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# A Framework for the Classification of Management Control Tools

Experiences with Activity-Based Costing in the German Public Sector

by

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# Abstract

**Title:** A Framework for Classification of Management Control Tools: Experiences with Activity-Based Costing in the German Public Sector

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**Five key words:** Contingency, Framework Development, Iron Triangle, Activity-based Costing, German public sector.

**Purpose:** To find a suitable framework for the categorisation of management control tools as guidance for a purpose-oriented choice of management control tools. This is done by applying the iron triangle in the case of Activity-based costing (ABC) in the German public sector. Thereby the ABC adoption in the German public sector is analysed, including the discussion of purpose-oriented versus trend-driven management.

**Methodology:** A quantitative empirical study among German municipalities is performed. Thereby the data is collected through a web-based questionnaire. The data analysis is done on basis of univariate methods as well as with a logistic regression analysis.

**Theoretical perspectives:** The idea to develop a framework for the purpose-oriented choice of management control tools is based on the idea of contingency theory. Evidence concerning the use of ABC in Germany supplemented with findings from other contexts serves as a starting point for the empirical work in this thesis.

**Empirical foundation:** Empirical data is gathered through a web-based self-completion questionnaire from high-ranked civil servants in German municipalities. The questionnaire is developed based on relevant literature as well as insights from practice which are gained through two pre-interviews.

**Conclusions:** The iron triangle is not found suitable for the categorisation of ABC in the context of the German public sector as its three dimensions 'time', 'cost' and 'quality' do not cover the emerging area of transparency.

Concerning the use of ABC in the German public sector the most important influential factor seems to be the size of the municipality while hype tendencies imply a rather trend-driven adoption.

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# List of Abbreviations

ABC	Activity-based Costing
BSC	Balanced Scorecard
ca.	Circa
CCT	compulsory competitive tendering
CIMA	Chartered Institute of Management Accountants
df	Degrees of freedom
e.g.	exempli gratia
et al.	Et alii
etc.	Et cetera
i.e.	Id est
ID	Identity Card
IDRE	Institute for Digital Research and Education
IT	Information Technology
N.A.	No answer
n.d.	No date
OECD	Organisation for Economic Co-operation and Development
S.E.	Standard Error
Sig.	Significance test statistics (p-value)
SPSS	Statistical Package for the Social Sciences
TC	Target Costing
TD-ABC	Time-driven Activity-based Costing
TQM	Total Quality Management
UK	United Kingdom

UNRISD United Nations Research Institute for Social Development

US United States (of America)

vs. versus

# 1 Introduction

## 1.1 Background

In the past five decades considerable attention has been drawn to the topic of management control. In its original notion, this term was closely linked to the effective and efficient use of resources within an organisation, but separated from other control contexts such as strategic- or operational control (Anthony, 1965). Over time however also other than financial outcome controls were addressed. In fact different levels of management control like psychological- or social controls emerged in practice and became an increasingly studied subject in academia. However what was always kept was the idea that management control is supposed to influence the decision-making process and the behaviour of organisational members so that the performance of the organisation is increased and its targets are achieved (Carenys, 2012).

In order to enable the achievement of the inherent management control objectives and to improve management decisions in organisations, different management control tools were developed. The discussions around these tools treated often extensively advantages and disadvantages while staying rather inconclusive (Kaplan/Norton, 1992, Norreklit et al., 2008). Even though that might be a subjective impression, some parts especially of the practice-oriented discussion around this kind of tools partly seemed to imply the search for a universally applicable management control tool fitting to all purposes regardless the popularity of contingency theory. That is also underlined by the occurrence of hypes around certain management control tools at different times (Rayner et al, 2005). In order to provide a new perspective on this topic, this study shall provide more insights about the suitability of management control tools by applying a contingency approach. This aim shall be achieved by establishing a new way to illustrate the suitability of management control tools for different purposes by classifying them into a framework, which fits to this goal.

Despite the variety of goals and tasks that can be found in today's organisations, it seems to be possible to depict the major dimensions of management in a multi-dimensional framework as this has been done by several researchers in the past (Neely et al., 1995; Weaver, 2007). Indeed, in line with our contingency approach, it is very important to take a framework which can provide a link between tools and contextual factors. It is crucial that such a framework includes all relevant dimensions and supports typical objectives of the investigated organisations. One such management framework is the so-called 'iron-triangle' (see figure 1) which consists of the three management dimensions time, cost and quality (Lock, 2007). The triangle is mainly used in the field of project management which is the reason why it is also referred to as project management triangle. However Neely et al. (1995) or Gering (1999)

among others use the same dimensions to describe the performance of all single business activities. Therefore the triangle can be seen as a rather universal framework not only usable in the context of project management, making it most suitable as a general framework for the categorisation of management control tools which could provide general guidance in terms of the choice of good management practice in different situations.

A test as basis for subsequent development of the framework will be achieved through an exemplified classification of Activity-based costing (ABC) into this framework based on the experiences with ABC in the German public sector. These experiences will be gained through the execution of a quantitative survey among German municipalities. This choice of context is an interesting setting for the abovementioned framework testing due to several reasons. First the reform process in public accounting in Germany has led to an increased use of more modern accounting and costing techniques such as ABC. Second, since this is a rather recent development and still an ongoing process, German public managers might be very well able to depict the costs and benefits of ABC since a lot of them might have experiences from times before and after the implementation of ABC, which they can compare to each other. Finally although the context of public sector might imply several specific characteristics, also some conclusions on the private sector may be drawn as common characteristics can be found between these two contexts.

In addition the separate findings concerning the use of ABC in the German public sector add on to the research areas of New Public Management (NPM) and ABC. This context including the German public sector as well as ABC will be further introduced in the course of this thesis.

While other frameworks were considered, the triangle was chosen due to the fact that it is by far the best documented framework and in addition the only one that was found which included only relevant dimensions with regards to the context of this study. In fact most of the similar frameworks which can be found for example on Wikipedia are not developed by credible academic sources. Moreover none of the additional dimensions (e.g. scope, risk, resources, and product), which were found in alternative frameworks (Wikipedia, 2015), appeared to be particularly relevant in the present context.

Based on this weighing of arguments, the triangle framework will be taken as starting point and as basis for further developments towards a final framework.

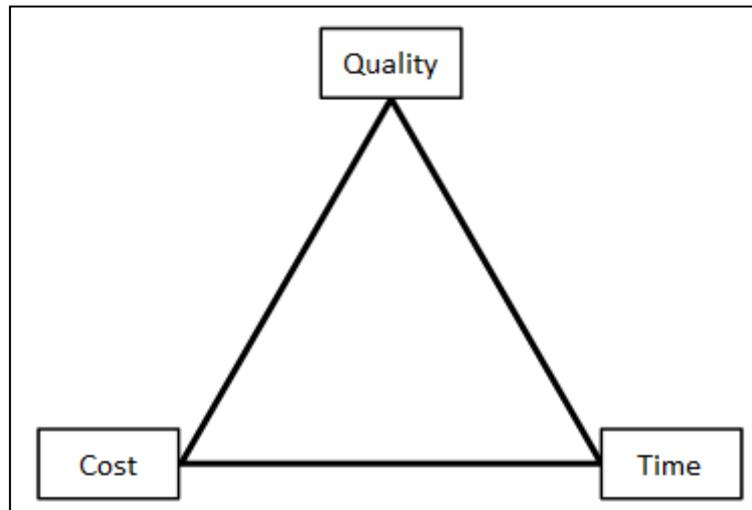


Figure 1: The 'iron' triangle (own figure based on Lock (2007))

## 1.2 Problem discussion and motivation of this study

An essential part of nowadays' management of organisations is a developed management control design with suitable tools in order to ensure the rationality of management decisions and to influence organisational behaviour (Weber/Schäffer, 2011). The contextual dependence of suitable business and management approaches has been acknowledged in line with the raise of contingency theory in management control research over the second half of the last century (Fiedler, 1964; Mertens, 2009). Along with that comes the claim that the choice of management control tools should happen completely purpose-oriented, depending on the context. This would cause natural variations in management control between different kinds of organisations, activities or projects. However, since a typical development of adoption rates (hype cycle) can be observed for several management control tools (accelerative increase in the beginning → short peak phase → strong decrease in popularity → slow but continuing increase in the following) (Rayner et al, 2005) there is evidence for a rather trend-driven implementation of management control tools (Power, 2011; Tang et al, 2007). One tool for which a hype cycle could be observed is ABC (Turney, 2008), which shall be the subject of this thesis. We claim that the manifestation of hype cycles in practice constitutes a deviation from the theoretical ideal according to contingency theory. Therefore one contribution of this thesis shall be in providing guidance to practitioners how to come closer to this ideal. That goal shall be achieved by developing a framework for the categorisation of management control tools on the basis of the 'iron triangle'.

That such a general framework does not exist yet can be illustrated by the fact that management control tools have mostly been evaluated in an isolated manner in the past,

which also applies for the tool ABC (e.g. in Abdel-Kader, 2011). To consider management control tools as independent parts increases the risk of having overlapping effects or gaps in the management control environment of an organisation. That increases the general risk of inefficiencies in many parts of the organisation (CIMA, 2013). We claim this to be a result of a lack of an integrated framework, which could solve the problem of lacking guidance in making a purpose-oriented choice of management control tools. That is a second reason why the development of a general framework for the categorisation of management control tools shall be approached in this thesis.

It has to be acknowledged that while there are different management control tools suitable for different purposes also different management frameworks may be suitable for different contexts. The triangle appears to be a very general framework whose suitability shall be clarified in terms of its application for private- and public sector organisations.

