Activity Based Performance Management – state-of-the-art and not time driven

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Abstract
In this paper we examine which costing method - Activity Based Costing/Management (ABC/M) or Time-Driven Activity Based Costing (TD-ABC) - fits best in the frame of Performance Management. A literature review on both costing methods and qualitative observations from a case study, where ABC/M was implemented in a German logistics company, provide the basis for our research. TD-ABC comes along with a variety of alleged improvements compared to existing ABC/M, which is assumed to struggle with conceptual problems and low diffusion rates (ABC-paradox). We find that TD-ABC is only appropriate for simple company models, because of its limited expressiveness and accuracy. Our findings show shortcomings connected to the concept of TD-ABC concerning data gathering and the myopic view on time to reflect all business activities. Furthermore there is significant evidence that a part of the academic world missed to capture ABC/M in its state-of-the-art; for them it still exist in the conceived version from the mid-80’s. ABC/M provides all features necessary to function within the frame of Performance Management. We develop a framework which is based on ABC/M and name this Activity Based Performance Management (ABPM). We show how ABPM supports to align operational and financial decisions to a company’s strategy.

1 Introduction
This research analyses which of two costing methods is most appropriate for Performance Management (PM), Activity Based Costing/Management (ABC/M) or Time-Driven Activity Based Costing (TD-ABC). The question is discussed through a literature review and findings from a case study in the German logistics industry.

PM is a strategic concern for management of profit or non-profit organizations. Since the 90’s PM has exerted considerable influence on the actions of today’s companies, it is

“…evolving at a considerable rate to combat new organizational realities; owing to the fight for industrial supremacy, the concept of performance, as it is measured and
evaluated, is undergoing a transformation in modern business organizations” (Folan & Browne, 2005, p.664).

Between the many different ways on how ‘performance’ can be defined and measured activity-based costing approach represents an evolution. This is due to its view of the organization which “defines it as a network or processes or activities” (Lebas, 1995, p.29). ABC (later ABC/M) was developed over 20 years ago and is considered by academics and practitioners as the most “important innovation in management accounting of the twentieth century” (Gosselin, 2007). It has been continually improved with support of Information Technology (IT) and has proven itself as a powerful cause-based costing method.

Although Kaplan (Cooper & Kaplan 1988) is considered as one of the founding fathers of the “original ABC” in the 1980’s, in 2003 he started redesigning this method which led to TD-ABC (Kaplan 2003, 2004 & 2007). He argues that ABC/M does not capture the complexity of a company’s operations, it is too complex and time-intensive to implement and hence a too cost-intensive investment. In contrast he claims that TD-ABC reveals excess capacity, processes faster, provides high accuracy and can be well supplied from existing IT-systems, such as ERP. Kaplan derives his assumptions on the disadvantages of ABC/M from his experience and feedback from practitioners.

Other Academics outline reasons why ABC/M implementations have been avoided, abandoned or not adopted, in spite of the proposed benefits, the so called ABC-paradox (Gosselin, 2007). Demeere et al. (2009) and Wegmann (2007) present TD-ABC as an improved activity-based costing method compared to ABC/M. Other authors point out that TD-ABC brings conceptual shortcomings connected to the use of time estimates (Cardinaels & Labro, 2007). Gosselin (2007, p.649) concluded that TD-ABC is the most recent development in the field of activity-based costing methods, but “does not solve the conceptual problems inherent to ABC”.

We compare TD-ABC and existing ABC/M on the basis of a literature review. Additionally we reflect on qualitative observations from a case study where ABC/M was implemented in a German logistics company.
In contrast to prior research, Kaplan’s (2003, 2004 & 2007) and other TD-ABC favouring papers are critically examined and the alleged novelties are called into question. This is conducted by questioning whether:
1. the critics and conceptual problems Kaplan and other academics stated on ABC/M are justified and
2. TD-ABC can be considered as an “evolved ABC/M” where those challenges have been mastered, especially through supposedly innovative time estimates and capacity cost rates.

We outline, using different examples that a state-of-the-art ABC/M model does not show the problems which are perceived by Kaplan and other academics. We also find that there are new conceptual problems introduced by TD-ABC, in particular by focusing only on the utilization of time estimates. Our results show that TD-ABC cannot be considered as and evolved ABC/M. Furthermore we find that TD-ABC has very limited expressiveness on excess capacity and vague accuracy. Therefore it should only be used for simple setups with homogeneous activities which can be reasonably reflected through duration drivers.

Finally a framework for PM containing a state-of-the-art ABC/M model is developed. We outline an exemplary architecture which is applicable for most of today’s companies. ABC/M provides the basis to compare measured performance with constrained objectives from PM. Hence it supports to align financial and operational decisions to a company’s strategy. We call this framework Activity Based Performance Management (ABPM).

Structure of this paper
For this paper we imagine the following fictitious case: In order to receive better insight of his company’s cost structures, a CFO is preparing for an ABC/M project. The model shall be integrated within the company’s new frame of the PM. The CFO is refreshing his knowledge on ABC/M reviewing the latest academic papers and case studies, including our mentioned case study. For several times he is now confronted with the term “Time-driven Activity Based Costing” questioning himself:
1. What characterizes this activity-based costing method?
2. Whether it is more sophisticated than ABC/M?
3. What needs to be considered for a successful implementation of the favoured method?

On the basis of his findings, he needs to decide which costing method is more suitable for the upcoming project.

Approaching our problem through a fictitious narrative is a method adapted from business and accounting education. Hill and Stewart (1999) and Vitz (1999) underline that narratives, real or fictitious are a “valuable part of higher education” (Vitz, 1999, p.185) and, as we find, also well suited to introduce our approach.

This paper is structured in relation to the content of our fictitious case:

- Chapter 2: ABC/M and TD-ABC in the literature
  We investigate how contextual and behavioural factors are associated with the ABC-paradox and whether TD-ABC is a result of it. TD-ABC is supposed to have an improved concept; we ask whether it has become a trend.
- Chapter 3: Methodology
  The qualitative observation methodology of the research is outlined.
- Chapter 4: Case study
  We present the key facts of our case study with focus on the implemented ABC/M model.
- Chapter 5: Comparison between TD-ABC and ABC/M
  We compare TD-ABC and ABC/M, based on the criticism Kaplan stated towards ABC/M. The results from our literature review and observations from our case study are confronted with Kaplan’s statements.
- Chapter 6: ABC/M in the frame of Performance Management
  ABC/M shall be integrated in the framework of PM. We describe an exemplary case how ABC/M interacts with PM and facilitates decisions which

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1 Please note that this fictitious CFO case is not in connection to the (real) case study we will refer to
are aligned to a company’s strategy. Based on this we outline the components of our framework, which we name ABPM.

- Chapter 7: Conclusions
  From the perspective of our fictitious CFO we interpret the results in reference to literature and our research questions.

2 ABC/M and TD-ABC in the literature

The ABC framework was introduced by Cooper and Kaplan (1988, p.97) as a “tool of corporate strategy” where especially manufacturing companies could generate a competitive advantage from insights on product costs which are “radically different from data generated by traditional systems” (Cooper & Kaplan, 1988, p.100). Against the background of growing overhead costs, ABC evolved in the 1990s from a process-cost allocation method or “costing technique” to a “management philosophy” (Jones & Dugdale, 2002) and therefore was named Activity-based Management (ABM). Practitioners and academics realized that providing financial (and non-financial) information on activities and costs lead to new insights and management implications. Since we do not want to contribute to the discussion on differences between ABC and ABM, this paper uses the label ABC/M according to Foster and Swenson (1997). ABC/M considers the existing overlap between the mentioned terms.

2.1 TD-ABC as a consequence of the ABC-paradox?

After 1995, practitioners and academics noticed difficulties connected with implementations of ABC/M. Some organizations abandoned ABC/M projects (Kaplan & Anderson, 2004; Innes et al., 2000; Gosselin, 1997).

Gosselin (1997) provides explanations on contextual factors that influenced the diffusion of ABC. Surveys point to the fact that the majority of firms have not implemented ABC/M (Kennedy & Affleck-Graves, 2001), in spite of the benefits proposed by academics and management accountants. This phenomenon is called ‘ABC-paradox’. Gosselin (1997) approaches the ABC-paradox by defining levels in which ABC has been implemented or adopted and associates them to organizational determinants. His findings are that ABC diffusion and
levels of adoption are determined by structure, centralization, formalization and (vertical) differentiation of an organization. The results indicate that ‘prospectors’, highly vertically differentiated and mechanistic organizations are more likely to adopt ABC. Prospectors are characterized by high R&D investments and their dynamism in seeking market opportunities. Highly vertically differentiated organizations show a high depth of structure, reflected by the number of hierarchical levels below the chief executive. Mechanistic organizations are those who facilitate the adoption and the implementation of administrative innovations.

Research on ABC diffusion provides results concerning other contextual factors. Nicholson (1993) and Cobb et al. (1992) surveyed companies asking why organizations were not planning to adopt ABC or why they had rejected ABC. Their findings can be summarized in the following statements:

- Products or services were not the types that would benefit from ABC
- Information technology inadequacy and non-value-added activities
- Difficulties in linking cost drivers to individual products
- Amount of work involved in comparison to the benefits resulting from ABC
- Difficulty of collecting quantitative information on cost drivers

Adjacent research fields, such as Accounting Behavioural Research also contribute to explain the ABC-paradox. Argyris and Kaplan (1994) for instance, describe situations in which individuals tend to block an ABC implementation. The authors argue that ABC systems have the potential to reveal and generate information which can be embarrassing or even threatening to managers. Since (indirect) costs are allocated, the profitability structure of products and divisions can be affected. Hence adaption and support can be related to the effect ABC/M has on the profit of divisions.

