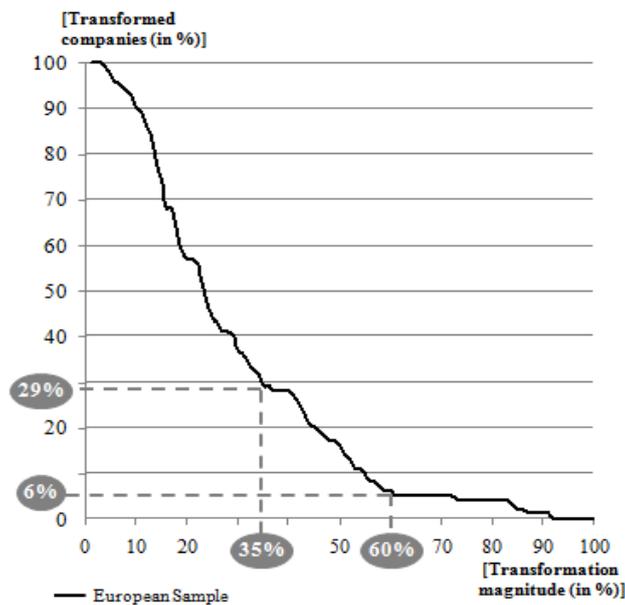
5 Critical acclaim

The metric is based on measuring changes in shares of segments and thus clearly measures changes in the composition of a business portfolio (*requirement 1*) and therefore it is also able to detect both organic and inorganic transformations because the establishment of a new organically developed segment would automatically result in a change in shares of the segments and thus to a transformation (*requirement 3*). Furthermore, the metric is able to detect changes in a portfolio where the total size remains equal after restructuring because a firm concurrently acquires and divests segments of the same size. The overlap between the old divested and the new acquired segment of the two comparing years would, according to the specification of the metric, consequently be zero and thus automatically leading to a transformation. Moreover, the metric does not misinterpret portfolio extensions as portfolio transformations because an extension does not change the overall composition of the business portfolio.

Requirement 2 claims a continuous measurement and the need to distinguish between annual and perennial changes (non-transitivity). The metric is able to continuously measure the progress of the transformation on a year by year basis, but also able to measure perennial changes over a longer time period from any year t to T.

This example further illustrated the non-transitivity of the metric as the yearly changes in Vivendi's portfolio didn't add up to the total contribution to the target portfolio.

One important characteristic of this transformation metric is that it is not transitive: $\text{TFM}(t, t+1) + \text{TFM}(t+1, t+2)$ is not necessarily equal to $\text{TFM}(t, t+2)$. This characteristic is important to not add-up annual portfolio changes that oscillate back and forth and thus neutralize themselves. Consider the following example: The composition of a portfolio is exactly the same in year 1 and year 3, it changes, however, from year 1 to year 2 and changes back to the original composition from year 2 to year 3. Although a transformation can be measured between year 1 and 2 and between year 2 and 3, the total transformation between year 1 and year 3 amounts to zero. This characteristic of the suggested metric ensures that simple fluctuations of portfolio compositions will not be misinterpreted as portfolio transformations.

The metric further allows identifying firms that conduct a portfolio transformation within a given sample by applying the illustrated elbow criterion and thus distinguishing between real portfolio transformations and pure portfolio fluctuations (*requirement 5*). It also allows for the first time in portfolio restructuring research to measure and especially quantify the magnitude of a portfolio transformation (*requirement 1*), and also determining a firm-individual transformation period with a clearly and especially objectively defined transformation start and end date (*requirement 4*).

Furthermore, the metric does not focus on a specific restructuring type such as refocusing or repositioning, it generally captures any kind of changes in a portfolio composition which also leads to types of transformations that have hardly or never been in research foci before as they haven't been identified as a portfolio restructuring type with the applied measures in prior research studies in the area of portfolio restructuring. Beyond analyzing antecedents and outcomes of portfolio restructuring, the metric allows to analyze the whole process of a portfolio transformation and gain important insights for both scholars to conduct process-related theory-building research and also practitioners in managing a portfolio transformation more successful.