While it is clear that there is a lack of an overall framework for categorisation of management control tools, it is not clear if the hype cycle concept can also be observed in the German public sector. Especially since the German public sector is in many ways different from the original context in which the tool ABC was used. Also the generally observed German conservatism which is particularly strong in the public sector could be a counter argument which could even lead to a reverse tendency (Nobes/Parker, 2013, Rainey/Fernandez, 2011). While strong hype tendencies imply many trend-driven adoptions the lack of any increasing interest in a new tool may indicate the opposite, namely that the tool is not considered even though it would be suitable.

## 1.3 Purpose

The main purpose of this thesis is to develop a framework for the categorisation of management control tools. In order to do so, a suitable framework of categories (management dimensions) needs to be defined.

In order to really test the suitability of the triangle as an all-encompassing management framework it therefore makes sense to analyse it in a context for which it may not have been originally designed. This is done in this thesis by choosing the use of ABC in the German public sector as context for the thesis.

Despite the ABC origins in Anglo-Saxon manufacturing companies the study is made in the German public sector on municipal level. Even though this choice of context is not the particular focus of this thesis, it is expected to influence the results. As this empirical study requires questions concerning the use of ABC and allows for further data collection, the analysis of the ABC adoption in the German public sector is the second focus area of this thesis. Along with this the hype cycle for German municipalities will be identified and illustrated.

The reason for the scope limited to Germany lies in the aim for a more detailed analysis with respect to both of our research ideas, the categorisation of ABC as well as the analysis of ABC use in the German public sector.

## 1.4 Research approach and context

Throughout the thesis a contingency approach is taken which stresses the fact that the predefined context bears multifactorial influences affecting the findings. Therefore the iron triangle seems to be a suitable starting point for the categorisation of ABC, which includes relevant basic dimensions and, due to its simplicity, allows for expansion without losing much of its flexibility.

The results of the executed survey in the German public sector shall give insights about the suitability of the framework for the categorisation of management control tools by providing data about the strengths and weaknesses of ABC. In case of ambiguous results, this approach provides the possibility to adjust the framework and to perform a categorisation into the final framework.

As our study is conducted in Germany a translation issue becomes relevant. While we refer to the costing concept which is labelled as 'ABC' throughout the thesis, the term has to be translated to German for the survey. 'Prozesskostenrechnung' is thereby seen as the most suitable translation (Weber/Schäffer, 2011). Despite the suitability of this term slight differences in meaning may be caused through this translation. We will discuss them further in the third chapter.

Another specialty of Germany is the rather conservative approach towards Anglo-Saxon innovations which can be observed in the field of accounting in general (Nobes/Parker, 2012), and in particular in the public sector, Germany was known not to be as advanced as other countries in the past, in particular concerning the reforms in line with NPM (Hood, 1991). The results will also provide information about the use of ABC in German municipalities and allow for a discussion of potentially influential factors on the implementation of it.

The context of ABC in the German public sector for testing a possible framework for the categorisation of management control tools is expected to be suitable as the use of ABC in German municipalities is documented by several studies. Indeed some crucial factors like the raise of NPM and also the recent financial crisis imply an environment of change towards a higher likelihood of ABC use (Hood, 1995; Musil, 2005; Sartorius et al., 2007).

## 1.5 Outline of the thesis

The thesis will be continued with the presentation of the methodology, which will be used for the study in combination with the discussion of its limitations. That is followed by a comprehensive chapter about the theoretical foundations of central research objects of this thesis, namely the 'iron triangle' and ABC, against the background of contingency theory as well as an overview of empirical findings from the past concerning the use of ABC in different contexts. The theoretical findings will also be used in order to formulate expectations concerning the empirical results of the study. The theory chapter will be followed by the presentation of our results by using univariate and multivariate analysis (regression). The results will be analysed in chapter five by interpreting them regarding the expectations, which were set up in the theoretical chapter by considering existing theory and the limitations of our research approach. Also implications for practitioners and academia in terms contributions to the research area and prospects to further research will be discussed here. The thesis will end with a brief conclusion which summarizes the main findings and outlines related areas of future research.

## 2 Method

### 2.1 Definition of context

We identified that a categorisation of management tools based on the predefined dimensions time, cost and quality is yet to be started. In order to set this starting point by categorizing the tool ABC as it is used in the German public sector the scope of our research is automatically limited. Indeed a generalization of the results to other sectors, countries or tools will be difficult. The fact that municipalities were chosen as a sample relates to a combination of advantages. First, the likelihood to find ABC adopters was seen as acceptably high based on previous research and information about recent developments. Second, the fact that municipalities are not- and will never be multinational makes their context better definable compared to companies which allows for comparison between different contexts (e.g. in different countries). Third, they differ in size which allows for comparison based on size as measured through the number of inhabitants or financial resources. Fourth, as being on partly subordinate to state- and national political level municipalities are not equally autonomous in their decisions as firms would be (Haschke, 1997), so that the factors influencing the use of ABC might be of interest. Further, the public sector use of ABC in Germany is still a rather undiscovered research area compared to the vastly researched private sector use of ABC. In addition a higher response rate seems to be more likely than in private sector companies. Indeed a study has shown that the response rate in the public sector is in the upper midfield. If not municipalities were taken as population for this study, production companies would have been another option but they show a lower response rate (Baruch/Holtom, 2008). What is particularly remarkable is that the minimum response rate in the public sector is far higher and the standard deviation is lower than in the other investigated sectors (Baruch/Holtom, 2008). Especially these last two characteristics make municipalities a suitable population for this study. Finally, the use of ABC in German municipalities is a rather new phenomenon (Ministry of Finance - State Hessen, 2014; Brandl et al., 2003), so that public managers, who experienced the introduction of ABC, can give insightful and accurate replies about the effect of ABC for management control in public management. That is an important difference compared to private companies, since in the private sector a high implementation rate of ABC was observed in the beginning of the 1990s (Innes et al., 2000). Also several countries and public administrations implemented ABC already more than 20 years ago (Oseifuah, 2014). In these cases, the likelihood to get replies from managers, who experienced the change in these days, is supposed to be significantly lower whereas in German municipalities, ABC is a rather current topic, which is also confirmed through former studies. So, this study is supposed to assess the further progress of this development and gather answers about the suitability of ABC for different purposes.

The fact that the survey was done in Germany is also related to the German background and the language skills of both researchers limiting the choices to English or German speaking municipalities. The fact that the researchers possess specific knowledge about the political system as well as cultural factors in Germany allows for slight contextual adaptations (e.g. wording of questionnaire etc.) in the research approach which could not be made by any researcher without this specific contextual knowledge. The focus on one single country instead of several was decided mainly in order to allow for a deeper analysis.

## 2.2 Choice of overall research approach

The quantitative approach was chosen in order to ensure that a higher number of experiences can be gathered than in case of a qualitative case study. This is necessary in particular in order to draw more credible conclusions concerning the suitability of the framework by applying statistical methods (Zikmund et al., 2012). The analysis concerning both research focus areas was done based on empirical data obtained from civil servants from finance departments of German municipalities through a web-based survey. Since the framework of the triangle for classifying management control tools shall be tested empirically, a qualitative study could provide misleading results due to a high dependency on the situational factors of the investigated study objects. Furthermore, the quantitative approach is also suitable for the second purpose of our study as it will allow us to make more general statements on the development of ABC use in German municipalities.

The choice to make a quantitative study is supported by the fact that it can be categorized as descriptive rather than exploratory as we are combining fields (ABC and public management) in which a lot of research has already been done (Zikmund et al., 2012). Indeed also the classification of ABC as a management control tool is approached descriptively. As we will discuss further below, many factors which may influence ABC adoption and also a framework of objectives which may be reached through ABC application can be identified out of existing literature. In order to follow this analytical approach and in order to be able to link the findings to the context of our research a quantitative study is deemed to be suitable (Zikmund et al., 2012). However we are aware of potential weaknesses of the quantitative approach. For example we limit our research to existing ideas as most of the categories in our questionnaire will be predefined and almost no space can be provided to collect additional or contradicting thoughts of the respondents. Also it is difficult to estimate how respondents understand questions of the survey. While in an interview it is possible to interrupt the respondent and clarify aspects which may have been misunderstood it is not possible to react on misunderstanding in a quantitative survey. However this missing possibility to interact with the respondent is also strengthening the objectivity of a quantitative survey as the researcher cannot influence the answers of the respondents and thereby cause bias (Zikmund et al., 2012; Bryman/Bell, 2011). As mentioned above a quantitative research approach is

suitable for descriptive studies. However it may be problematic to interpret the results that are found. This concern is linked to the fact that no clarifications can be made by the respondents and no additional information concerning causal relationships can be obtained (Bryman/Bell, 2011). For the interpretation of our findings we will be able to some extent to use other researchers' findings which have determined causal relationships in comparable contexts.

In order to get to know more about the suitability of ABC for managing different dimensions, a literature review will be performed so that expectations for our own analysis can be built. Thereby normative papers as well as case studies will give first insights into the general use of ABC in different kinds of organisations and contexts and help to formulate concrete expectations.

Expectations will be formulated in the following areas:

- Applicability of the 'iron triangle' for the classification of ABC
- Classification of ABC into the triangle
- Adoption rate of ABC in German municipalities
- Areas of ABC use in German municipalities
- Current stage of development of the German public sector in terms of ABC (hype cycle)
- Satisfaction of ABC users
- Applicability of ABC in the public sector context

Since a purely theoretical literature review would not be satisfying due to a possible lack of relevance, an empirical survey shall be made. The survey will be analysed descriptively in order to find correlations between the use of ABC and control success of certain dimensions. The above expectations can consequently be compared to the findings of our empirical survey.

This combination of information sources is supposed to give more insights into the suitability of ABC in a management control context dealing with the dimensions cost, time and quality.