In his most recent papers on ABC/M, Kaplan (2004 & 2007) does not directly refer to contextual or behavioural factors that could be associated with the implementation or adoption of ABC/M. Yet Kaplan recognizes that there is an ‘ABC-paradox’ (2007), since for him there is a contradiction between the advantages ABC/M offers and the diffusion rate:
“...ABC was not universally accepted. In an annual survey of the adoption of management tools, ABC ranked below the median, with only a 50 percent adoption rate. For a system that gives companies insights into the cost and profitability of products, processes, services, and customers - insights not otherwise available - the low adoption rate seemed surprising.” (Kaplan, 2007, p.5)

But for Kaplan (2007) the ‘ABC-paradox’ is caused by conceptual factors, meaning those which are inherent to the existing ABC concept:

“Many companies, because of the time-consuming surveying and data-processing costs of ABC systems, either abandoned ABC entirely or ceased updating their system, which left them with out-of-date and highly inaccurate estimates of process, product, and customer costs.” (Kaplan, 2007, p.3)

Other academics followed Kaplan in their conclusion on ABC/M. Everaert and Bruggeman (2006) created an instructional case to support Accounting Education on differences between ABC and TD-ABC. As “one of the first teaching cased on TDABC” (Everaert & Bruggeman, 2006, p.153) the learning objective was to help students understand the differences between traditional ABC and TD-ABC. However the authors show a certain degree of dissatisfaction with ABC, since their learning objectives include that “students quickly find that the simple ABC model does not provide the information required by the CEO, while the complex ABC model would be very challenging to implement” (Everaert & Bruggeman, 2006, p.128). The table below contains literature were comparisons between TD-ABC and ABC/M in favour of TD-ABC have been provided. The assumptions which led the following authors to their critical position towards ABC/M will be discussed in chapter 5 “Comparison between TD-ABC and ABC/M”.

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2 ABC/M and TD-ABC in the literature

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Author(s)/
(Type of literature) | Source | Judgements on ABC/M
--- | --- | ---
Everaert et al. (2006) (Instructional case for Accounting Education) | Author’s experience with ABC, Kaplan & Anderson (2004) | Students must learn difficulties in the ABC/M model
Barrett (2005) (Academic article) | Feedback from ABC practitioners | • Inability to uncover excess capacity
Demeere et al. (2009) (Case study) | Kaplan & Anderson (2004 & 2007) | • high cost of updating • inaccurate estimates of process, product, and customer costs • not easy to implement (on the large scale)
Coners (2007) (Formalisation of TD-ABC) | Kaplan & Anderson (2004) | TD-ABC is an advanced ABC/M with new instruments

Table 1. TD-ABC supporters in literature

Although most of the listed authors refer to Kaplan’s papers as a source for criticism on ABC/M, they do not share every point of criticism Kaplan (2003, 2005, 2007) has stated. However, there are only a few papers which go beyond mere recognizing of TD-ABC and ABC/M. Academics who state critical ideas

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2 Translated from German

“this supposedly new approach does not solve the conceptual problems inherent to ABC such as: fixed costs considered variable, idle capacity costs, and the design and maintenance of the ABC model” (Gosselin, 2007, p.649).

Barret’s (2005) findings justify the existence of TD-ABC as an equal alternative to ABC/M, but question the single-metric approach of time as the basis for every driver rate within a model. Cardinaels and Labro (2007) claim, based on their empirical investigations, that time estimates, which are required for the model setups, are prone to error and not helpful for determining excess capacity.

Besides the comparison of TD-ABC and ABC/M, this paper shows that assumptions towards existing ABC/M need to be reconsidered. The diffused perception of today’s ABC/M is identified as a possible reason for the ABC-paradox and the emergence of TD-ABC. In this sense this paper extends current research.

2.2 Trends: ABC/M and the appearance of TD-ABC

Besides the company related analysis on diffusion of ABC/M through surveys and literature research Gosselin (2007) also conducted a trend analysis. For this he empirically observed the academic focus on first ABC from 1988 until 2004 and then second on ABM from 1991 until 2005 by capturing the number of published papers in the Proquest ABI/Inform Global database. For the latter and more recent analysis, the published ABM papers, a peak in number of published paper could be observed in the years between 1995 and 2000 as shown in the following graphic.
This chapter is dedicated to the question of what trends can be drawn when we observe academic papers published on ABC/M and TD-ABC based on the method Gosselin (2007) has conducted. For our observation we have utilized the Online Academic Databases (OAD) ISI Web of Science\(^3\) (WoS) by Thomson Reuters and Google Scholar\(^4\) (GS). WoS is the biggest bibliographic and citation index based on the former Institute for Scientific Information containing around 12,000 international journals, which are exclusively scientific (Mayr, 2009). Although Mayr indicates that results in GS are not purely scientific, still GS covers besides free accessible sources mostly scientific papers obtained through co operations with publishers like Blackwell, Nature Publishing Group and Springer. Since its launch in 2004 the amount of qualified scholarly content has increased significantly (Mikki, 2009). Mikki analysed differences between the WoS and GS database coming to the result that,

"it will be wise to apply different services, WoS for its guaranteed proofed scientific content and controlled citation data, and Google Scholar for its wider collection including books and proceedings." (Mikki, 2009, p.49)

Based on this we find that GS is sufficient to serve as an additional indicator for our trend analysis, although its results are not purely scientific. However our aim

\(^3\) [http://wokinfo.com/](http://wokinfo.com/)

\(^4\) [http://scholar.google.com/](http://scholar.google.com/)
is not to fully map the scientific landscape, but to draw meaningful conclusions on the presence of both costing methods in Online Academic Databases and to derive assumptions on diffusion in the real world. Concerning the query we have implemented in WoS, we could only observe a trend on ABC/M, but not on TD-ABC. This is due to the fact that the string “TD-ABC” includes the string “ABC”, which could not be technically excluded in our search request, to separate between TD-ABC and ABC/M. Therefore our request was containing "activity based costing" OR "activity based management" from 1993 until 2009 concerning published items and citations.

![Published Items in Each Year](image)

**Figure 2. Number of published ABC/M papers**

These results essentially correspond to Gosselin’s (2007) findings from above, a growing number of papers in the late 90s, around five papers per year, followed by a declining number before 2005. Please note that since our search includes an explicit spelling of “activity based costing /management”, the number of results is limited. This means that some papers which were possibly related to the ABC/M topic are not covered by this search. The results of the next query show the number of citations in the field of “activity based costing /management”. Here two more aspects need to be considered:

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5 Several attempts to incorporate a search logic separating between “TD-ABC” and “ABC” failed

6 OR means that both results are summed up
- Cross-citations are included, the indicated growth is not necessarily significant.
- Cross-discipline citations and citations from the broader context of costing methods are included. For example, some authors from Business Process Engineering and most TD-ABC authors reference to ABC/M literature.

![Citations in Each Year](image)

**Figure 3. Number of citations within ABC/M papers**

Although the explanatory power concerning the growth of citations is limited, we can yet say that ABC/M is a subject of interest to the academic world. This message is also covered by the results received from our GS queries:

![ABC/M results in Google Scholar](image)

**Figure 4. GS search for ABC/M**
In both GS queries we have explicitly separated between TD-ABC and ABC, using a feature of the GS search engine. The curve of ABC/M results (above) indicates that there was a maximum of interest in 2006 with a number of 158 findings. Recall that compared to WoS, GS provides a “wider collection”, means not only academic papers, but also books and proceedings. TD-ABC was initiated in 2003 (Kaplan, 2003) and received a growing interest from the academic world, as our next figure indicates.

![Figure 5. GS results for TD-ABC](image)

The number of results increases from nine in 2003 to 67 in 2009. TD-ABC seems to be less present than ABC alone, but a significant trend can still be recorded.

We find also interesting that, if we do not explicitly exclude “TD-ABC” from the query “ABC” (the 1st GS query excludes “TD-ABC” findings) we receive Kaplan’s working paper on TD-ABC (Kaplan, 2003) ranked on the first place, meaning even before any paper on existing ABC/M. This rank is a result of a high number of links and visits, hence a clear indication that TD-ABC is very present in the online world and has become a trend. Since ranks of GS are caused by the number of links, we quote Walker’s (2002, p.524) abstraction on the power of such a rank: “Links have become the currency of the Web. With this economic value they also have power, affecting accessibility and knowledge on the Web.”
Since our results mark TD-ABC as an important subject to the academic world, we will analyse whether it is justified to consider it as an evolved ABC/M.

3 Methodology

Within our research, different types of sources and methods are utilized. The literature contains theory on ABC/M and TD-ABC as well as case studies and empirical examinations. Whenever it is suitable and possible we add the perspective of our case study to the discussed aspects, where we analyse and reflect on the observed data. Krefting (1991) underlines that use of different sources can lead to trustworthiness which increases readers’ confidence and ensures quality of findings. Letts et al. (2007) state that multiple sources and perspectives reduce the chance of systematic bias. Regarding this paper the sources and perspective are structured as shown in the following table:

<table>
<thead>
<tr>
<th>(Type of) Source</th>
<th>Literature</th>
<th>ABC/M implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Empirical Data</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Theories</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Observation</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Research Methodology</td>
<td>Literature Review</td>
<td>Qualitative Observation</td>
</tr>
</tbody>
</table>

Table 2. Sources and methodology of this paper

Qualitative observation rationale

Since the case study was derived by observing an ABC/M implementation, qualitative observation and research was found the optimal method of choice. According to Patton (1990) observation can lead to deeper understandings than interviews, because knowledge of occurring events is provided, and may enable the researcher to see things that participants themselves are not aware of, or that they are unwilling to discuss. Recorded data is important in this context, because researchers rely most heavily on the use of notes, which are running descriptions of settings, people and activities (Hoepfl, 1997). In practice, qualitative research involves an ongoing reflection on data and its positioning against different theories. This is maintained through the discussion of Kaplan’s findings (Kaplan 2003, 2004 & 2007) in contrast to other academic
papers and our case study. These perspectives contribute to further develop the chosen research questions.

To quote examples connected to ABC/M, Ahrens and Chapman (2006, p.830) stated that qualitative field researchers should not “recount sequences of activities in the field and then label them ‘activity-based costing’ (ABC)”. Instead of describing what occurred in the field, the research should outline the way in which “particular actors interpreted and went about practicing ABC from the description itself” (Ahrens and Chapman, 2006, p.830).