6 Application of the metric

6.1 Sample and data collection

The sample contains the largest 100 European non-financial multi-business firms for which segmental data can be traced for at least nine consecutive years (i.e. $Y = 8$) within the period of 1998 to 2010. Data has been taken from the Thompson Reuters DataStream Advanced Database (for the years 1998 – 2010). All annual and/or 20-F reports of all 100 sample firms have been analyzed for the years 1998 – 2010 in order to check and – where necessary – manually adjust the segment data due to changes in shares of segments and organizational restructurings undertaken by the sample firms. In cases where it was not possible to trace the segment data over 9 years, the firm dropped off the sample and I supplemented the sample accordingly with the next largest firms. Therefore, all companies for which valid and continuous segment data for at least 9 consecutive years within the period of 1998 – 2010 could be retrieved are included in our sample. Major results are depicted in Figure 3.

Apparently, about 64% of all firms transformed their business portfolios less than 30%. The remaining approximately 36% transformed their business portfolios more than 30%. Only 14% of all firms have a transformation of more than 50%, which means that those firms replace more than half of their business portfolio during the sample period and thus become a different kind of firm. The annual median transformation magnitude of all firms is 3.81%.

Figure 3: Distribution of transformation magnitude for 100 European firms
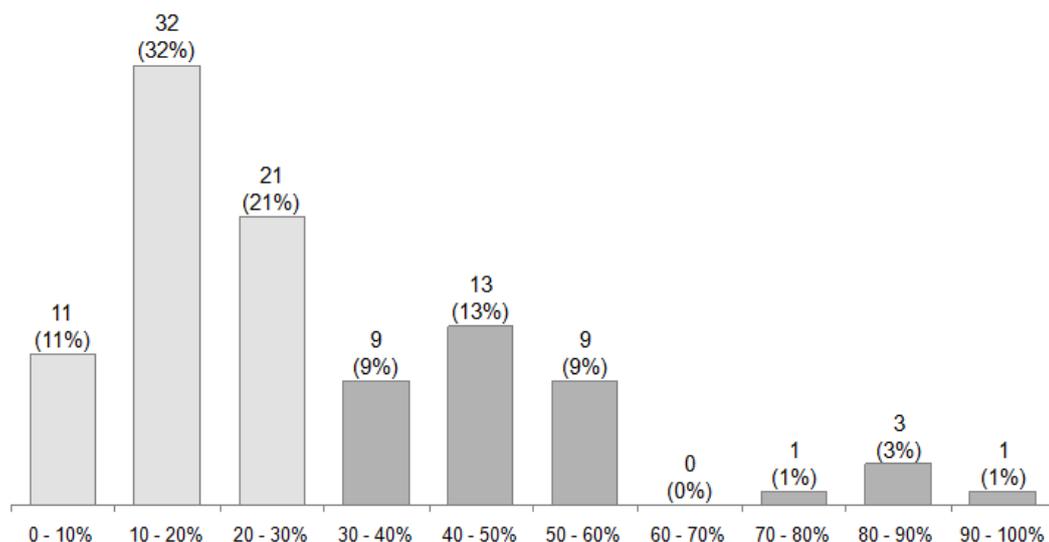
6.2 Determination and adjustment of transformation parameters

According to the description in the last chapter, one needs to specify a transformation cut-off parameter (CO) and a period parameter. To identify major portfolio transformations, an elbow criterion based on a graphical representation of the distribution of transformation magnitudes in the sample has been applied (see Figure 2) as described in the last chapter: The graphical representation yields two angles at around 35% and 60% respectively. This suggests that transformation processes that do not exceed 35% within the sample period should be defined as regular business portfolio changes. In cases of transformations between 35% and 60%, i.e. firms restructure/substitute up to 60% of their portfolios it seems appropriate to speak of moderate transformations, while transformations beyond 60% constitute radical transformations especially because they lead to a new 'identity' of the firm.

The period-parameter allows selecting only one time slice in case that more than one of the several time slice tests that are being conducted per firm exceed the 35% cut-off criteria specified with the cut-off parameter. According to the last chapter, the larger time slice has only been selected if its additional yearly transformation magnitude exceeded the median annual transformation magnitude of the full sample by 50% (5.72%).