## 2.3 Sample selection

A complete list of all 11'093 German municipalities was retrieved from the website of the German Federal Statistical Office (Statistisches Bundesamt, 2015a). As not all of the municipalities can be analysed in our thesis due to time limitations we use a sampling approach based on a combination of the ideas of random sampling and clustering which are described by Bryman/Bell (2007). First we divide the population into three clusters based on the size (no. of inhabitants) of the municipality. The categories are thereby chosen in line with the definition of the Federal Statistical Office with the adaption that all municipalities with less than 20'000 inhabitants are merged into one category (instead of keeping three categories as suggested by the Federal Statistical Office. This leads to the three clusters of 76 'large'

municipalities with more than 100'000 inhabitants, 603 'mid-sized' municipalities with a size between 20'000 and 100'000 inhabitants and 10'414 'small' municipalities with less than 20'000 inhabitants (Statistisches Bundesamt, 2015b). However, contrary to the multi-stage clustering approach which is described by Bryman/Bell (2007) we used all three clusters for further analysis. Since many parts of our planned analysis are related to the use of ABC, as many municipalities as possible which use ABC should be included. As size is one of the most important influencing factors for the use of ABC (Cagwin/Bouwman, 2002; Innes/Mitchell, 1995; Baird, 2007) it is reasonable to take as many large municipalities as possible into the sample since their likelihood of using ABC is expected to be significantly higher. Therefore the complete sample of all 76 large municipalities was included in the sample. But since we also intend to analyse the use of ABC in the German public sector in general the small and mid-sized municipalities cannot be excluded, especially since the vast majority of all German municipalities is small. In order to be able to still draw conclusions about the diffusion of ABC within each of the three clusters we randomly selected 76 municipalities from the 'small' as well as from the 'mid-size' cluster using random number generation in Excel, similar to the approach suggested by Bryman/Bell (2007). The small- and the mid-sized sample also serve as control group in order to qualify the findings for the large municipalities and to investigate whether the expected differences between municipalities of different size exist.

The above sampling approach has been developed to suit our two-sided research approach, considering on one hand the adoption rate of ABC and on the other hand the use of ABC among adopters which serves as a basis for the categorisation of ABC using the iron triangle. On one hand, large municipalities are favoured which is likely to fill up our sample with more 'adopters', which would allow us to analyse the conditions and intentions around the ABC use with more statistical power. And on the other hand we also consider small and mid-sized municipalities which we need in order to draw conclusions about the situation of ABC adoption in the German public sector in general.

Even though it can be assumed that the adoption of ABC is linked to Geography (Rehm/Rehm, 2010), we do not adapt the sampling in order to obtain the same absolute or relative portion of each state of Germany. Indeed we rely on our random sampling approach for mid-sized and small municipalities to generate a fairly distributed sample for the entire country. For the large municipalities this problem is not existent as all 76 large municipalities are investigated.

Our sampling approach will allow for descriptive analysis of the three samples separately as well as combined. Inferential statistics and statistically backed conclusions on the population are only allowed for the three samples separately (e.g. inferential statistical findings in the 'small' sample can be generalized to the population of small municipalities in Germany). Despite these restrictions theoretically backed discussions about the situation of the population of all municipalities in Germany will be included in the discussion keeping the missing statistical basis in mind (Bryman/Bell, 2011).

## 2.4 Design of the survey

The survey method was determined to be an online self-completion questionnaire. A first draft of the questionnaire was designed after the research purpose had been defined. This draft version was then further enriched based on a review of relevant literature, mainly concerning the use of ABC. The resulting questionnaire was tested in two pre-interviews. The first was done face-to-face with a high-ranked finance responsible from the municipality of Berlin, on the 7th of April. The second was done by phone with a finance director from Bonn, on the 11th of April. The pilot tests were supposed to give insights about the practical use of ABC in the daily business of municipalities and to find major flaws in the overall research question and in particular questions of the questionnaire (Bryman/Bell, 2013). The interviews were conducted by using open questions about the general topic of ABC in municipalities. In the course of the interviews the particular aspects of the questionnaire were tried to be addressed if that was not done by the interviewee. Due to the relative independence of the interview guideline from the questionnaire draft, the interviewees were still included in the final survey although that represents a potential limitation (Bryman/Bell, 2013). The pilot tests confirmed the relevance of most questions and gave input for some revisions and also for one new question (Q12).

As control questions, the municipality name and the postal code as well as the size category were required to be filled in. These questions were used in order to be able to identify the municipality and link the answers to additional factors like 'state' which were not asked in the questionnaire. Further questions concerned the background of the respondent. While some of the obtained details about the respondent, like the variable 'hierarchy level', were used later in the analysis the main purpose of that section was to control for bias in the respondent behaviour and to collect evidence for the data quality (e.g. senior staff vs. secretary). Finally the essential questions focused on the use of ABC in order to be able to classify it later to the dimensions cost, time and quality.

From the beginning, the intention was to design a rather short questionnaire in favour of a higher response rate (White/Luo, n.d). The final questionnaire (see appendix A-C) took the respondents probably around ten minutes to reply to.

The survey was executed as web-based survey, using the Google form for questionnaires as platform with the main advantages to increase the accuracy of the data as legibility problems are avoided and the respondents can be guided through the form by programming it adequately. The fact that the responses are automatically saved electronically and do not have to be copied manually, e.g. from a paper form to an Excel spreadsheet, limits the potential for data processing errors (Bryman/Bell, 2011). Although web-based surveys appear to have low response rates, it deemed to be to the most feasible approach. Due to cost and time restrictions it would not have been possible to call every municipality or to visit them personally, which would promise a higher response rate. The use of postal mail is also costive and does not promise a significant increase in terms of response rate. The fact that we send out

personalized emails to every municipality in the whole sample which included the hyperlink to the questionnaire is likely to increase the response rate as well as the inclusion of the questionnaire as word document from the first reminder on (Baruch/Holtom, 2008). Even though a plain email form may have been more efficient, the use of tick boxes, which is essential in this study, did not allow for the use of an email form. The deviation from our original approach by attaching word files to the mail from the first reminder on was due to several requests of civil servants who were not able to open the link or who worried about its data security. The word document was immediately sent to those, who had requested an alternative and was attached to the two reminders. Therefore, this study can be considered as a mix between a Web-based survey and an email survey.

Apart from the response rate and the easier practical handling, the self-completion questionnaire is linked to certain advantages and disadvantages concerning the execution. The self-completion questionnaire provides the same circumstances for all respondents by containing exactly the same questions with the same wording. The interview method provides more flexibility here, which can help to reduce misinterpretation from the respondent's side. However, there is also the risk of distorted results due to variations in the wording throughout several interviews or due to follow-up questions asked by the respondents. Furthermore, there is always a personal dimension in an interview especially in face-to-face interviews but also when calling by phone. All this individualises the single interview situations and thereby making them less comparable (Bryman/Bell, 2013). Interviews are also bound to a specific time, when it is conducted. When sending a self-completion questionnaire, it is left up to the respondent when to fill out the survey. That gives a higher degree of freedom to the respondents and is considered an advantage of the self-completion questionnaire compared to the interview method (Bryman/Bell, 2011).

Self-completion questionnaires reduce the willingness to respond to a survey concerning the time dimension. In a personal interview, a timeframe of 30 minutes will probably be considered as not overdriven whereas a 30 minute self-completion questionnaire will most likely be regarded as inappropriately long. But also for shorter questionnaires, the questions should be of high relevance since the fatigue must be expected to increase faster in a self-completion survey than in an interview situation having personal contact (Bryman/Bell, 2013). So, the designed questionnaire is limited to a rather low number of pre-determined questions, which cannot be explained to the respondent or complemented by additional information like an interview situation would allow.

## 2.5 Formulation of answers

The survey was formulated with the aim to be as clear as possible in order to avoid accuracy problems. As discussed above, the term 'Prozesskostenrechnung' as German translation for ABC was used.

Overall we tried to use generally understood terminology, gave instructions in the beginning of the survey and included as few open questions as possible. In the end, the survey was designed without any content-related open questions. The few open questions included were the control questions Q1 and Q2 (name of municipality and postal code) and unambiguous questions, like budget-size (Q4).

All other questions were closed questions. This approach was followed in order to increase the comparability and manageability of the data. Although the chances of biases influencing the answers may rise, this method provides results, which are easy to handle either for the researchers as well as for the respondents. Since the subject of ABC and the context of municipalities is not completely new and undiscovered, the suitability of the questions as well as the answers was tried to be increased through a consultation of prior research on this topic (Bryman/Bell, 2013).

For most questions (Q3, Q5, Q6, Q7, Q8, Q9, Q14, Q17) exactly one answer was required and allowed to be given. This was ensured through programming form fields as 'required' so that they cannot be skipped. That allows for a high completeness of data but also can increase the share of unqualified answers (Bryman/Bell, 2013). This risk was tried to minimize by including evasive answers (e.g. 'I cannot/ do not want to answer this question'). However that opened up the possibility to choose this answer also for those, who actually have an opinion and knowledge about the topic but do not want to think about it or look up some information about it (Bryman/Bell, 2013). Only twice (Q10, Q15) tick boxes were used in order to allow for several choices as information content would likely have been lost otherwise. Apart from one question (Q10), the ticking of more than one answer would not give sensible results. In this single case, there is the risk that the pre-defined answers are not sufficient, which may lead to bad data quality. This is why we included a field 'other' for the respondents to add categories which they believe are missing in our list.

The main question (Q11), which determines the classification of ABC into the three-dimensional triangle, was designed as a ranking grid. This approach decreases the information content but helps to obtain very clear results (Fabbris, 2013). As there are only three items to rank and as we can expect that the respondents have a rather clear opinion about the application of ABC in their municipality the respondent burden is not expected to be too high. Since to our knowledge this framework is applied in this sense for the first time, the focus was set on finding clear evidence about the suitability of it. That will allow a conclusion if further use and testing can be recommended or not. Principally, homogenous findings will argue rather for the first option, heterogeneous findings more for the latter albeit that requires a specific analysis.. Finally the essential questions of the questionnaire about the benefits of ABC (Q12, Q13, Q16) were designed as seven-point Likert scale questions in a horizontal format. Although the Google form allows for avoiding technical mistakes when answering the surveys (e.g. ticking more than one box per question for multiple choice questions or per row for tick box questions), mistakes with regard to the content of text field entries cannot be excluded. That can for instance be influenced by the pace, with which the respondent filled out the survey (Bryman/Bell, 2013).