Jones and Dugdale (2002) and Briers and Chua (2001) formulated key questions for the processual analysis of ABC. Instead of the repeatedly discussed ‘do people use ABC?’ and ‘why do they keep using ABC?’ they have stated qualitative questions going a step further:

‘what do people have to do to be recognised as using ABC?’ and

‘what else besides the organisational practices of ABC contributes to their shaping?’ (Briers and Chua, 2001)

The focus here lies on how ABC was assembled regarding the practical, social, organisational, and technical dimensions.

In our case study, a project at a German logistics company, where ABC/M was implemented under the supervision of the Controlling department will serve as an illustrative example. The observations are obtained throughout the whole implementation process from interactions between the consultancy and the project manager for the ABC/M implementation at the logistics company. The interactions have been recorded as email correspondences and documents representing answers to specific questions which rose during the implementation period.

Dialogues or quotations are not illustrated based on a strict agreement on data access. Direct data access is available to examiners on request. However we provide qualitative input from the case study as well as reflections on interactions and observations.
When we talk about “ABC/M model”, we mean primarily the model design and logic and in second place the support by software. Our underlying assumption is that modern ABC/M software solutions can provide very similar results, once they are optimally utilized. Hence it is the model’s design which determines the quality of an implementation.

The project was under constant evaluation from the logistics company and respectively the Controlling department. Therefore, the leading qualitative concern during the project revolved around the question:

Does the implemented ABC/M model deliver the desired results?

There are other issues of central importance during an ABC/M implementation: the model has to be configurable and suit within the social and managerial environment.

Since there are many software vendors, consultancies and academics claiming that their ABC/M method (solution) is state-of-the-art, we need to point out differences in the perceived features of today’s ABC/M and in this respect where the discussed models actually differ. In his papers, Kaplan (2003, 2004 & 2007) claims advantages in favour of TD-ABC, which he believes to be an evolved, and problem free activity based costing method. So based on Jones, Dugdale, Briers and Chua we centre on the questions:

1st Does our ABC/M model show the conceptual problems Kaplan and other academics are pointing at?

2nd Does TD-ABC display the claimed conceptual advantages?

3rd How does the implemented ABC/M model perform in comparison to TD-ABC and its alleged new features?

The discussion of the observed data focuses on aspects which have been recognized by the academic world as conceptual problems of ABC/M, instead of illustrating the whole implementation process. We then compare features of existing ABC/M to the alleged novelties of TD-ABC. In the end all necessary aspects managers need to consider in order to make a decision in favour of TD-
ABC or ABC/M are marked out. For that we slip back into our fictitious CFO and present our most important finding from his perspective. Academics may use this paper to classify TD-ABC with its advantages and shortcomings and to further investigate why it is perceived as an evolved ABC/M by some authors.

4 Case study: ABC/M implementation at an air freight logistics company

Case set up
The logistics company offers products and services revolving around air freight. The main products are air freight, special services connected to air freights and storage space provisioning. The dimensions for which products are charged are € per kg or € for a service.

![Figure 6. Product types offered by the logistics company](image)

One major challenge during the implementation was to implement the assignment logic of the cost consumption according to the complexity of activities and the product portfolio. Products and service can be combined or rely on each other. For instance, air-freight products as well as logistic-related special services could require storage space. One product was billed per kg freight, the other one based on each provided service. An additional challenge was to conflate data required to supply our ABC/M model from different underlying systems: a billing system, a transaction-oriented system (ERP) and a warehouse system.

To provide some project key data:

- 350 products
- Around 600 employees
- 131 different relevant process steps considered for activities
- 32,000 individual flight events
- Each flight event was described using 81 attributes
- 420,000 considered special service occurrences
- 54 different drivers to allocate costs
- 1,030 different cost positions
- 184,000 assignments
- 80 database queries to process information
- 24 different source tables

**Underlying ABC/M methodology**

Although our case study takes place in the German area, the implemented ABC/M model is not a modified German version of ABC/M, such as “Prozesskostenrechnung” (process cost calculation). It is not the purpose of this paper to investigate which regional alterations of ABC/M exist. Our ABC/M model is derived from the Anglo-American original ABC (Cooper & Kaplan, 1988).

**Purpose of ABC/M**

Overall aim of the project was to increase transparency of cost-consumption. In the following we present the resulting features of the implemented ABC/M model:

- Capacity utilization and planning
- Internal cost allocation
- Customer profitability
- Product posting and pricing
- The controlling process: rolling with shorter cycles
- Reporting: standard reports and Online Analytical Processing (OLAP).

The variety of capabilities underlines multi-purpose character of the implemented model.
Calculation was performed with support of software solutions. Data from transaction-oriented systems, from different warehouse-, accounting- and billing-systems was extracted to databases, then transformed and finally loaded (ETL) into the ABM software. The ABM software in use was SAS Activity-Based Management.

**Project setup**
The project was divided into the following tasks

1. Activity and process mapping
2. Data integration and loading
3. Model calculation: ABM model and driver logic
4. Analysis & reporting
5. IT concept / installation

The project setup and management is not subject of discussion. Within this paper we focus on conceptual aspects and features of the implemented ABC/M model.

**5 Comparison between TD-ABC and ABC/M**
This section is structured as follows. We present the concept of ABC/M and outline why ABC/M is considered as an innovation compared to traditional costing methods (chapter 5.1). Then the idea of TD-ABC is briefly introduced (chapter 5.2). We comprehensively discuss the different aspects of TD-ABC in comparison to ABC/M in the subsequent chapters and provide the results of the conducted research (chapter 5.3- 5.8).

**5.1 Concept of ABC/M**
The concept of ABC/M is to assign costs to products, to customers and to services through a two step allocation procedure. Its focus lies on the allocation of cost over activities, such as training employees, supporting processes and organizational transactions, which are not visible through traditional accounting (Gosselin, 2007). Typical steps for an ABC/M model setup are explained in the following.
**Determining the resources**

First costs of a company’s resources are determined. It is important to capture and understand all operational and financial resources, such as equipment, technology, facilities, operating supplies, electrical power, labour and other items used in the performance of an activity (Vazakidis et al., 2009). During this step the applicable resource drivers are developed as the mechanism to convey resource costs to the activity. Basis for assigning resource expenses may be number of FTE, a percentage, a size of an area, time (minutes that people or equipment spend performing activities), or a combination of two or more driver-types (Barrett, 2005).

To give an example: the total costs for resources are 70.000€. There are two activities S1=“receive and forward package” and S2=“lookup package data”, which require 40% and 60% of the resource capacity. S1 is performed 50.000 times, while S2 was executed 60.000 times.

<table>
<thead>
<tr>
<th>Activity</th>
<th>%</th>
<th>Activity costs</th>
<th>Driver Quantity</th>
<th>Driver rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>40</td>
<td>28.000€</td>
<td>50.000</td>
<td>0,56/S1</td>
</tr>
<tr>
<td>S2</td>
<td>60</td>
<td>42.000€</td>
<td>60.000</td>
<td>0,7/S2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
<td><strong>70.000€</strong></td>
<td><strong>60.000</strong></td>
<td><strong>0,7</strong></td>
</tr>
</tbody>
</table>

*Table 3. Exemplary resource driver rate calculation*

**Capturing processes and activities**

A process is defined as a collection of related activities. Within an activity performed work is captured. It is important to identify all relevant activities, where resources are converted into some type of output. The activity driver can be viewed as the mechanism to assign activity costs to cost objects or other activities.

**Cost objects**

The variety of outputs and services where costs accumulate, are cost objects, such as the products and services, sales channels, customers or combinations of these. These objects benefit from incurring work activities. (Cockins, 2001).
Drivers
Drivers reflect the cost consumption in ABC/M and therefore play a key role in the model design. There are two major types of drivers: transaction drivers and duration drivers. Examples for duration drivers are material handling time, set up hours, machine hours and direct labour hours. Transaction drivers capture the transactions that have been performed, for example number of setups.

As displayed in Figure 7, ABC/M assigns costs using three major blocks: the resources, activities and cost objects. In practice resources are structured in cost types per cost centres and can hence be obtained from existing accounting systems. The same applies to cost objects; ABC/M takes cost objects which are deposited in an accounting system (Proctor, 2009).

What makes ABC/M more sophisticated than traditional costing method is its view on cost as a “function of changes in level of activity” (Labro, 2006). ABC/M introduces a hierarchy in which fixed costs become variable costs, such as...
facility, product-sustaining, batch, and unit level cost. In contrast, traditional costing methods estimate cost as a linear function of volume. Costs are only viewed as variable when they exist on the unit level; other costs are wrongly assumed as fixed. Labro (2006) outlines an example where she states that product advertising cost, an instance of product-sustaining cost, is typically considered as fixed together with other advertising cost. However, cost for product-specific advertising do not longer occur, once the particular product is stopped from being sold and should hence be incurred as variable. The following table presents the confrontation between traditional view on expenses and the cost hierarchy of ABC/M:

<table>
<thead>
<tr>
<th>ABC/M</th>
<th>Traditional costing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facility level costs</td>
<td>Fixed costs</td>
</tr>
<tr>
<td>Product-sustaining costs</td>
<td></td>
</tr>
<tr>
<td>Batch level costs</td>
<td>Variable costs</td>
</tr>
<tr>
<td>Unit level costs</td>
<td></td>
</tr>
</tbody>
</table>

Table 4. Cost hierarchies in ABC versus traditional costing, source: Labro (2006)

Granof et al. (2000) outlines that the main advantage of ABC/M in contrast to traditional costing methods lies in the decision support function. Since costs are aligned according to cost drivers, they provide:

- more accurate information on the structure of cost consumption
- prioritization of cost-management efforts.

For Swenson (1997), the use of ABC for both decision-making and performance measurement is typical of the ‘best practices firms’ studied.