Taking all requirements and analyzes into account, the transformation cut-off parameter was determined to be 35% and the period-parameter to be 5.72% which results in 27 out of the 100 firms that are classified as transformations.

6.3 In-depth analysis of Vivendi SA's portfolio transformation

Vivendi's journey from a construction and environmental services company in 1998 to a company completely focusing on media businesses like games, music and television in 2010 (Vivendi, 1999-2000; 2007-2011; Vivendi Universal, 2001-2006) is exemplarily used to illustrate the practical applicability of the proposed method. Figure 4 shows the yearly transformation of Vivendi's business portfolio $TFM(t-1, t)$.

Figure 4: Yearly transformation of Vivendi's business portfolio
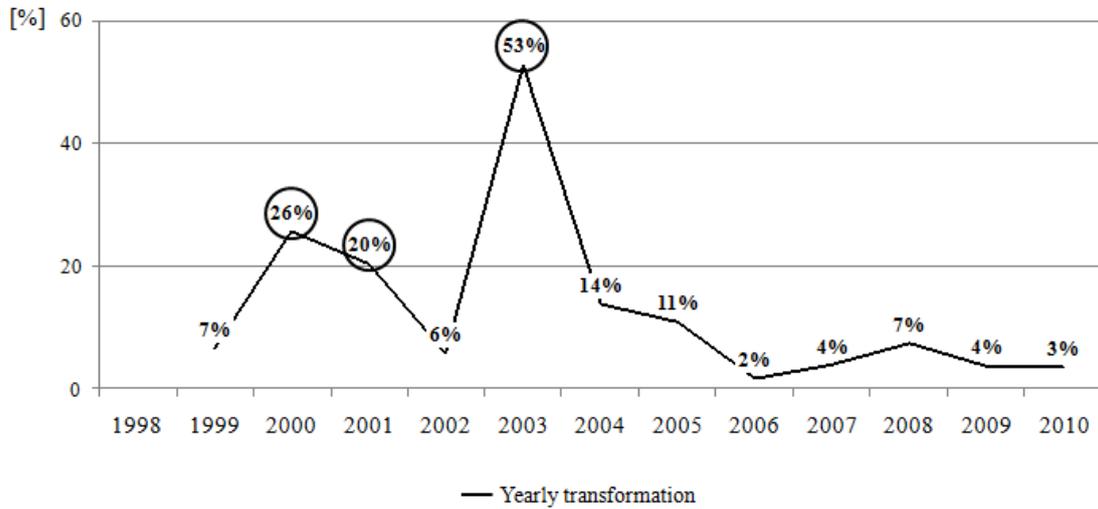
According to Vivendi's entrance into the media business by full acquisition of Canal+ and the merger with Pathé, the acquisition of Universal Studios as well as the sell-off of Vivendi's former core business "property and construction" and the spin-off of the environment business, the three largest yearly transformations are in 2000 (26%), 2001 (20%) and 2003 (53%). The resulting transformation process and pathway of Vivendi is shown in Figure 5.

Figure 5: Vivendi's transformation pathway – Overlap with portfolio in 2010
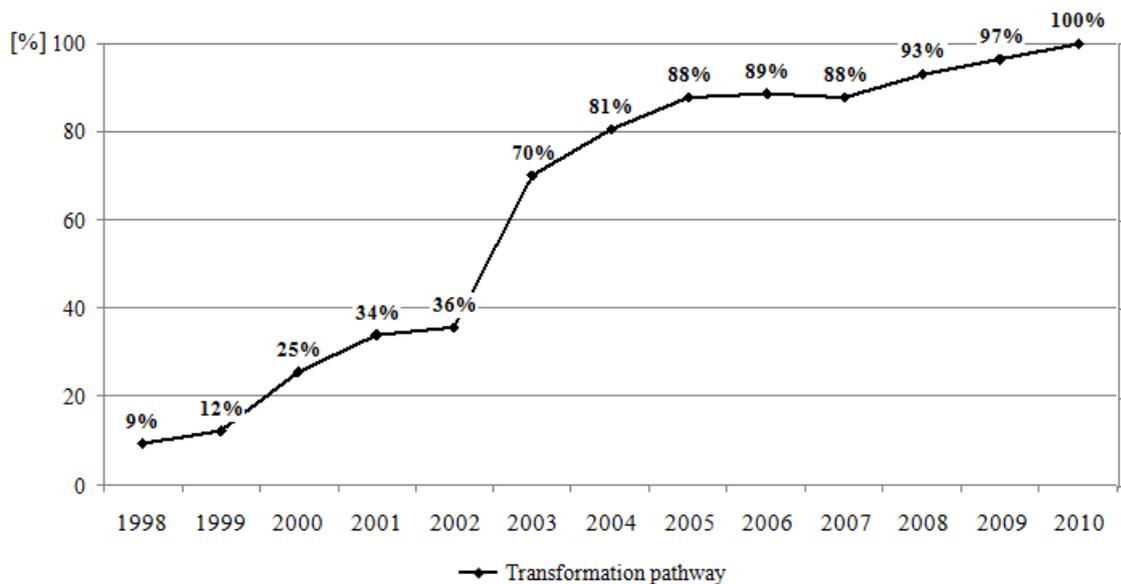