### *Use of Likert scale for attitude questions*

The use of a Likert scale appeared to be suitable for asking about the respondents' attitude towards the use of ABC and their experiences with it (Bryman/Bell, 2013). The Likert scale was exclusively applied to such attitude questions. Nevertheless, it gives room for interpretation by the respondent which causes the problem that the ideal of having steps of an equal size (i.e. intervals) along the scale will not be achieved in reality (Jamieson, 2004). The format of the answers may also influence the response pattern. However, no evidence for clear biases assignable to a certain formats could be found. There is weak evidence that a horizontal format might show a smaller bias due to layout effects than a vertical one (Toepoel et al., 2009). Even though the five-point Likert scale is more common, the decision for the seven-point scale was made with the aim to achieve an advanced degree of accuracy and still keep the complexity on a decent level (Finstad, 2010). A five-point scale was considered to be not sensitive enough but a further expansion of the scale could have made the questionnaire becoming an exceedingly high challenge for the respondents. So, the seven-point Likert scale deemed to be a suitable compromise between the conflicting goals of accuracy and simplicity (Johns, 2010). A problem of providing seven options to choose from is that an odd number might tempt the respondents to tick the middle-box (four). That avoids to express a strong opinion and to obtain a rather neutral standpoint. The argument for an uneven number of options is related to the goal to maintain high data quality. Indeed to offer a neutral point for the respondents is done in order not to force them to choose one of the sides even though they may not have an opinion on the subject (Johns, 2010). Actually, neither the pro nor the contra argument for using a Likert scale with an uneven number of boxes are applicable in our case since the fourth tick-box does not represent a neutral opinion but just one step on the scale between 'low benefits' (of ABC) and 'high benefits', whose meaning may mean 'moderate benefits'. That means that there is no directly neutral standpoint obtainable, which would again refer to the abovementioned critique of risking data quality. An unambiguous evasive answer ('I do not know') would have solved this problem (Johns, 2010). On the other hand, the respondents are asked to estimate the benefits of ABC to the best of their knowledge. So, the reliance on the respondent' professional knowledge is a fundamental assumption for this study. A minimization of the corresponding risk was tried to be achieved through a thorough search for appropriate contact persons. The middle-box ('Moderate benefits') could possibly be interpreted as the break-even point of costs and benefits, which comes along with the use of ABC. Also in this case, this field would have been important to be included.

## 2.6 Execution of web-survey

For the total sample of 228 municipalities the contact email addresses of suitable contact persons were tried to be identified. It was tried to identify the person in charge for controlling, cost- and activity costing or cost management. If this could not be achieved persons in charge for general finance (head of department) or politicians from the finance committee were tried to get in contact with. The smaller the municipalities are, the harder it was to get in touch with

them, especially through email contact. In these cases, the mayor was often selected as contact person or in very rare cases the association of municipalities in the corresponding region was contacted and asked for forwarding the questionnaire to the local responsible or for answering on behalf of them in case that they have the required knowledge.

This approach includes the danger of not getting the right person or at least not the optimal person to reply to the questionnaire since it was necessary to rely on the available contact information. The contact information was used to personalize the form letter. Besides the general instructions and information about the study more specific requests relating to the forwarding of the email were added in the abovementioned cases where contact information of the relevant person was not available. Still the risk of addressing a person without distinctive knowledge about ABC in the corresponding municipality answering the survey must be considered.

The questionnaire was sent out on the 13th of April. The letter text was principally standardized but personalized in terms of the address (name of the contact person and name of the municipality) since it might increase the response rate (Bryman/Bell, 2013). The text was supposed to be as personal and informative as possible under the maintenance of an efficient way of working. The purpose of the survey was pointed out in the text as well as the sample selection process. A deadline until the 30th of April was set which equals to almost three weeks response time. This date was set, since the 1st of May which is missing for a full three week period, is a holiday in Germany on which no responses can be expected anyway. With regards to the shortness of the questionnaire, 14 working days were considered to be sufficient and an expansion of the deadline was expected not to result in a significantly higher response rate. Two reminders were sent out on the 19th of April and on the 27th of April in order to increase the response rate further (Bryman/Bell, 2013).

An incentive or a lottery was not offered to the respondents. This was not deemed suitable for the context of addressing civil servants, who have strict regulations about the reception of presents. However the distribution of this master thesis was promised to those who are interested in the results.

## 2.7 Data transformation

In order to analyse the data we did some transformations in order to support analysability and to increase the data quality. First of all the data which was obtained through the submission of Word documents was included in the spreadsheet which was automatically generated through the respective Google form function. Next we corrected responses in the fields of postal code and city which could not be matched with our sample. Further we added a column with the name of the state, mainly in order to match the data with the information about the adoption of double entry bookkeeping (obtained from: Haushaltssteuerung, 2013) which is expected to be an influential factor also for the ABC implementation. Also we ensured that text entries are

displayed in a countable form (i.e. one entry per cell) which is not automatically the case for questions with checkboxes that allow single or multiple choices. Text entries which can be related to a scale were converted into numerical entries (e.g. '7=very useful' was changed to '7') in order to allow for further descriptive statistical analysis. An overview of transformations that were made to the initial data is given in table 1 below. The coding which was applied in order to prepare the data for statistical regression analysis (e.g. in the case of size, hierarchy level, opinion, etc.) was kept unidirectional. This means the higher numerical value was assigned to the end with the higher likelihood to have a positive influence of ABC use, which was in some cases not possible to estimate with much certainty.

Question	Description	Original/New Data Type	Transformation	Use in the study
Q1	Postal code (form entry)	nominal	-	to look up "state"
Q2	Size category	ordinal	names instead of numbers; coded: 1, 2, 3	Independent variable explaining ABC use, Regression, Descriptive Analysis in Excel
Q3	Municipality name	nominal	-	to look up "state"
Q4	Budget size (EUR)	interval	-	Independent variable explaining ABC use, not further used as it is similar to no. of inhabitants
Q5	Budget exceedance	ordinal	coded: 1 (7-10x), 2, 3, 4 (=never)	Independent variable, Regression, Descriptive Analysis in Excel
Q6	Hierarchical level respondent	ordinal	coded: 1 (lowest), 2, 3, 4 (=Top)	Data quality indicator, Independent variable, Regression
Q7	Department respondent	nominal	-	Data quality indicator
Q8	Work history respondent	ordinal	-	Data quality indicator
Q9	Use of ABC	ordinal/binary	changed to binary, coded: 1, 0	Dependent variable
Q10	Purpose of ABC use	nominal/binary	binary for different answers that were chosen	Descriptive analysis in Excel
Q11	Usefulness of ABC for cost/time/quality	ordinal	-	Descriptive analysis in Excel, Alpha, Rho
Q12	ABC contribution (concrete)	interval	median calculated and ranked similar to Q11	Descriptive analysis in Excel, Alpha, Rho
Q13	Satisfaction with ABC use	interval	binary (4 and above = 1; 3 and below = 0)	Descriptive analysis in Excel
Q14	History of ABC use	ordinal	-	Descriptive analysis in Excel
Q16	Applicability of ABC in public administrations ("Opinion")	interval	-	Regression Analysis
Add 1	State (Bundesland)	nominal	added based on Postal Code and Municipality name	In order to link the data to further variables
Add 2	Double Entry Bookkeeping	binary	added based on state; source: haushaltssteuerung.de	Regression Analysis
Add 3	Eastern/Western Germany	binary	added based on state (1=E)	Regression Analysis
C 1	Combination of Q6 and Q16 -> Hierarchy Opinion	binary	1=[Opinion > 3 AND Hierarchy > 2], i.e. Middle management or above with opinion 4 or above	Regression Analysis

Table 1: Overview of data transformation

The abbreviation for question (Q) is kept while 'Add' stands for 'addition' which is used for variables which were not initially asked in the questionnaire but which were added based on links which could be reasonably made based on the information obtained. Also the table shows one combination (C) of variables which was made in order to analyse the specifically linked part of the data set.

One additional step of data transformation was taken in order to prepare the data set for the regression analysis which will be described further below. As missing values cannot be handled by the statistic program such gaps were filled with a randomly picked other response value relating to the same question. This is in line with the methodology of random imputation suggested by Pfeffermann/Rao (2009). For the random assignment a combination of the Excel formulas IF(), ISTEEXT(), INDEX(), RANDBETWEEN() was used in order to pick a random value from any row of the same array in case of a text ('N.A.') entry. For all value entries the value was kept. The process was ended by copying and pasting back the values of the replaced 'N.A.' entries. However several iterations of this process were necessary in order to get rid of all 'N.A.' entries as some of the randomly picked entries were again 'N.A.'s in the first iteration. The so prepared data was only used in the regression analysis. For other descriptive statistics which were purely done in Excel, missing values of the relevant parts of the sample were simply excluded.

## 2.8 Reliability and validity considerations

In order to be able to draw appropriate conclusions from the analysis it is important to ensure that the measures are valid, or in other words, that they really measure what they are supposed to measure (Bryman/Bell, 2011). Validity is achieved through the fulfilment of several conditions one of which reliability. Reliability includes the consistency of measures over time (stability), between different observers (inter-observer reliability), and internal reliability which refers to relationship of indicators with the group (index) to which they belong (Bryman/Bell, 2011). In our case the first two elements of reliability are not critical as, due to the fact that a web-based survey method has been chosen, the risk for bias due to characteristics or behaviour of the observer is limited. Even though we have not been able to test this we can reasonably assume, also based on the experience in our pilot interviews, that the same web-based survey conducted in the future by different researchers would lead to results of the same quality.