5.2 The concept of TD-ABC

In contrast to ABC/M, TD-ABC skips the activity-definition stage and hence the allocation of costs to multiple performed activities (Kaplan, 2007): A TD-ABC model can be essentially set up by estimating two parameters:

1. the unit cost of supplying capacity and
2. the required time to perform a transaction or activity
The estimated time reflects the idea that resources performing different activities vary in complexity. Cost drivers are translated into time equivalents. The TD-ABC setup starts by estimating the cost of supplying capacity. It is important to measure the practical capacity, defined as a percentage or amount of time of the theoretical capacity of 100%. In order to receive the practical capacity, working time-outs and occurrences unrelated to actual work performance are deducted, such as time for breaks, arrival and departure, and communication, machine downtime. The unit costs are then calculated by dividing the cost of supplying capacity by the practical capacity. The output dimension is therefore given as cost per time:

\[
\text{Capacity cost rate} = \frac{\text{cost of supplying capacity}}{\text{practical capacity of resource supplied}}
\]

TD-ABC is based on the strong hypothesis that the entire cost generation is based on the time consumption (Wegmann, 2007). Instead of transaction drivers which are mainly used in existing ABC, TD-ABC is based on duration drivers. Figure 9 from Evareart (2008) graphically illustrates the allocation methodology of TD-ABC.
Everaert et al. (2008) also summarized the differences between the setup of an ABC/M and TD-ABC model.

**Panel A: ABC**

- **Step 1** Identify the different overhead activities
- **Step 2** Assign the overhead costs to the different activities using a resource driver
- **Step 3** Identify the activity driver for each activity
- **Step 4** Determine the activity driver rate by dividing the total activity cost by the practical volume of the activity driver
In the following chapters we discuss the differences between TD-ABC and ABC/M in detail. For that we not only take the model setup into account, but also the various characteristics of TD-ABC which are predominantly caused by the fact that it is based on time consumption.

### 5.3 Data gathering through interviews

Kaplan criticizes the data gathering of an ABC/M implementation in order to receive information on activities and driver rates. For him the process of interviewing and surveying employees carries along several problems, among them high consumption of time and high cost.

According to Kaplan (2003, 2004 & 2007) the time estimates required to calculate the driver rates for TD-ABC can be obtained by direct observation or by surveying managers. Hence, in case of a model setup or changing operating conditions, personnel do not need to be (re-)interviewed. Managers could undertake the model setup and updating by simply estimating the time units required for each (new) activity. Since this way of unit time estimation should
consume less time, it is supposed to reduce the cost of implementation and updating, compared to ABC/M.

*Time consuming interviews vs. direct observation*

Case studies on the implementation of TD-ABC indicate that practitioners have mainly followed Kaplan’s instructions on how to conduct the unit time estimation. For instance, Demeree et al. (2009) implemented TD-ABC at an outpatient clinic. They have gathered data through direct observations and interviews with department heads and outpatient clinic managers. To register different time consumptions for relevant activities a stopwatch was utilized. This process was repeated 3 months later to ensure that consistent results were obtained. This data gathering method was recorded as a success.

For their instructional case Everaert et al. (2008) stated interviews which were derived from real ABC implementations. As a consequence students were supposed to recognize that data collection for existing ABC is “very time-consuming” (Everaert et al., 2008).

Within our case study, workshops and interviews were conducted where managers and employees were introduced to the new costing system and interviewed concerning their tasks and activities. It is important to note, that although ABC/M was implemented, that approach was not obligatory. During the first consultations with the ABC/M project leaders, they were confronted with an option to decide on how to gather information. Two combinable alternatives were presented together with their advantages and disadvantages: workshops with all employees and interviews with cost centre managers. The following illustration shows which aspects managers were taking into consideration when they had to balance between the methods:
In our case, we practiced a top-down/bottom-up approach:

- Each employee invested 3 hours of his/her time to participate in those workshops.
- Managers were interviewed

As a result employees were involved in the setup process and actively supporting the implementation of our model. Managers provided an overview on major activities within their departments. However, the decision in favour of workshops was taken not only based on a trade-off between time investments and motivation of employees, but also because of a general reason: ABC/M provides insights on activities. Receiving information firsthand means also a better understanding of processes and activities. Decisions changing the effectiveness of a company can be introduced easier. In literature there are other examples where managers have accepted efforts of workshops and interviews, even if the only benefit was a review on processes and workflows (Carolfi, 1996 & Ittner et al., 2002).

For the most recent update of the ABC/M-model in early 2010, it was sufficient to only interview managers. But this was not conducted according to Kaplan’s method, since circumstances were different:

- concerning changes of activities, managers could conduct interviews and observe changes by themselves, since they were familiar with our approach.
- updates were not only related to changing processes and activities but mainly due to changes in the product portfolio (we refer to chapter 5.8 Data loading processing and reporting).

In literature another data gathering approach for the ABC/M model setup is mentioned: “Rapid Prototyping” (RP). RP is especially applicable for large scale implementations (Cockins, 2001). An enterprise-wide ABC/M model can be subdivided in to several children ABC/M models. To setup such a model there are two possible ways, starting from

- departmental-ABC/M models consolidated to the enterprise-wide system or
- high-level ABC/M is selectively adjusted into lower levels of detail

The aim is to accelerate the model setup and the organization’s learning about ABC/M. Intensive training and interviewing at the initial phase is not required. Cockins (2001) describes an instance, where only a sample of cross- functional employees had collectively constructed a “tiny” high level ABC/M model which then served as base for the entire enterprise. Another advantage of this approach is that mistakes are detected quickly and up-front, when they can be easier corrected as in a big model. This aspect leads us to our next topic: errors in costing systems.

5.4 Costing accuracy: sources of errors

Besides direct observation, there is another reason why Kaplan favours the TD-ABC approach instead of interviews, such as conducted in ABC/M. He considers managers the more reliable source concerning accuracy of information on time consumption and activities (Kaplan, 2003). The accuracy of the cost driver rates derived from individuals, is called into question, since employees introduce errors. This is due to their “subjective estimate of their past and future” (Kaplan, 2003, p.3). For Kaplan, managers generate more accurate information and fewer errors within a TD-ABC setup. He criticises the accuracy cost drivers of existing ABC/M, since they are derived from employees. His claim is that employees are tempted to bias time allocations, anticipating how they might be used (Kaplan, 2003). Kaplan does not justify why
employees behave in such a way but managers do not. Especially since managers are also affected by results on the performance of their department and hence can be tempted to bias estimates. Kaplan himself stated once that managers can be embarrassed or even threatened by systems which have the potential to reveal and generate information (Argyris & Kaplan, 1994). We found another author who reflected on his experience on PM implementations when he realized that

“...organizations were not economically rational, integrated entities, but composed of individuals with their own priorities and motivations, which were themselves influenced by the rewards and penalties expressed by senior managers.” (Otley, 2003, p.311-312).

We note that there is no difference on which hierarchical level potential bias takes place, since everyone might be tempted to influence the outcome of a model, which reveals his or her performance. Hence managers cannot be considered a more reliable source per se.

Concerning TD-ABC’s accuracy, Kaplan concludes that inaccuracies in unit time estimates are eventually revealed either in unexpected surpluses or shortages of committed resources. On the other hand, he does not explain why within ABC/M inaccuracies cannot be discovered in a similar way. Cockins (2001) points towards a fundamental aspect of ABC/M, stating that each cost can be traced by “its unique quantity or proportion of its driver” (Cockins, 2001, p.16). The resource expenses are eventually reaggregated into the final cost objects, this leads to revelation of errors. Therefore activity drivers in ABC/M do not only segment cost flows but also “govern accuracies” (Cockins 2001). Since in every module of ABC/M costs and their sums are visible, there is no difference in revealing errors compared to TD-ABC. But what about the source of errors Kaplan mentioned? Are time estimates and the way they are generated more accurate in TD-ABC?

In order to discuss what impact errors have on accuracy we need to first define what types of errors may occur in a costing system. Cardinaels and Labro (2007) have analysed the potential sources of errors that can be made when
designing a costing system. The categories of substantial errors are: aggregation, specification and measurement errors. In the following illustration an overview of these error types is provided as well as the stages of an ABC/M model (see also Figure 11) where they can occur.

Since TD-ABC heavily relies on time estimates as key cost drivers, our focus is on measurement errors. There are two ways measurement errors can occur. First, while assigning cost to cost pools, for example when manual labour is wrongly assigned to secretarial cost pool. The second and more important case for our discussion appears when “specific units of resource consumed by individual products are wrongly measured” (Cardinaels & Labro, 2007, p.21). In TD-ABC, estimation on how employees divide their time over various activities, is required. Because the allocation of (indirect) cost is based on these estimations, measurement error would have an important impact on the accuracy. Recall that Kaplan suggests managers should provide reasonable estimates for the time spend on various activities, or they should be obtained through surveys. Cardinaels and Labro (2007) find that even if employees have no incentives to bias the time estimates for a TD-ABC model, “significant errors
Comparison between TD-ABC and ABC/M are made in these estimates” (Cardinaels & Labro, 2007, p.23). The authors argue that cognitive capabilities of people are too limited to specify accurate information on time spans they spend on performing their activities. In consequence serious measurement errors on estimates are conceived. The authors add that this “problematic issue” can also be observed on existing ABC/M if it makes extensive use of duration drivers. There is hence no difference in which method is utilized, ABC/M or TD-ABC: the greater the role of estimated duration drivers is, the more is the model prone to inaccuracy. Recall that in contrast to TD-ABC, within ABC/M the driver type is not limited to be based on time estimates. Since time can reflect cost consumption through activities, ABC/M can, but does not need to take duration estimates into consideration. For such setups the authors highlight the importance of early notification of participants. Once a person is informed in advance that he or she needs to provide time estimates on the range of activities, errors on time allocations of activities are reduced (Cardinaels & Labro, 2007).

5.5 Cost of excess capacity

In addition to the supposedly improved ‘data gathering’ and ‘higher accuracy’ TD-ABC is favoured by Kaplan and his academic followers because it is supposed to reveal excess capacity. In existing ABC/M proportions for the time spent for different activities are stated in relative measures and add up to 100%. There is no focus on revealing excess capacity. Therefore Kaplan assumes that in ABC/M “resources are working at full capacity” (Kaplan 2003, p.4). On the other hand, in order to determine the capacity cost rate, TD-ABC deducts idle time from full capacity which leads to the practical capacity (see also “The concept of TD-ABC”). Managers are supposed to quantify excess capacity through estimation. Kaplan also provides support on how to approach this estimation: “as a rule of thumb, you could simply assume that practical full capacity is 80% to 85% of theoretical full capacity.” (Kaplan, 2004, p.3).