If 2010 is defined as the "target portfolio" (i.e. $T = 2010$), the curve shows the overlap of each year's t business portfolio with the portfolio in 2010 ($POL(t, T)$) and illustrates how Vivendi converged to the target portfolio over the preceding years. The transformation of Vivendi's portfolio between 1998 and 2010 is about 91% in total, resulting in an average yearly

transformation of about 8%. In other words, 91% of the revenues of the fiscal year 2010 were generated by business units that were newly acquired and/or developed, while only 9% were derived from businesses that had been part of Vivendi's portfolio in 1998. Analyzing the transformation pathway in more detail suggests that four important conclusions can be drawn: First, the period with the single biggest progress towards the target portfolio was between 2002 and 2003 (34% - see Figure 5). Second, while Vivendi massively transformed its portfolio in 2003 (53% - see Figure 4) the final contribution to the target portfolio was only about 34%. Third, while Vivendi's portfolio transformation pathway follows rather an S-curve, the yearly transformation shows two major peaks in 2000 and 2003. Such a development is in line with previous research regarding the need for acquiring firms to implement and consolidate newly acquired businesses before taking the next step as they have to account for limited –managerial– resources (e.g., Penrose, 1959; Barkema & Schijven, 2008). And fourth, the transformation pathway curve increases monotonically, which means that there were no major detours during the transformation.

When applying the transformation cut-off criterion of 35% and the period-parameter of 5.72%, Vivendi's transformation takes 4 years, starting in 1999 and ending in 2003 (see Figure 6). The total transformation of the business portfolio during this period amounts to 87% which means that only 13% of Vivendi's target portfolio in 2003 has already existed in 1999. Thus, the determined transformation period based on the transformation metric in fact includes the major changes that have taken place within Vivendi's portfolio and herewith proofs the functionality of the transformation metric in practice.

Figure 6: Vivendi's transformation pathway – Overlap with "target portfolio"
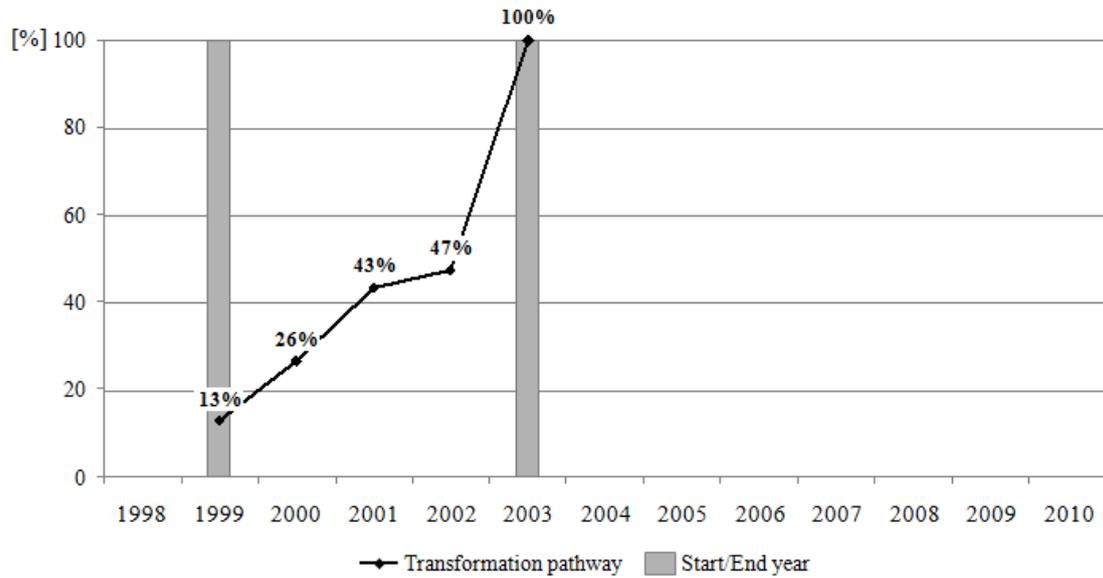
7 Conclusion