Internal reliability however is a relevant topic for the design of our study. In particular for the analysis of the fit of ABC into the three dimensions of the iron triangle which was done based on Q11 and Q12. While in Q11 very specifically the assignment of ABC into the three dimensions of the triangle was asked from the respondents (i.e. they had to prioritize the three dimensions) Q12 was designed more general in order to control the outcome of Q11. This was done by adding the most relevant aspects for which ABC could be useful. In order to compare the answers for both questions (Q11 and Q12) however the different aspects which were to be

rated in Q12 had to be assigned to the three dimensions cost, time and quality. Indeed we grouped the items of Q12 based on whether they refer to cost-, time- or quality focus, as depicted in table 2.

Item of Q12	Assignment to Dimension
Economical use of resources	Cost
Transparency	Quality
Accuracy of budget allocation	Cost
Economic justification of decisions	Cost
Increase in time efficiency	Time
Better services for the citizens	Quality
Accurate financial forecasting	Cost
Pricing of products and services	Cost
Performance measurement	Quality
Quality assessment of products	Quality

Table 2: Grouping of items to dimensions of iron triangle (Q12)

This grouping was tested for internal reliability using Cronbach's Alpha (calculation see appendix D). This method deemed to be suitable as an internal reliability test despite some limitations which will be mentioned below (Bryman/Bell, 2011). Cronbach's Alpha was calculated in Excel applying the following formula (Salkind, 2012):

$$\alpha = (k/(k - 1))(s_y^2 - (\sum s_i^2)/(s_y^2))$$

While:

$k = \text{number of items}$

$s_y^2 = \text{variance associated with the observed score}$

$\sum s_i^2 = \text{sum of all variances for each item}$

The calculation of Cronbach's Alpha was only done for the indicators of Q12 which relate to quality and cost. For 'time' no Alpha could be calculated as only one indicator was assigned to the dimension. Cronbach's Alpha lies normally between 0 and 1, as a rule of thumb 0,8 or

above is seen as internally reliable, nevertheless exceptions are made in practice (Bryman/Bell, 2011).

The results of 0,7 (cost) and 0,6 (quality) show a fairly good suitability even though the target which is generally seen as a hurdle for well fitted factors within an index varies between 0,7 and 0,8 depending on the source in literature (Tavakol/Dennick, 2011, Lance/Butts/Michels, 2006). Furthermore, a very high figure for Cronbach's Alpha could indicate redundancy in the questionnaire. However, there is a current scientific discussion ongoing about the suitability of fixed upper and lower bounds. Among researchers, it is more and more claimed that for some purposes a very high coefficient should be sought for whereas especially in basic research without much prior research done lower figures of it might be acceptable. (Lance/Butts/Michels, 2006, ResearchGate, 2015). The latter case can be seen to be in place for this study, since no prior paper with a similar research purpose can serve as an original to stick to. That is why the results have to be interpreted with caution particularly since the coefficient is not exactly suitable for our purpose. Contrary to the presumptions of Cronbach's Alpha we expect a mix of high, medium and low ratings for the different items within one dimension, which implies a higher tolerance level concerning Cronbach's Alpha. Even though the result of Cronbach's Alpha did not indicate internal reliability, the initial groups of factors were kept as exclusion of single factors did not improve the Alpha significantly. Despite for Q12 the internal reliability was not much in question in our study as most of our questions were rather directly asking what we wanted to measure.

In order to take the deficiencies of Cronbach's Alpha with respect to our approach into consideration, the answers of the two questions about the general (Q11) and concrete (Q12) use of ABC were analysed using Spearman's Rho. This is a reliability test which aims to assess whether the usefulness which the respondents assigned to the three dimensions in Q11 was confirmed by their answers in Q12 (i.e. on average higher scores for the prioritized dimension). Spearman's Rho indicates the correlation between two ordinal variables which makes it suitable for our purpose. The coefficient can be positive or negative lying always between 0 and 1 while values close to 1 (-1) indicate high positive (negative) correlation (Bryman/Bell, 2011).

For the purpose of testing, the answers of Q12 were again categorized into one of the three dimensions cost, time and quality whereby the grouping of table 2 above was kept. Then for each of the three dimensions the average score per respondent (row) was calculated taking into consideration all scores which belong to the respective dimension. The resulting category scores were then ranked vertically (i.e. ranking the 16 responses from 1 to 16 based on the score). For same values the average rank was assigned using also 0,5 steps of ranks. Similarly the answers for Q11 were ranked from 1 to 16. In both cases the similar direction of ranking (highest value = first rank (1), lowest value = last rank (16)) was maintained. After these

preparatory calculations the below formula (from: Abbott, 2014) could be applied for each of the three categories time, cost and quality).

$$r_s = 1 - (6\sum d^2)/(N(N^2 - 1))$$

While:

*d = rank difference between Q11 vs. Q12*

*N = number of ranks (rows in sample)*

The calculation as well as the results are depicted in appendix E. Spearman's Rho shows positive correlations for all dimensions with rather high values for cost (0,59) and time (0,69) and low value for quality (0,1).

Besides the reliability-related aspects validity includes other criteria which are to be considered. For example face validity was ensured through the pre-interviews which were made as well as through the development of the questionnaire based on literature. The same applies for construct validity which we can see as confirmed in our study as our assumptions are largely based on several sources of prior research which lowers the risk of potentially invalid measures. However there are some new assumptions which we developed ourselves. For example we had the idea that the use of ABC could be related to the stage of development in accounting in a particular geographical area of Germany. In cases where double entry bookkeeping is mandatory in a specific state we would rather expect more ABC adoption than in other states. This assumption will be tested for its validity and discussed in the analysis section.

The last two aspects of validity, predictive validity and convergent validity, were left out in our considerations due to time restrictions as it would be impossible to check our own potential predictions for their validity in the future (predictive validity) and also since we could not observe the daily routine in German municipalities and the decision making processes in the state governments (convergent validity). Overall it can be said that it was tried to achieve a valid set of measures for the analysis through the extensive theoretical literature which had been used for the development of the questionnaire as well as the two pre-interviews and the help of generally known reliability indicators (Cronbach's Alpha). Nevertheless it is of course not possible to achieve 100% certainty of the validity of measures in research (in line with: Bryman/Bell, 2011).

## 2.9 Univariate analysis

The aim of our descriptive analysis is to show central tendencies in our data. Thereby we stick to our three predefined size samples for most of the analysis of the adoption of ABC in general (i.e. Adoption rate and potential explanations). In addition however we introduce the

binary variable 'ABC adopter' which follows from our data with '1' being ABC adopters across all three samples and '0' being non-adopters.

The univariate data analysis has mainly been done with the Pivot Table (and Pivot Chart) function of Microsoft Excel which served as a starting point to get an overview of the data. For our first research subject, the use of ABC in the German public sector, we use a combination of methods of univariate analysis and multivariate regression analysis. For example we take advantage of the suitability of bar charts for comparison of the quantity of responses between different answer categories when analysing Q13 (satisfaction of ABC users) and Q16 (opinion of all participants about ABC applicability). While one Likert scale value distribution can be shown using a bar chart this becomes impossible when several distributions of Likert scale values are to be compared simultaneously which is why we chose to display this specific situation (Q12) using box plots. For showing the variety of concrete uses of ABC relating to the three dimensions time, cost and quality this is seen as the most suitable graphic as it includes besides the median as measure of central tendency also information about the dispersion. This is best illustrated by the structure of a box plot which includes a horizontal line showing the median value, two boxes and two 'whiskers' representing the four quartiles. Finally also the comparison of the adoption rate between the three samples which we make using a stacked column 100% chart belongs to the methods univariate analysis. The fact that the median is used and not the arithmetic average is not particularly important in the case of a Likert scale as no extreme values can be expected (in line with: Bryman/Bell, 2011).

## 2.10 Regression analysis

In order to analyse the use of ABC further a logistic regression analysis was performed. This method was chosen as it is suitable in particular if the dependent variable is binary which is the case for the coded variable USE ABC\_binary. In order to analyse the influences of other variables on the use of ABC statistically a correlation matrix including all variables which are seen as potentially influencing the use of ABC (see table 3)

<b>Variable</b>	<b>Description</b>
<i>USE ABC_binary</i> (dependent variable; Y)	<ul style="list-style-type: none"> <li>Shows whether a municipality uses ABC based on their answer to Q9.</li> <li>Coded: Yes-answers (=1); No-Answers (=0)</li> </ul>
SIZE_inhabitants_coded (independent variable; X)	<ul style="list-style-type: none"> <li>Shows the size of a municipality based on their number of inhabitants as asked in Q3.</li> <li>Coded based on the three samples 'large' (=3), 'mid' (=2) and 'small' (=1).</li> </ul>

Budget size (EUR) (independent variable; X)	<ul style="list-style-type: none"> <li>Shows the size of a municipality based on their budget as asked in Q4).</li> </ul>
BUDGET EXCEED_coded (independent variable; X)	<ul style="list-style-type: none"> <li>Indicates how often the budget of a municipality has been exceeded in the last ten years.</li> <li>Has been coded in order to convert the verbal categories into numerical values which can be used in the SPSS (i.e. Never = 4; 1-3 times = 3; 4-6 times = 2; 7-10 times = 1)</li> </ul>
DOUBLE ENTRY BOOKK (independent variable; X)	<ul style="list-style-type: none"> <li>Indicates whether a municipality is situated in a state which has made double entry bookkeeping mandatory (=1) or not (=0).</li> </ul>
GEO_E_vs_W (independent variable; X)	<ul style="list-style-type: none"> <li>Assignment of the municipality to former Eastern- (=1) or Western (=0) Germany.</li> </ul>
Hierarchy_Opinion (independent variable; X)	<ul style="list-style-type: none"> <li>Merged variable consisting of 'hierarchy' (from Q6) level of respondent and 'opinion' (from Q16) about the applicability of ABC in the public sector in general.</li> <li>Merged due to the logic that only the combination of a high hierarchical position and a favourable opinion could lead to ABC adoption.</li> <li>Coded binary with the combination of favourable opinion (&gt;3 on Likert scale, Q16) and high hierarchy level (middle management or higher, Q6) coded as 1.</li> </ul>

Table 3: Description of variables for regression analysis

In order to interpret the results the most important elements of the SPSS outputs which follow the above selections shall be presented. Indeed three parts of the whole output will be shown in the results.