This approach was perceived as revolutionary by academics who implemented TD-ABC like Demeree (2000), Coners (2007) Everaert & Bruggeman et al. (2006 & 2008) and Wegmann (2007). However, estimating idle capacity is not a trivial concern. First, the mentioned TD-ABC’s “rule of thumb” needs to be
called into question (Barrett, 2005), since there is no empirical evidence, which would support its application. Second and more important, besides examples, how idle capacity can occur, “time for breaks, arrival and departure, communication and training”, (Kaplan, 2004, p.3) there is no rationale provided on how to determine idle capacity. Also the assumption that managers will reveal their capacity utilization must be doubted. For managers excess capacity also means that employees have much idle time and their department is ineffective (Barrett, 2005). So the unanswered questions remain: Who is willing to admit that a part of their (department’s) working time is spent idle, managers or employees? How to otherwise measure excess capacity? TD-ABC aims to overcome the problem that no employee is willing to admit that he or she is not working at full productivity. Absolute estimations of time units, rather than percentages are viewed as the key for insights on capacity utilization. Labro and Cardinaels (2007, p.23) question this method and provide empirical evidence that people tend to “over-estimate dramatically the time they work, on average 37%”. At this point, we must raise serious concerns on the accuracy of TD-ABC, since the claimed accuracy does not stand against the listed empirical result. The estimation approach is prone to error. Hence TD-ABC is not able to reveal excess capacity.

Furthermore the assumption that ABC/M is incapable of considering or managing excess capacity, a view Kaplan shares with other TD-ABC practitioners, must be set right. Within ABC/M idle capacity can be managed through the assignment logic. Capacity utilizations can be classified into different time-status modes; the simplest way is to distinguish between productive time and idle time. Based on this, subsequent cost reassignments of each time-status mode to specific recipients can be traced. The structure of activity drivers and the driver rate determination are not changed. The following illustration by Cockins (2001) provides an example on how activities can be split into different time-status modes, respectively “idle”, “nonproductive” and “productive”
State-of-the-art ABC/M supports many ways to allocate idle capacity, based on Cockins (2001) approach depicted in Figure 9. After the quantity of unused capacity is measured or obtained, the costs of excess capacity can be assigned

- equally, costs are divided by the number of existing assignment and then allocated.
- proportionally, according to the relative proportion of outbound allocations
- to other cost objects, when for instance idle time for “testing” should be reassigned to R&D costs.
- or not assigned, in order to receive for example product costs at full capacity utilization capacity costs are not allocated.

We can imagine an example: a chicken manufacturer has total warehouse space of 2000 square meters, where 1543 square meters are in use\(^7\). The idle capacity is therefore 22.85%. The offered chicken products are Breast, Leg, Wings, Fried Chicken, Frozen Chicken and Fresh Chicken. Our manufacturer knows that the measured idle space is due to empty refrigerators which are required for the Frozen Chicken product. We assume that the number of

\(^7\) Measuring idle capacity of a warehouse is far more comprehensible than determining idle time of a warehouseman
refrigerators cannot be adjusted according to the customers’ (seasonal) demand; they hence have to be kept in stock. Managers decide to allocate the full costs of idle capacity to the particular product, the Frozen Chicken. If the idle capacity cannot be traced to one particular product, or if managers decide to spread these costs among all products, a proportional or equal allocation method might be chosen. The following illustration shows how a proportional allocation for our example can look like:

![Figure 13. Idle capacity cost allocation, software: MyABCM](image)

Summarizing our findings, we state that TD-ABC makes an attempt to reveal and incorporate excess capacity, but struggles with accuracy concerning its time unit estimations (Cardinaels & Labro 2007). ABC/M on the other hand provides a full set of options on how to deal with idle capacity (Cockins, 2001) which has been revealed before. For each objective set by the management the business environment there is a choice between different allocation methods. In the end, users have to decide how to allocate cost of excess capacity. If the decision is not to distinguish used from unused capacity, we must assume that managers accept some level of excess capacity or are reasonably vigilant in not tolerating idle resources. However both, TD-ABC and ABC/M, can consider, but cannot reveal, excess capacity.
5.6 Time vs. multi-metric approach

Measuring idle and maximum capacity in order to provide capacity utilization remains a difficult task (Popesko, 2009). In the best case measuring idle capacity is obvious, as shown in our warehouse example. But in other cases capacity is not plainly tangible, for example when we consider IT-infrastructure utilization (Carter & Crovella, 2004), capacity provisioning is difficult to measure but necessary. In such contexts, it stands to reason to make use of various capacity measures – not only time estimates. The restriction of TD-ABC to reflect business activities only through time estimates generally needs to be called into question. In fact, the myopic focus on time can lead to exclusion of other cost factors.

Consider our warehouse example from above: In order to improve the process of “freezing chicken” and be able to cut costs, process engineers would be limited on the homogenous cost factor time. But besides time, costs for space and electricity are possible key cost drivers to accelerate cost cutting decisions.

For a bank loan officer it would be more intuitive to estimate the number of credit reference checks as a transaction driver than time\(^8\). For instance, 40€ per credit check could be related easier than a duration of 17.2 minutes for the same.

Within the field of Activity-Based Costing and Environmental Management (ABCEM) “environmental metrics and well established principles from economics and cost accounting” are utilized to determine monetary cost, energy and waste (Bras & Jan Emblemsvåg, 2001, p1.). Here, for example, cost drivers for fuel consumption are reflected through the amount of consumed litres. Barrett (2005, p.7) commented on TD-ABC’s limitation on duration drivers:

“In any organization, some functions -- such as marketing, legal, research, and areas of IT -- include activities that are far from homogeneous and repetitive. Trying to force a time-driven methodology onto activities in which cycle times vary wildly is inappropriate; for those activities, an alternative methodology should be used.”

\(^8\) Against the background of the financial crisis it might be reasonable to also incorporate the costs of credit risk within such an approach
Within our case study, heterogeneous processes of an airfreight-logistics company were reflected through a broad range of metrics (multi-metric approach). The following table provides a list of metrics which have denote the cost-consumption for the ABC/M model.

<table>
<thead>
<tr>
<th>Cost driver unit</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>KG</td>
<td>Invoiced weight</td>
</tr>
<tr>
<td>Hours</td>
<td>FTE</td>
</tr>
<tr>
<td>Quantity</td>
<td>Stored Freight</td>
</tr>
<tr>
<td>Quantity</td>
<td>Shipped pieces</td>
</tr>
</tbody>
</table>

**Table 5. Cost driver types in the ABC/M case study**

However ABC/M does not exclude time estimates for driver rate determinations, but can include all imaginable and reasonable metrics as a basis for cost consumption.

### 5.7 Complexity of processes and activities

"The time-driven approach usually operates with fewer equations than the number of activities used in any existing traditional ABC system, while permitting more variety and complexity in orders, products, and customers, and, therefore, delivering more accuracy" (Kaplan, 2003, p.9).

We note that for Kaplan complexity cannot be modelled efficiently within existing ABC/M. TD-ABC provides a novelty which is supposed to handle these cases better. Kaplan introduces *Time Equations* to capture activities with different degrees of complexity. Depending on the company’s product and activity structure determining activity drivers can be very complex. To illustrate this problem, he outlines example activities, where chemicals can be prepared differently before they are shipped:

- Case 1: normal treatment, packaging requires 0.5 minutes
- Case 2: normal treatment + special packaging (requires additional 6.5 minutes)
- Case 3: normal treatment + shipment by air (requires additional 0.2 minutes to place chemicals in a plastic bag)
- Case 4: normal treatment + special packaging + shipment by air
To cover all these cases without actually increasing the number of activities or drivers (and hence increase the model’s complexity) Kaplan introduces the following Time Equation:

Packaging Time = 0.5 + 6.5 (if special handling required) + 0.2 (if shipping by air)

What makes Time Equations innovative is that different degrees of cost complexity, caused for instance by optional features of product or service, are captured through activity duration drivers. Within these drivers Kaplan has incorporated a distinction of cases. For him this innovation is the only way to avoid the introduction of a “separate activity for every possible combination” (Kaplan, 2003, p.9) of activity characteristics. Concerning existing ABC/M, Kaplan (2003) stated that for heterogenic transactions, or complex activities, the number of activities and drivers needs to be expanded. For each activity a driver is defined and resources are assigned according to the consumption. Everaert et al. (2008) investigated whether ABC/M can model this kind of complexity. They state an example where a wholesaler failed to model variable characteristics using ABC/M. Their findings are that within an ABC/M model

- complex logistic operations cannot be modelled
- heterogeneity of activities with different subtasks are ignored, or
- separate activities for each subtasks have to be created.

Demeree et al. (2009) follow this assessment on the capabilities of today’s ABC/M. They conclude that ABC/M only supports a single driver rate for each activity which leads to an inflation of the number of activities in ABC and creates difficulties in estimating the practical capacity for each sub-activity.

Trying to solve the challenge of cost based evaluation and differentiation of complexity grades, there is also another approach. For ABC, Heina (1999) recommended to specially create cost objects for each combination of a complex product features and to introduce weighting-factors where different degrees of complexity are incorporated. A weighting-factor greater than 100% reflects a greater handling-complexity for a specific process variation. The
process costs are then obtained by multiplying the basic process costs with the weighting-factor. The aim is to provide process cost variations with different cost characteristics on alternative process variations. Heina basically argues that the number of cost objects should be increased.

We find that weighting-factors are only capable of incorporating and displaying different degrees of process complexity, but do not reduce complexity within a model. This approach can be seen as counterpart for the creation of additional activities as mentioned above.