Research on portfolio restructuring has mainly focused on antecedents and the outcomes of restructuring efforts whereas most attention has dominantly been directed to refocusing strategies (e.g. Johnson, 1996) and single divestitures (e.g. Brauer, 2006) while other strategies and fundamental transformations of the business portfolio have received hardly any attention to date.

Research on the process side of portfolio restructuring has however largely been neglected which is mainly due to a lack of longitudinal study designs and the existence of an adequate metric to measure, describe and analyze portfolio transformation processes as shown in this paper.

In an effort to overcome this shortage, the present study defined requirements for a metric to successfully conduct research on the process side of portfolio transformations and furthermore developed a metric according to the defined requirements. The metric now allows us to quantify and analyze transformation patterns and yield insights into the key characteristics such as magnitude, transformation period and shape of a portfolio transformation. Furthermore, the metric not only focuses on one specific type of portfolio restructuring such as refocusing, but on any kind of a change in a firm's business portfolio composition.

Moreover, based on the real life example of Vivendi it was shown that the metric adequately identifies and captures a transformation as it proceeds in practice in terms of magnitude and time duration and thus is not just a scientific tool, but also contributes to a better understanding of real life transformation processes. By analyzing the transformation pathway, the metric also allows to describe a transformation over time by shape and also compare and analyze firms according to the way they transform their business portfolios, one can see e.g. whether major parts of the portfolio are being changed at the beginning or towards the end of a transformation.

In future research the metric can also be adapted by measuring the segment shares in terms of total assets instead of sales revenues as total assets are not as volatile as sales figures. This kind of adaption, however, most likely requires rather internal firm data than an outside-in view due to a lack of public data availability.

The introduction of the metric also offers several promising avenues for future research: First, it fosters the application of longitudinal studies and also more small sample and case-study based research designs to develop a theoretical basis of transformation processes by analyzing those in detail. Second, it creates transparency over the transformation process such as the interplay and temporal sequences of acquisitions and divestitures and thus one might be able to determine a set of transformation archetypes. Third, combining this process knowledge with performance data allows the identification of key success factors of portfolio transformations in general and also by transformation archetype. By developing such a set of do's and don'ts for each transformation archetype would then not only have a scientific impact, but also a real practical impact and support for managers who plan to conduct a portfolio transformation. Finally, the application of the transformation metric is not only limited to quantify business portfolio transformations. It is basically applicable to all kind of portfolios where shares of portfolio elements can be quantified and one is interested in understanding the dynamics of the change process within that portfolio. In the field of *management*, one application option is to understand market dynamics, based on speed and magnitude of changes in market shares. This might be helpful to better assess market dynamics and understand which kind of phase or life cycle a market resides (e.g. saturation when dynamism slows down). A second example is the application of the metric to a company's customer portfolio to better understand different customer groups and also to see how these groups change over time. In addition to the change process over a certain time period, the metric would also allow evaluating the yearly changes and so it might be helpful

to see if years of severe changes in the composition of different customer groups coincide with the introduction or the exit of a certain product. Based on this examples, one can think of many more ways to utilize and apply the metric in to understand dynamics within a portfolio (other areas include e.g. *migration research*).

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