The **model summary** is included mainly for completeness reasons. It consists of the three components -2 Log likelihood, Cox & Snell R square, and Nagelkerke R square. Indeed the -2 Log likelihood is not considered very informative, except for the comparison of nested models (IDRE, 2015) and we will therefore not further explain this component and also not use it for interpretation. The two R-squares by Cox & Snell and Nagelkerke can be seen as attempts to construct an R Square for Logistic Regression, however it remains unclear how these 'pseudo-R-Squares' can be interpreted (IDRE, 2015; University of Strathclyde, 2015). In general these pseudo R squares can be expected to be lower than a (regular) R square in an OLS (ordinary least squares) regression. However Nagelkerke's version is an iteration of Cox & Snell's pseudo R square which addressed the problem that Cox & Snell's R square had its theoretical maximum not at 1 (like the R square in an OLS regression) but at a lower value

between 0 and 1. Therefore the value of Nagelkerke's R square can be seen as closer to the R square which indicates the percentage of the variance of the dependent variable which is explained by the model. A higher value in these pseudo R squares can therefore generally be regarded as indicating a better fit of the model (University of Strathclyde, 2015). Or in other words, the R square value is the correlation between all the predictor variables together and the dependent variable (Norris et al., 2014).

The **Hosmer and Lemeshow Test**, similar to the above described R square values, describes the goodness of fit of the model. In fact the Chi-square test statistic indicates whether the observations fit the expectations under linearity (Rovai et al., 2014). For the interpretation of the SPSS output a p-value higher than the predefined level of significance (cut-off) indicates that the model does not predict the values significantly different from the observations that were made (University of North Texas, 2015).

The **final regression model**, titled '**variables in equation**' by SPSS: The regression output consists of the elements B (coefficient), S.E. (standard error), Wald (Wald chi-square value), df (degrees of freedom), Sig (two-tailed p-value), Exp (B) and the (in our case) 90% confidence interval (IDRE, 2015)

The *coefficient (B)* is the predictor value in the logistic regression equation for the direction and the strength of the influence of the respective independent variable on the dependent variable. However, contrary to the linear regression the value cannot be interpreted as 'if X increases by one unit Y increases by the coefficient'. In the logistic regression equation the coefficient shows the increase in the logarithmic odds of Y which is caused by an increase of X by one unit, given that all the other predictor variables (X) do not change (IDRE, 2015).

The *standard error (SE)* indicates the standard deviation of the distribution of a random sample around a parameter. It is an indicator for the precision in case of repetition (University of Berkeley California, 2015).

The *Wald chi-square* is calculated as  $(B/SE)^2$ . It tests whether a regression coefficient of a predictor variable is significantly different from the null-hypothesis value of zero (National Centre for Research Methods, 2015). It has to be interpreted in connection with the corresponding p-value (Sig) which indicates the significance level of the statistical test (regression). It should lie below the predefined confidence level in order to reject the null hypothesis on that level (University of Berkeley California, 2015). In the SPSS output p-values are provided for each independent variable. The comparison of their value, in our case with 0 and 1 decides about the rejection of the null hypothesis.

The *degrees of freedom (df)* indicate how many parameters of a model can be freely chosen, i.e. the number of variables in the model (University of Köln, 2015; IDRE, 2015). From the perspective of one predictor variable therefore one degree of freedom is reasonable.

*Exp (B)* shows the odds ratio for the respective predictor (IDRE, 2015). The odds ratio is an indicator for the strength of the statistical relation of two variables. Its value is always positive. An odds ratio of 1 is interpreted as 'no difference in the odds of the two variables' while an odds ratio of less than one indicates a decrease of the odds of Y (dependent variable) with an increase of X (independent variable) and any value above 1 indicates an increase of the odds of Y with an increase of X. The odds ratio is often used in order to predict the effect of a one-unit increase of the X-variable on Y. This is indeed the right interpretation if the increase in question is amounts only for one unit. However the odds ratio must be raised to the power of the unit change in order to calculate the effect that a multiple-unit increase of X is expected to have on Y. This is illustrated in the below formulas (in line with: Acock, 2008).

Odds Ratio > 1:

$$((Odds\ Ratio)^{unit\ change\ X} - 1) \times 100 = Expected\ \% \ change\ in\ Y$$

Odds Ratio <1:

$$(Odds\ Ratio)^{unit\ change\ X} \times 100 = Expected\ \% \ change\ in\ Y$$

The confidence interval (C.I) which is mentioned in the SPSS output as upper- and lower boundary value indicates the precision of an estimate. The interval, which is defined through sample size and confidence level, and expands to both sides around the estimate. In this thesis, a 10% confidence level is taken which implies that the resulting confidence interval contains the real value of the estimate with a 90% probability (University of Berkeley California, 2015).

Since the absolute response rate of ABC users is too low, a separate regression analysis of the questions concerning the areas of ABC use and the categorisation of the tool into the dimensions time, cost and quality is not expected to provide further insights (Snee, 1977).

# 3 Theoretical background - a framework of research ideas

In this chapter we will present the theoretical foundation which sets the scene for our own empirical study. As our research approach is largely based on the idea that the sensible use of management control tools depends on the context, we will start by introducing the concept of contingency theory. After providing some information about the historical development of contingency theory, we will discuss its application in today's business environment and in a management control context. From the idea of contextual dependence the application of the iron triangle will be derived. This framework which consists of the three dimensions time, cost and quality is seen as appropriate to explain the different focus areas of management in general. We use the triangle to illustrate our hypothesis that each management tool can be placed within these three dimensions. As the empirical part of our thesis is limited to the tool ABC, we will cover the theoretical and empirical background of this tool in the second part of this chapter. After summarizing the rough idea of ABC and its historical development we will present empirical findings of other authors concerning the use of ABC in its original private sector context. We will thereby cover the adoption rate of ABC, its empirically recognized advantages and disadvantages, as well as enabling factors and challenges for the use of ABC. The evidence from the private sector helps us to put the findings from the public sector context into perspective. Further we will discuss findings of studies about ABC in the public sector, focusing on the adoption rate as well as advantages and disadvantages. And finally we will introduce some characteristics of the German public sector as this is the context in which our empirical study will be conducted.

## 3.1 Contingency theory

### 3.1.1 Historical development of contingency theory

#### *Era of questioning the bureaucratic model of Weber*

The contingency theory was originally developed and applied in the field of organisational theory. In the 1960s, a turning away from the dominating Weberian bureaucracy model was noticeable (Mertens, 2009). The Weberian model is an idealistic model, which claims that several aspects are required for all kinds of organisations in order to work efficiently. A

deviation from this ideal is considered to be necessarily followed by a decrease in organisational efficiency. This normative model was criticized for being far away from reality and for reserving the term 'efficient' only to those organisations which fulfil all of the idealistic criteria. This view was regarded to be too narrow-minded and too exclusive since also other forms of organisations than bureaucratic organisations could be observed in reality as working efficient (Laske et al., 2006), whereas organisations following the bureaucratic ideal formally could be found, which did not work highly efficient. Empirical tests were performed by Blau and Gouldner finding out several kinds of appropriate bureaucracy in public administrations as well as in industrial companies (Auer-Rizzi et al., 2007). This phenomenon could not be explained by Weber's approach, so the theory of a general, optimal form of administration and management failed due to a lack of empirical evidence.

#### *First studies using Contingency Approach*

That led to a new strand of research with new premises, highlighting situational factors as being relevant for the optimal form of an organisation. That implied that no absolute statements about a universally applicable organisational form can be made. One of the first principle discussions of this new approach and its relevance for the organisation was performed by Burns and Stalker (1961) mainly focusing on the nature and dynamic of the organisational business as situational factor. The first more specific empirical research on contingency factors was performed by Woodward focusing technology (Auer-Rizzi et al., 2007). It could be found that successful organisations had only some few characteristics in common, which did not allow to make any generalizations. Furthermore some first evidence could be gathered that for specific situations a specific form of organisation, administration and management was more suitable than others. Another fundamental work was presented by Fiedler (1964) introducing the term 'contingency theory' and applying it to the field of leadership. He identified group atmosphere, task structure and leader position power as relevant situational factors in this field. Lawrence and Lorsch (1967) can also be rated among the pioneers in applying contingency theory. They investigated differentiation and integration strategies in different organisational subsystems and corresponding environments. Other contingencies like organisational design, economies of scale and scope and workforce (Child, 1975) or global differences (Hofstede, 1980) were discussed in the following decades. These works constituted the beginning of contingency theory.