We have presented two ways in which academics made an attempt to deal with complex activities within ABC/M. To set up an example for each of the presented approaches, we assume that a company has activities 1, 2 and 3, which can be combined to receive the product “white” or the variations “blue”, “red” and “green”. Imagine that we are talking about a car manufacturer producing one car that can be full-equipped “white” or combinations of equipments “blue”, “red” and “green”. For example, activity 1 manufactures environmentally-friendly features, like switching to biofuel-enabled components. Activity 3 leads to a lightweight car. If we combine 1 and 3 we receive a car in the “green” version, light and (therefore also) with low pollution. The following table explains the possible activity variations and the resulting product variation:

<table>
<thead>
<tr>
<th>Activity variation</th>
<th>Product variation</th>
<th>Product cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1+2+3</td>
<td>white</td>
<td>6</td>
</tr>
<tr>
<td>1 and 2 but not 3</td>
<td>blue</td>
<td>1+2 = 3</td>
</tr>
<tr>
<td>2 and 3 but not 1</td>
<td>red</td>
<td>2+3 = 5</td>
</tr>
<tr>
<td>1 and 3 but not 2</td>
<td>green</td>
<td>1+1+3 = 5</td>
</tr>
</tbody>
</table>

Table 6. Exemplary activity and product variations

To keep this example simple the activity number also represents the activity cost. Costs are defined according to the complexity of the product feature and not further considered within our example. Relevant for this illustration is the amount of complex information which can be added to the model.
Figure 14. Complexity in connection with activity or product variations

The figure shows the cost-complexity structure according to the academics above. The alternatives are placed on the left and the right side of the figure. According to what the authors above perceived to be possible for existing ABC/M, within a model we can either

- keep the number of activity variations and introduce cost objects ➔ new cost object for each possible product (cost) variation, or
- keep the number of cost objects and create variations of activities ➔ capture our costs within new activities

Since both approaches add information to the model, respectively activities 1, 2 and 3 or cost objects blue, green and red, both ways increase the overall complexity. The point is that information is added independent from the actual cost consumption. In both TD-ABC and ABC/M processes are segmented to achieve cost-related estimations for different cost objects and product types. In the literature, formalizing specific processes according to product type or group is called “variation-modelling⁹” or “variability” (according to Varia et. al, 2007).

However, complexity is either shifted from the activity side to the cost object side or vice versa. In contrast, TD-ABC avoids this type of complexity by introducing functions which keep the information needed only where the resource (time) is consumed. Kaplan’s Time Equations are recognized by the mentioned academics as a “breakthrough” (Everaert et. al, 2008), since for them ABC/M-models could not provide any comparable complexity reducing solutions.

As a matter of fact and in contrast to what authors have stated above, today’s ABC/M models provide complexity reducing functions for drivers: the calculated drivers, which include driver formulas. Driver formulas or similar - case distinguishing - drivers are part of any state-of-the-art ABC/M model and software.

We found papers from 2002 documenting ABC/M implementations with calculated drivers using “Oros 99” ABC software (Kamath, 2002). The following table shows an excerpt of today’s software vendors which support models with calculated drivers:

<table>
<thead>
<tr>
<th>Vendor</th>
<th>Software</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAS(^{10})</td>
<td>SAS-ABM</td>
</tr>
<tr>
<td>SAP(^{11})</td>
<td>SAP-BO</td>
</tr>
<tr>
<td>MyABCM(^{12})</td>
<td>MyABCM</td>
</tr>
</tbody>
</table>

Table 7. ABC/M software with calculated drivers

The formulas allow implying not only distinction of cases, but also a whole set of Boolean logic and mathematical terms. For example, consider the set up of Kaplan’s shipping example from above. Recall, the possible combinations are normal treatment + optional (shipment by air AND/ OR special packaging)

Let us extend the possible treatments by a forth case with another constraint:

\(^{10}\) www.sas.com
\(^{11}\) www.sap.com
\(^{12}\) www.myabcm.ch
When shipment by air is chosen, the special packaging requires 20% more time, because the customs duty requires reclosable packages for potential checks.

Driver formulas allow us to consider constraints in advance without increasing the model’s complexity. As a logical expression we could write for this case:

\[
\text{IF shipment by air AND special packaging} \\
\text{THEN} \\
\text{normal treatment + shipment by air + special packaging } \times 1.2
\]

In an ABC/M model, which reflects the treatment of logistic Companies, relations, constraints and combinable service and product features can be more complex than in these examples. We can imagine situations where costs do not behave linear and have to be reflected through polynomial function of higher degree. Or in situations where asset cost (resource cost) are step fixed, meaning that the costs “jump” when the output quantity increases and reaches a certain level. For example, a mail sorting machine which can sort mails up to a number of 10,000 a day. Once 10,001 mails need to be processed, an additional machine is required to be set up. These challenges are very likely to occur within the field of Regulatory Accounting, where costs of capacity provisioning are determined, for instance in Telecommunication Infrastructure (ITU, 2009). Here, internet data cables have to be upgraded when the data traffic exceeds the capacity of the provided bandwidth. Regulatory Authorities demand such ABC/M based cost calculations from telecommunication providers when setting prices for sharing infrastructure with competitors.

We can conclude that intelligent design of the calculation logic and driver formulas which reflects behaviour of costs is required to avoid increasing complexity within a model. In this sense the capabilities of Time Equations are similar to the Driver Formulas, up to the point that Time Equations are limited to
the input dimension time (we refer to chapter 5.6 Time vs. multi-metric approach). Concerning TD-ABC Kaplan\textsuperscript{13} (2007, p.1) stated:

“Time equations handle complexity by simply adding terms with Boolean logic that test for the presence of a particular feature that adds or subtracts time to overall processing time, a simple and elegant technique.”

An example from our case study, on how this “elegant technique” was implemented in existing ABC/M:

<table>
<thead>
<tr>
<th>Name</th>
<th>DriverType</th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>FlightEvent</td>
<td>Calculated</td>
<td>\text{if}(\text{&quot;Vertyp&quot;}=2,0,\text{if}(\text{&quot;Vertyp&quot;}=1) \text{ AND} \text{\textbackslash (&quot;GTyp&quot;}=3),0,\text{if}(\text{&quot;Vertyp&quot;}=1) \text{ AND} (\text{&quot;GTyp&quot;}=5),0, \text{&quot;FE&quot;}))</td>
</tr>
</tbody>
</table>

\textbf{Table 8. Calculated driver example from the case study}

This example shows how even a high degree of complexity can be handled. For instance, the combined Boolean terms ensure that if Vertyp equals 2 the output is 0. If Vertyp is not equal to 2, another Boolean term is utilized, checking whether Vertyp equals 1 and at the same time GTyp equals 1 and so on. Overall four combined case distinctions are incorporated within this term.

The elements entered in the formula above (Vertyp, GTyp, etc.) are attributes. They are directly connected to the related activity or cost object account.

\textit{Issues connected to reduced complexity}

Reduced complexity can also mean that information is lost. We illustrate this issue by using an example connected to attributes of a cost account.

During the implementation process the question, whether the model could actually handle complexity was not raised. For all participants it was obvious that calculated drivers which reflect logistic operations can be utilized within the driver formulas. Therefore the focus lay on how to utilize driver formulas, means to design and apply a logic for processes and activities.

Rather than “can we reduce model complexity?”, another related discussion could be observed: “how to deal with reduced complexity?”. We will illustrate

\textsuperscript{13} “Adding Time to Activity-BasedCosting”, interview with Kaplan on TD-ABC, 11\textsuperscript{th} April 2007
this problem with an example: visibility of attribute values for reporting purposes.

The company had two major process groups, cargo related activities (cr-activities) and special services (ss-activities). They are either assigned to a cost object for flight events or for special services. The underlying billing- and transaction-systems capture the invoices (revenues) and transported weights, both attributes in the model. In demand products can require cr- or ss-activities or both. The model was designed in a way that attributes (and their values) are only attached to destination accounts, if

1st there is an assignment to the destination account and

2nd the source account has a driver, where the attribute is included and utilized.

In our case we had a driver “Security” which was only utilized for export-flights and correlated to the transported weights. The underlying idea was that export flights require more security preparations in relation to their weight (see also example from above). Within the model, the transported weights for cost objects are not equal to the input value of overall transported weight. Only cost objects related to export products have the amount of transported weight attached as attributes. As a consequence, transported weights are not fully traceable anymore, for instance if we want to ensure that the sum of transported weights is equal to the input value.
This problem depicts a discussion on how attribute values should be reported, after complexity was reduced. A question which is more connected to general decisions on reporting: managers (Controlling department) have to define their way of treating attributes. The ABC/M calculation logic filters activity variations and their attribute costs according to the actual cost allocation. But these values (costs) can yet be designed to be comprehensively traceable, so that at any point within the model the sum of attribute values remains constant. Managers have therefore to decide whether

- Attributes should be fully visible; the sum always adds up to 100%.
- Sum of attribute values are visible according to the consumption through the utilized drivers, which may be less than 100%.

We can conclude that reports generated for Controlling and PM need to be commented, since the model’s allocation logic and implemented functions are not visible within standard reports. Therefore reducing complexity is always connected to question on how to report reduced complexity.

### 5.8 Data loading, processing and reporting

As we have seen TD-ABC cannot commit to the promises which have been stated by TD-ABC favouring authors so far. Still there are alleged novelties which could make a difference in the decision between ABC/M and TD-ABC. In
this chapter, we question how both systems can be integrated into the operational and technical environment of companies. Which costing-method is more advanced in this respect?

In today’s business environments, processing enormous amounts of (digital) data substantially relies on the use of IT. Therefore it is not surprising that Accounting Research is incorporating this topic and Kaplan (2003, 2004 & 2007) claims a problem-free integration into existing systems for TD-ABC. In this context, what makes the difference between ABC/M and TD-ABC in his view can be summarized as follows:

- TD-ABC requires less storage space than ABC/M. (Kaplan, 2003 & 2004)
- Generic spreadsheet tools such as MS Excel and even ABC software packages are exceeded by existing ABC/M. TD-ABC on the other hand delivers “fast processing times and real-time reporting” (Kaplan, 2004, p.2)
- TD-ABC can be fed from transactional system, such as Enterprise Resource Planning (ERP) and Customer-Relationship-Management (CRM) (Kaplan, 2004 & 2007)

Storage space requirements
Kaplan describes ABC/M-cases where “the demands on the computer model used to store and process the data escalate dramatically” (Kaplan, 2003, p.3). ABC/M is supposed to have high storage costs; since for example a company with 150 activities and 600,000 cost objects (products and customers) required 2.16 billion database items to save data of 24 months (Kaplan 2003).