### 3.1.2 The importance of Contingency Theory for Research in today's business environment

The long history of the contingency theory is no argument against its use in today's business environment. The discussion about situational factors affecting an organisation is more relevant than ever. Especially the discussion of Burns and Stalker (1961) about the different needs and abilities of mechanistic and organic organisations are of considerable topicality. Were the circumstances in the 1960s, 1970s and onwards rather stable, are they very volatile nowadays. According to the A.T. Kearney's Turbulence Index, the volatility of the business environment raised by ca. 75% between 1999 and 2011, (A.T. Kearney's, 2011). While

contingencies 50 years ago were mainly determined by e.g. industry, core business activities or country, all abovementioned contingencies are constantly in question in the current global competition (Charan, 2013). The organisational design is rarely stable over several years but often changed through restructuring projects. Also the core business focus and the corresponding business strategy can change very quickly regarding some prominent examples e.g. IBM in the past or Apple in recent times (Zook, 2007). A change in the business strategy, for instance from product differentiation to cost leadership, directly affects economies of scale and scope. The fierce competition in many industries forces organisations to change the focus more often than in former times. Hyper competition makes competitive advantages in most cases not prevalent for a longer period of time caused by the immediacy which comes along with the new information and communication technology allowing competitors to imitate successful strategies and innovations very fast (Wiggins/Ruefli, 2005). Although this might be mainly true for big companies with a multinational approach, the trend proves a more volatile business environment for nearly all kinds of organisations even though possibly on a smaller scale. Principally it can be said that an organisation is facing much more contingencies today than ever before, requiring a quick adaptation to them. Referring to Burns and Stalker (1961) only organic businesses will be viable in this competitive environment since only they are able to respond appropriately to this quick changing environment and to the corresponding situational factors. That constitutes the crucial relevance of the contingency theory nowadays. Therefore, this approach shall be the basis of this thesis and be applied to the field of management control.

#### *The Contingency Approach in a Management Control Context*

The application of the contingency theory to management control related topics followed in the 1970s. Especially environmental factors, organisational structure and technology emerged as main classes of contingencies under which the abovementioned situational factors can be subsumed such as size or competition. Otley (1980) proposed a new framework for contingency theory in the field of management control by deriving the organisational design from fundamental contingent variables such as technology and environment and not to consider it as a basic contingency. In line with this, Merchant and van der Stede (2012) merge technological and environmental factors to a new class called 'environmental uncertainty'. Furthermore they highlight the organisational strategy as one of the main classes and introduce multinationality as an own major contingency. That is reasonable especially for multinational companies, which have an even more dominating role nowadays and it also goes along with the studies of Hofstede (1980). Apart from these bigger general frameworks, single contingent factors were investigated frequently over time. Organisational size got particular attention from the early beginning on in several studies with the main focus on the relationship to budgeting processes and decisions (Waterhouse/Bruns, 1975, Merchant, 1981). A more modern topic was business strategy as a contingency and its effect on the incentive and reward system (Govindarajan/Gupta, 1985, Merchant, 1985). Also in the beginning of the 1980s, organisational culture as contingency was identified to have significant influence on the effectiveness of the control system. A control system incompatible with the organisational values would arouse resistance among the workforce and consequently failure (Flamholtz, 1983, Markus/Pfeffer, 1983). Another more contemporary topic is the influence of national

culture on the management control system using the findings of the studies of Hofstede (van der Stede, 2002) or adding on to and expanding them (Harrison/McKinnon, 1999). Considering this history of management accounting research, the use of the contingency approach for explaining characteristics of management accounting systems seems to be popular and is nowadays a widely established research approach (Anthony/Govindarajan, 2002).

#### *The Contingency Approach in an ABC context*

The significant importance of management control tools and methods such as ABC as part of the management control system was already stated by Westerlund and Sjöstrand (1979). They mention explicitly economic planning in the long-run and resource allocation and budgeting in the short term as essential elements of management control systems. All of them are potential areas of application for ABC. Another newer approach was developed by Malmi and Brown (2008) with the management control package. In this framework, ABC can be classified as a long-range planning tool (Cagwin/Bouwman, 2002, CIMA, 2001) as well as a cybernetic tool with focus on budgeting purposes (Rivero/Emblemsvåg, 2007). Hence, the findings on contingency theory in the field of management control can principally be applied to the use of management control tools such as ABC. Moreover, there is evidence for the suitability of contingency theory to be applied to ABC in particular. A large number of studies have been performed concerning the design and implementation of ABC using a contingency approach. Anderson and Young (1999) show the relevance of situational factors for the design and implementation of ABC. A newer study on the same topic was performed by Sartorius et al. (2007) in a South African context, in Lithuania (Gimzauskiene/Kloviene, 2008) and in Morocco (Elhamma/Fei, 2013). Generally, ABC seems to be the most popular management control tool for applying the contingency theory compared to other tools like Target Costing (TC), Lifecycle Costing or Balanced Scorecard (BSC) (Chenhall, 2003). That was also recognized by the developers of ABC, who stated that every organisations need to have a specific cost system fitting to its individual requirements, which are shaped by contextual factors (Cooper/Kaplan, 1999).

This strand of research shall form the foundation of this study. In line with the statement of Cooper and Kaplan, it shall be found out for which decisions ABC might be a suitable costing system. Depending on the frequency of such decisions arising in the daily business, organisational managers will be made capable to decide if ABC fits to their organisation or not. The use of ABC as a planning and cybernetic tool must be reasonable regarding the external circumstances in which the firm operates. So, if a fit can be created between external situation-specific circumstances and the internal use of ABC, it will most likely contribute to the organisational performance.

### 3.1.3 The Contingency Approach in the public sector with specific regard to Germany

Even though the private sector emphasis is obvious within the contingency literature the theory has been applied to the public sector context as well. For example Woods (2007)

assesses the impact of the contingency variables external environment, technology, strategy, and organisational size in the risk management of a city council. Further Christensen/Yoshimi (2003) apply contingency theory in a performance measurement context in the public sectors of Japan and Australia. But also classic authors of NPM like Hood (1991) use contingency theory in order to explain phenomena in the public sector. Therefore we can conclude that the contingency approach is also valid for our context. In order to outline the context of our empirical study we will now present the public sector context of Germany.

The public administration in Germany is established on three different levels: national, state and local level. Next to the federal government exist 16 state governments and around 11.000 municipalities (Statistisches Bundesamt, 2015b). These different levels are organized in the system of cooperative federalism. That means that the federation consists out of many autonomous units, which are supposed to work together closely and that their tasks which are to be carried out are interlinked with each other. That entails also close financial interlinkages between these governmental levels, which is expressed in widely unified tax rates and transfer of tax funds from states with a surplus to states with a deficit (fiscal equalisation) (Haschke, 1997). However the principle of local autonomy is of high importance and integrated into the Basic Law (Art. 28). The principle of local autonomy includes the principle of financial autonomy. That means that municipalities have to manage their financial matters independently and are entitled to raise local taxes. Apart from the governmental agencies and departments, there are also other units which are counted to the public sector, which are not investigated in this study like hospitals or universities (Haschke, 1997).

The accounting in German public administration is regulated by law. The traditional accounting approach has a strong cameralistic character with a high input-orientation, a cash-based approach and with strong emphasis on meeting legislative requirements in terms of budget control. After the unification of Germany, public debt increased considerably so that the 60% GDP-to-debt ratio could not be met in the middle of the 1990s (see figure 2, Statista, 2014). That caused a pressure for internal reforms in the public administration. At that time, more and more NPM methods were tried to be implemented in German public sector (Mohnke, 2013). An essential and more general element of them was the creation of competition in order to dissolve monopolies, which led to inefficiencies. That was achieved by privatisations on the one hand and by more and more transparency and benchmarking initiatives within public administrations on the other hand (Musil, 2005). The increased disclosure of information about the efficiency of public administration to the population and the possibility to be compared with other departments or administrative units was supposed to increase the pressure on managers as well as civil servants. Apart from the focus on increasing transparency and competitive elements also the accounting system and a more business-like approach to public management came into focus.

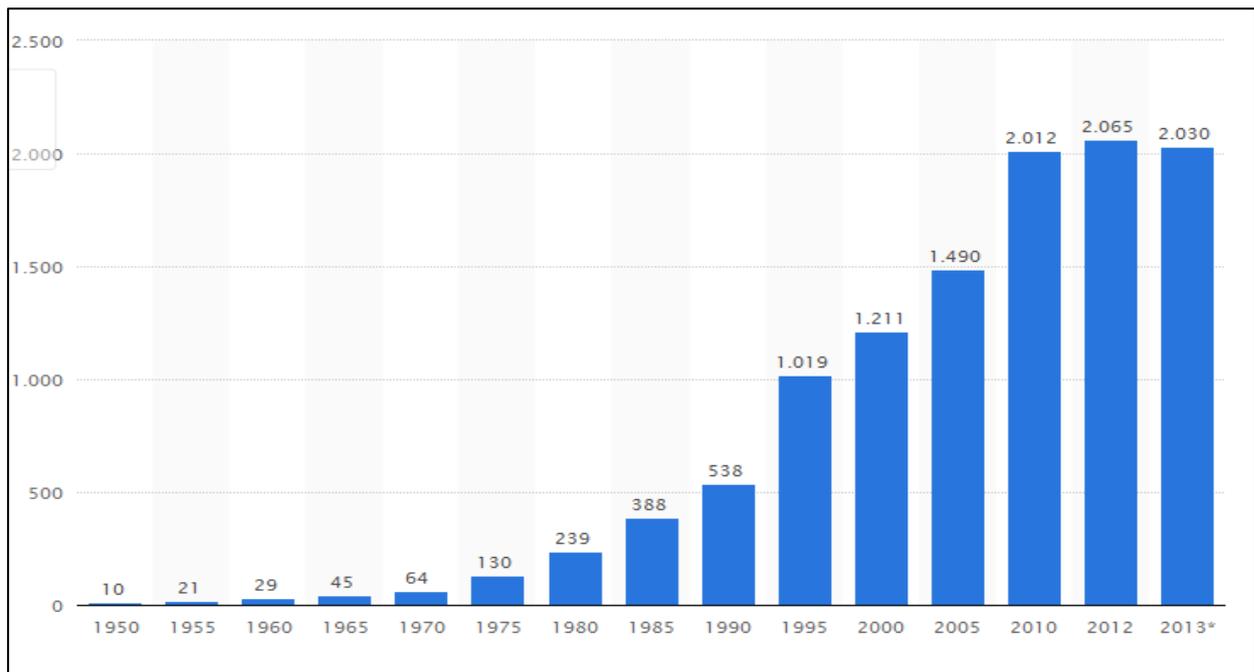


Figure 2: German national debt in billion EUR (Y-axis) over time (X-axis)