We find that stating the number of stored database items does not provide information on the costs associated with the storage. There are many factors which need to be considered, at least hard drive storage costs and average size of a single database record, but also IT- provisioning and maintenance costs. In
2010, for instance, cost for hard disks to save the stated amount of data would be around 1500$\textsuperscript{14}.

However, we need to generally question whether ABC/M really has the claimed requirements for storage and whether there is a difference to TD-ABC in this respect. First, we refer to the foregoing chapter 5.7 “Complexity of processes and activities”. The inefficient implementations for ABC/M mentioned here lead to increasing complexity and a high demand for storage and processing capacity. If, for instance, the number of cost objects is derived from every possible combination of product features, as Kaplan assumed to be necessary for ABC/M (Kaplan, 2004), the required storage space will always exceed what needs to be stored for TD-ABC. Also if we can only consider one activity-cost driver for each activity, as claimed to be the case for ABC/M (Everaert et al. 2008), the same problem occurs: unnecessary information is added to the model which increases the required amount of data. When users do not recognize that within existing ABC/M a single (calculated) driver can reflect the cost consumption of multiple activities, the increased amount of data leads inevitable to more required storage space. Once calculated drivers are utilized within ABC/M; therefore, data amounts should not exceed what is required for a TD-ABC model. We refer to a quotation from Barret (2005, p.6), who concluded his findings on the data requirements of ABC/M and TD-ABC:

"Therefore, to be accurate, time-driven ABC requires as much data collection as does traditional ABC"

Concerning our case study, we did not find that storage space was a significant cost issue. Besides the utilization of calculated drivers, we incorporated sophisticated methods on multi-dimensional databases to avoid redundancy in the imports to the ABC/M model (see also Golfarelli et al., 2003). As a result we could supply the model with low amounts of data. The following table shows the size of the data sets:

<table>
<thead>
<tr>
<th>Storage space</th>
<th>Type of data</th>
</tr>
</thead>
</table>

\textsuperscript{14} Not the Total Cost of Ownership, calculation and assumptions are provided in the Appendix
80 Megabytes | Input Data, Microsoft compatible database (compressed)
2 Megabytes | ABC/M model – compressed and exported to XML file

**Table 9. Storage space requirements for ABC/M from case study**

**Software and performance**

Kaplan (2003 & 2004) also mentioned lack of performance which arose during ABC/M implementations. He states examples where processing for an ABC/M model took days. We could also assume here that this is due to huge amounts of unnecessarily created data as stated above. However we find that there are other possible reasons which have led to a misperception on the performance of today’s ABC/M models. Besides data amount, Kaplan’s (2004, p.2) description of ABC/M implementations refers to problems where the implemented solutions and underlying systems were not capable to process the job:

> “Such expansion has caused ABC systems to exceed the capacity of generic spreadsheet tools, such as Microsoft Excel, and even many ABC software packages.”

Even if we assume a state-of-the-art ABC/M model where “expansion” did not take place (through the use of calculated drivers for instance), we must question the extensive use of generic spread tools. Indeed surveys indicate that those who have implemented ABC/M are mostly using spreadsheet software like MS Excel, rather than especially designed ABC/M software which is supposedly too costly to customize (Gosselin, 2007). Recent and more general surveys show that up to 86.2% of German, Swiss and Austrian companies use Spreadsheet tools to evaluate and plan their businesses (Seufert, 2008). The benefits of Spreadsheet tools, such as MS Excel are obvious; they are quickly applicable, since most users are capable of using them. Furthermore they create little or no costs, because they are mostly available within existing IT-systems. They also provide a high degree of flexibility (Rasmussen & Eichorn, 2000). But flexibility and the attempt to save costs can come at a trade-off as we show in the following. KPMG Consulting (1999) empirically analyzed the quality of Spreadsheet applications their customers had in use:

- 95% of the applications included substantial errors.
• 95% of the applications were poorly designed
• 92% of the applications made significant mistakes in tax calculations
• 75% of the applications included substantial errors in accounting
• 78% of the departments did not have any formal Quality Management

Rasmussen and Eichhorn (2000) summarized their findings and recommendations on the areas of application for spreadsheet tools as follows:

<table>
<thead>
<tr>
<th>Should be uses for/within</th>
<th>Should not be used for/within</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Small companies</td>
<td>• Process control</td>
</tr>
<tr>
<td>• Highly individual applications</td>
<td>• Performance intensive applications</td>
</tr>
<tr>
<td>• Short period necessity</td>
<td>• Complex environments</td>
</tr>
<tr>
<td></td>
<td>• Consolidation</td>
</tr>
<tr>
<td></td>
<td>• Organizational change</td>
</tr>
<tr>
<td></td>
<td>• Accounting</td>
</tr>
</tbody>
</table>

Table 10. Use cases for spreadsheet software, source: Rasmussen and Eichhorn (2000)

We record, a use case where ABC/M (or TD-ABC) is based on generic spreadsheet software is prone to error and characterised by low performance. Therefore, it is not surprising that in some ABC/M cases in literature spreadsheet software did not deliver satisfactory results, since this is an overstrained solution when a certain amount of data is involved. Therefore, avoiding specially designed ABC/M software because it is too costly or “too costly to customize” as Gosselin (2007) outlined, may come at other - hidden - costs.

“For large data sets that exceed the limits of spreadsheet software, such as index contents or user log data records, which may consist of millions of observations, database management system software provides a better alternative” (Wolfram, 2003, p.3).
Most existing ABC/M software solutions are based on the use or preservation of databases in one way or another\textsuperscript{15}.

Within our case study, the processing time, starting from extracted data of transactional systems (ETL) to the view on the results of the calculated ABC/M model, was around 10 minutes. State-of-the-art databases and especially designed ABC/M software were in use. Spreadsheet tools were only used in two cases:

- When there was no interface providing a direct data import from transactional systems
- When reports needed to be customized and presented, after calculation have been performed in the ABC/M model.

\textit{Integration into the company’s system environment}

Besides amount of data and the processing performance there is another unique feature claimed in connection with TD-ABC: the ability to receive data from in existing Entity Resource Planning (ERP) systems. Kaplan (2004) states that data collection for TD-ABC is simple and not cost intensive, since it can be based on data from a company’s ERP system where “data on order, packaging, distribution method, and other characteristics” (Kaplan, 2004, p.6) is already stored. Why this applies only to TD-ABC and not to ABC/M is not provided. As a matter of fact, however, ABC/M can rely on the same type and amount of data as TD-ABC; there is just no limitation on the driver-metrics. Literature provides many cases where ABC/M was implemented using data from ERP systems.

Simply integrating a costing-model like ABC/M or TD-ABC into such an environment may not be the optimal choice. Within the research field of Management Accounting and Integrated Information Systems (IIS) the relationship of ERP and ABC/M has been described and analysed. ERP systems emerged in the 1990s, as they integrated different informational and transactional system within companies and thus provided better support for management accounting (Davenport, 1998). But besides ERP, as a transaction-

\textsuperscript{15} ABC/M software examples with specifications: http://www.infogoal.com/links.php?n=19
Comparison between TD-ABC and ABC/M

oriented information system, other analysis-oriented information systems, such as Hyperion for the Balanced Scorecard (BSC), have become present in the range of information systems that support management accounting (Granlund and Malmi, 2002). Granlund and Malmi (2002) and Malmi (2001) also reported that management accounting techniques, such as ABC/M, are mostly not implemented within ERP systems but maintained outside using spreadsheet tools or specialised software. They argue that specialised software for ABC is considered more user-friendly and flexible regarding analysis and reporting.

Also ERP systems are considered too complex to additionally incorporate ABC/M. Chou and Tripuramallu (2005) find that ERP systems are limited in the capability to integrate other systems. Other authors like Boot et al. (2000) and Fahy and Lynch (1999) argue that both systems should not be integrated, since management accounting tasks should remain decomposed. Especially the transactional part that ERP systems most easily support and the analysis part which supports strategic decision making should not be put together. Fahy and Lynch (1999) wrote

“...while ERP systems improve the supply of transaction data for strategic management accounting activities, they typically cause significant damage to existing decision support capability of the firm” (Fahy & Lynch, 1999, p. 1).

We note that integration within or strong dependence from transactional systems such as ERP in order to supply an ABC/M model, can shift focus away from the analytical purpose of such a costing system.

But even if we consider a more sophisticated environment, such as Business Intelligence (BI), receiving required data to process meaningful analysis in ABC/M is not self-fulfilling. BI systems are automated and proactive environments (McKnight, 2004) which “typically offer the ability to analyze quantitative data and produce information that monitors business performance” (Oleskow et al., 2007). They are able to provide ad hoc, forecasting, and exceptional reports, as well as Online Analytical Processing (OLAP) pulling the data from existing ERP systems. In contrast to ERP, BI facilitates the decision support function, since it is originally designed to perform various analyses and
deliver superior reporting. Recent surveys indicate that ABC/M is evolving as a part of BI systems since both can be implemented simultaneously and jointly (Oleskow et al., 2007).

Concerning our case study, the ABC/M model was supplied from different heterogeneous systems which had no integration or interfaces with ABC/M. ETL was required to load data from these systems. On the basis of standardised data exports from existing transactional systems we implemented ETL steps. Within the ETL steps the following features were provided:

- Automated running to transform export data from transactional systems into import tables for the ABC/M model
- Log-files which confirmed that the transformation process was successful, or that failures occurred at a certain step
- Plausibility checks on the completeness and the consistency of the received data exports

Since no integration within ERP or a BI system was desired by the Controlling Department this solution gave a high perception on automation and integration within the existing company environment. Changes in the product portfolio which e.g. affected the structure of cost objects in the ABC/M model were also caught and considered by the implemented queries. On the other hand the ETL steps could be accessed and customized individually without interference with operational systems. This is required when managers decide to undertake changes concerning processes and activities. Accessing our user interface did not require any programming knowledge, such as SQL, so that users could execute the program once and then switch to the ABC/M model where the data then might be loaded. Thus the focus lay on the work with the ABC/M model where the analytical work was performed. In the end our approach was highly accepted by the management, since we utilized data from existing systems within a standardised and usability friendly environment.
6 ABC/M in the frame of Performance Management

So far we have focussed on the capabilities of existing ABC/M in contrast to TD-ABC. The idea behind both costing methods, ABC/M and TD-ABC, is to function as enablers for decision making, for instance they can

- highlight opportunities for cost reduction.
- provide insights on product costs and customer profitability.
- help to optimize business processes, logistics operations and the utilization of capacity.

However as we have highlighted in the foregoing chapters, TD-ABC’s capabilities are too limited to provide the informational basis for decision making. This is mainly due to its myopic focus on duration drivers, which may lead to some insights on cost structure, but leaves out relevant information in order to measure performance. We conclude that cost can be reflected within time, but performance requires a broader – multi-metric – view on an organization’s processes.

The evolution of ABC/M shows that it has emerged from a product cost calculation method (Kaplan, 1988) to an approach aimed to “manage cost at the root” (Lebas, 1999, p.501) through the business-process and activity perspective. To complement the multi-purpose character of ABC/M with a further aspect, its outcomes shall be aligned to the corporate strategy. For that it needs to function within the broader frame of PM. PM gives feedback about “whether the strategic and operational plans are succeeding” (Kangw, 2006, p.21), as for instance the Balanced Scorecard (Kaplan, 1992) does. In order to apply PM based on ABC/M, managers need to decide why they want to measure and what they want to measure, since there is no objective definition on the performance of a company. It suffices to derive performance as the future value retained from the definition of performance chosen by managers. Managers have to deploy components of casual models that lead to “the timely attainment of stated objectives within constraints specific to the firm and to the situation time” (Lebas, 1995, p.29).
From this definition of PM we extract that results delivered from an ABC/M model are obtained according to stated objectives and need to be managed actively within the firm’s specific constraints. We point out what PM in connection with ABC/M means by using an example: Consider the chicken manufacturer example from above. As a result of the economic crisis, the top-management has taken the strategic decision that cost for salaries should not increase within the next five years. In order to not lose market share this constraint should be handled more flexible within the marketing department. They have therefore set thresholds for the marketing salaries:

Up to 70,000€ - “green zone”, this amount was spent in the past year. Management should aim to not exceed this level.

Between 70,000€ and 100,000€ - “yellow zone”, only if the marketing department needs to perform additional campaigns in order to keep the market share these expenses are justified.

Above 100,000€ - “red zone”, this level of expenditure should not be reached, since company-wide cost saving efforts would be contradicted and insolvency becomes more likely. Even the biggest competitor cannot rely on a higher budget for marketing salaries.

To better illustrate this example we present a view on the ABC/M software MyABCM, where these constraints have been incorporated based on an ABC/M-model.
This dashboard view has the advantage of giving the management an immediate feedback on the actual cost expenditure in relation to the constraint. In this example we record that marketing salaries are within the yellow zone, with an amount of almost 77,000€ at the end of the year. This means that the number needs to be justified according to the stated thresholds and constrains from above. Managing “cost at the root” as Lebas (1999) has stated, should therefore also be part of the ABC/M-PM concept which we are outlining here. Managers need to be able to trace costs to the different activities and cost objects in which they flew in. We turn back to our example and take a look on the “Traceability View”, a feature provided by the software to trace stages of cost allocations:
Here we can see where the manpower costs for Marketing have been consumed. At this point, managers need to decide which accounts are of interest to be traced back to a certain cost object and distribution area. The path displayed here is “Institutional Marketing” for “Frozen Chicken” in different regions. Reasonable paths of interest can be determined, for instance, by the level of competition in a market for a certain product. If there is high competition for Frozen Chicken, e.g. in Argentina, managers will probably consider the consumed costs as justified and focus on other paths. This example shows how an integrated approach of ABC/M and PM can be set up. We record that PM benefits from increased insights on the root of costs through ABC/M. The combination of both enables to align financial decisions and operations to the strategy.

To conclude our findings on the framework of “Activity Based Performance Management” (ABPM) we outline the major building blocks in the following. At the bottom lies the data basis, represented by a transaction-oriented (analytical) system, such as ERP (BI). This block mainly delivers data input for...
resources and cost objects of an ABC/M model. The model performs the cost allocation according to the defaults from PM and the implemented logic. Furthermore, ABC/M represents the core of the framework, since the information which drives the whole setup is generated here. In the layer above we find the PM component which is aligned according to the strategy. Strategy is considered as predefined; it is determined by various internal and external factors, such as markets, competitors, suppliers and so on (we refer to Porter, 1980 & 1985). However, within PM it is the managers who decide what is worthwhile to measure and for which reason (Lebas, 1995) and thus set the frame in which ABC/M needs to perform. Furthermore, PM defines objectives and ties them to constraints, which can be reflected through parameters. A comparison of ABC/M measures and PM constraints outlines the starting points for paths in which costs can be traced.

![Figure 18. Activity Based Performance Management Framework](image)

Once the cost-consuming roots are identified, action plans according to strategic guidelines can be formulated and executed. We finish this chapter by quoting a very precise characterisation of PM which we find suits best the ABPM-framework we developed here:
“PM integrates operational and financial information into a single decision-support and planning framework” (Cockins, 2006, p.160).

7 Conclusions

We slip back into the role of our fictitious CFO from the Introduction of this paper. He has to select the most appropriate activity-based costing method and tie his choice into the frame of PM. At the beginning he notices the ABC-paradox: in spite of its proven benefits, ABC/M has low diffusion rates. The ABC-paradox is associated with contextual and behavioural factors, but especially with problems in the concept of ABC/M. Concerning the contextual and behavioural factors he knows he now has to ensure first that organizational culture is accepting a new system which reveals performance. Through employee motivation and senior management support he plans to prevent a perceived threat and to respond to resistance. However he has to compare and decide first: ABC/M or TD-ABC, which allegedly does not show any conceptual problems.

After he conducts his research the most conspicuous finding in reference to the literature is that at least a part of the academic world does not recognize ABC/M in its state-of-the-art. For them it still exists in its conceived version from the mid-80’s (Cooper and Kaplan, 1988) and has not made any improvements since that time. In contrast to what they perceive as ABC/M, today’s ABC/M does provide the following features:

- Whether data on activities and driver rates are obtained first-hand through employee-workshops, or manager interviews, they are combinable alternatives. However, conducting interviews with employees is not less accurate or more biased than interviewing managers, since there is no empirical indication for such a statement.

- Complex activities, product portfolios and cost functions are reflected within the sophisticated driver-logics of an ABC/M model. Case distinctions within calculated drivers reflect the cost-consumption of complex setups without increasing the model’s complexity.
Cost consumption of heterogeneous processes is best depicted through **multi-metric drivers**. For this case using a variety of driver rates is not only self-evident but leads also to high **accuracy**.

**Costs of excess capacity** are incorporated when managers decide to put a focus on this issue. They also decide how to allocate these costs in order or to optimize capacity utilization and planning.

Spreadsheet tools should only be in charge for supporting tasks, since they are prone to error; the ABC/M model shall be calculated using **special ABC/M software**.

Data from existing transactional systems, such as ERP or analytical systems like BI can be loaded into an ABC/M model. The process of extraction, transformation and loading (ETL) of such data is not trivial, but can give a **perception of an integrated or automated solution**. ABC/M does not have to be merged with underlying ERP systems.

As a matter of fact, both TD-ABC and ABC/M **cannot reveal excess capacity**. Also size and processing time of those models do not significantly differ.

Our CFO also finds that the use of TD-ABC is connected to shortcomings caused by the myopic view on time to reflect business activities. There is empirical indication that the extensive use of duration drivers, as they are derived from time estimations in TD-ABC, leads to inaccuracy of a model. However, our CFO finds case studies in literature where TD-ABC as well as the ABC/M model benefited from data supplied by ERP or BI systems.

His choice is ABC/M, since TD-ABC is only appropriate for setups where simple company models are to be implemented. Concerning TD-ABC, the resulting models are characterised by:

- the sufficient reflection of only homogeneous process and activities, due to the limitation on duration drivers.
- limited expressiveness, cost information which is only based on time cannot serve to optimize processes based on other metrics.
- low accuracy, due to error-prone time estimations.
At the end of his research, the CFO reflects on his results. He asks himself whether the ascertained misperception of today’s ABC/M is another **possible factor contributing to the ABC-paradox**, among the various factors which are already known.

Eventually our CFO prepares for the next C-Level meeting where he has to defend his favoured costing method. He presents ABC/M as an integrated component of the new framework of PM. He outlines how interactions within this framework take place through an exemplary use case. At the end, his presentation reinforces how ABC/M supports to align financial and operational decisions to his company’s strategy.

As an outlook for future research, we would see the need to empirically connect perceived features of ABC/M to the ABC-paradox. First, all features which exist within state-of-the-art ABC/M need to be stated. The results of this paper can be used as a basis to extract the standard features an ABC/M-model should provide these days. Then surveys which match the perception of ABC/M at firms to its existing features should be conducted. Questions whether implementations have been abandoned or avoided because of a misperception should be stated to complement such an empirical investigation. We can think about how such a questionnaire might look like. Questions such as the following should be included:

- Do you think that ABC/M can model all the (complex) products, services and customers which are related to your business?
- Do you associate managing (excess) capacity with ABC/M?
- Have you avoided/abandoned ABC/M implementations, because you missed one or more of the stated features?

The results should portray an empirical picture showing, to what extent the misperception of ABC/M contributed to the ABC-paradox.
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Storage cost, an exemplary calculation

If we roughly estimate the space required for the mentioned 2.16 billion database entries (using a few assumptions), we receive an amount of hard disk space up to 286Gigabyte. Since data needs to be saved redundantly, we assume 900Gigabyte of required space. In the year 2000 (Kaplan wrote his paper in 2003) a one-time investment for an appropriate hard disk, which can carry 900Gigabyte costs would be around 18,000$. This number needs to be put in relation to the company size with 600,000 cost object and customers.

Storage costs estimation based on Kaplan’s (2003) database example with 2,16 billion items, source: http://searchsqlserver.techtarget.com/tip/Determining-SQL-Server-database-storage-requirements

300Gigabyte hard disk cost around 500$ in 2010, source