Already in the early 1990s, legislative amendments were brought on the way in order to grant support to reform efforts made by the states. The states are the crucial actor in paving the way to a more modern accrual accounting as well as cost and activity accounting. The federal government cannot prescribe the enforcement of public management reforms in the states due to their financial autonomy but can just provide a suitable legislative framework (OECD, 2002). Single municipalities in turn can barely implement such a reform on their own although they have the rights to do so. But such a reform is costly and normally cannot be afforded by them (Pawan/Mellemvik, 2008). Therefore, only rich municipalities with one or several big residing companies as taxpayers may pay and organize such a project. These municipalities however may lack incentives to do so due to their wealth. That is why the implementation progress of accrual accounting and further cost and activity accounting techniques is very slow. The state ministers were rather hesitating, not really seeing the necessity of reforms and if so waiting for complete concepts they could apply in the implementation phase (OECD, 2002). The elaboration of these projects took several years with small steps. Accrual and double-entry accounting was finally permitted to be used in the German public sector from 1998 on (Ministry of Finance - State Hessen, 2014). Nowadays, there are still three states, which have not set a date for the obligatory introduction of a double-entry accounting system in municipalities. Also on state level are just four states using double-entry accounting whereas the others are following the concept of extended cameralistics (Haushaltssteuerung, 2013). That includes the traditional cash-based accounting extended by auxiliary calculations in terms of cost and activity accounting. Although the introduction of both accrual accounting and cost- and activity accounting is partly seen as more efficient and economical, the existence of cash-based accounting might not be necessarily excluding a modern approach to cost and activity-based accounting

(Meinhardt/Schulze, 2010). However, also the German public management approach seems to imply the assumption that a well-working double-entry accounting practice is a pre-condition for a high qualitative cost and activity accounting system as implied in figure 3.



Figure 3: Idealized implementation process of German public accounting reform (own figure based on Brandl et al. (2003))

Against the background of German municipalities, it might be recommendable to take the recent political history into account. The reunification of Germany constitutes a major event in this context. This might be the reason for different stages of development in public accounting and also different attitudes in the former east and West German parts. Based on Rohrer (2005), the public administrations in the former state of East Germany might be more flexible concerning change in the costing and accounting system in the corresponding municipalities, which are caused by three main factors: Firstly, many people moved from west to East Germany after 1990 because they expected better career prospects. This flexibility in terms of personal plans might be reflected also in job-related attitudes. Secondly, the accounting system in the German Democratic Republic was closer to double-entry accounting than the cameralistic system. Lastly, the East German administrations had to change their public accounting system radically with the integration into a common German state. That required already flexibility, which might facilitate further changes as well

compared to the perhaps more entrenched structures in West Germany with the strong emphasis on cameralistics.

### 3.1.4 The iron triangle - a suitable contingency framework?

Due to the high complexity and dynamic change of today's business environment, an underlying framework for the appropriate use of management control tools must be flexible and adjustable to a large variety of circumstances. That means naturally that the framework will not be a deterministic tool but requires a priori assessment by the managers using it. One framework, which deemed to be a suitable starting point, was the project management triangle or 'iron triangle'. The first version was developed by Martin Barnes most likely in 1969 and became the standard framework for project management (Weaver, 2007). It shows three dimensions (cost, time, quality) which help to prioritize projects. It is said that it is not possible to optimize all three dimensions but at most two. The third one can just be hold on a certain level but not above (Lock, 2007). If the management tools are regarded, it becomes obvious that each of them puts different emphasis on these three dimensions (e.g. Total Quality Management (TQM) vs. Target Costing (TC)). From this follows a different suitability of single management tools for the management of different dimensions. Since different projects are characterised by different prioritizations, one single management tool will not be suitable for the management of all kinds of projects. Therefore, it should be possible to assign certain management tools to certain dimensions and thereby to certain kinds of projects according to suitability.

The suitability of the project management triangle to classify management control tools results from the nature of these tools. As stated by Gimzauskiene/Kloviene (2008), ABC is only effective if it is used for decision making. That can be claimed to be valid also for all other management control tools, since the original function of management control is the support of the decision making process and to secure rationality in it (Weber/Schäffer, 2011). A decision always points at a specific direction and implies a priority in order to increase the company's performance. Following an of course simplified and more practice-oriented approach, the company's overall performance can be broken down to the focus on cost, time and quality (Gering, 1999). Applying these dimensions of the project management triangle, a focus in a decision can be cost-related, time-related or quality-related depending on which of the three dimensions is the most crucial one in the specific situation. Therefore the assignment of management control tools to these decision foci expressed in the three dimensions is a simplified though justified development out of the existing knowledge in the field of management accounting.

There can be other foci being relevant in decision making and thereby other dimensions to be applied. For instance, Neely et al. (1995) also add flexibility next to cost, time and quality but this and other dimensions will not be part of the initial attempt to categorize ABC in this thesis. Indeed, the framework shall be as simple as possible and still be of explanatory power for decision-making in practice. In general a fourth dimension is not deemed necessary to be included in advance, but the option to add other dimensions and thereby to change the shape

of the framework is considered later in the course of the thesis. This is especially relevant as the three-dimensional approach can be discussed controversially in terms of accuracy and comprehensiveness.

This thesis shall make a start in characterising the management tools according to their strengths and weaknesses. This start shall be done by investigating the use of ABC.

## 3.2 ABC

### 3.2.1 The concept ABC

ABC is a costing technique which was developed in the late 1980s by Kaplan and Cooper (Hopper et al. 2007) and became one of the most-researched and most popular complete costing methods (Fei/Isa, 2010). Originally designed for the use in manufacturing companies it was later used in other private sector industries and also in the public sector. We will now present the concept starting with its origins, followed by a discussion about its development and the application in both private- and public sector context.

#### *The origins of ABC*

The basic idea of the concept is to measure the resource consumption of products. This is done in a two-step process: Firstly, resource consumption of activities is measured and then the activities are allocated to cost objects (e.g. products). Thereby not only direct- but also indirect costs, which are related to the products according to their activity consumption, are considered. This is fundamentally different from traditional methods which either considered only direct costs or allocated the indirect (overhead) costs, but not very accurately. Indeed most companies allocated their overhead expenses to products if at all based on direct labour hours, material costs, machine hours or any other rough allocation method. The ABC approach allows for analysis of the product performance on a more accurate, reliable and valid information basis (Cooper/Kaplan, 1988). Even though ABC is considered a complete costing method it does not allocate all costs to activities. Indeed costs of unused capacity and Research and Development costs for completely new products remain unassigned (Cooper/Kaplan, 1988). The basic idea of the consumption-based, fair cost allocation of the concept ABC compared to the traditional approach is depicted in figure 4.

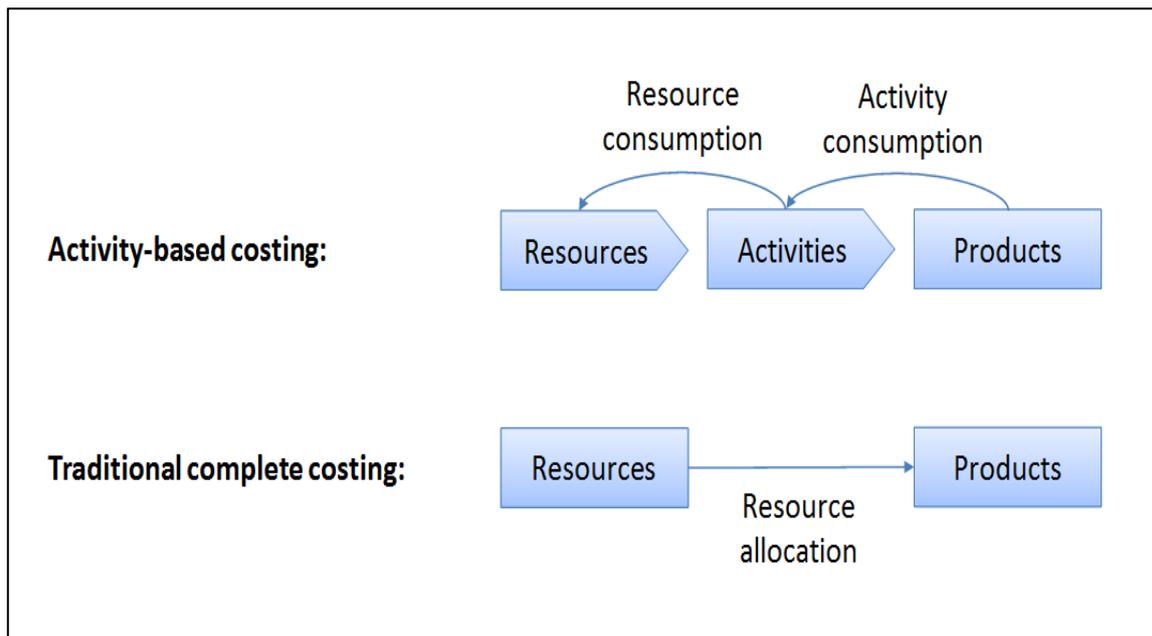


Figure 4: Comparison of the traditional costing approach and ABC (based on Cooper/Kaplan, 1988)

The idea of ABC was revolutionary in the 1980s when traditional volume-based costing methods were widely used in the important manufacturing sector. That the correct allocation of overhead costs was not much thought through before the 1980s is understandable as it did not matter much how the rather small portion of around 20% overhead costs (in 1950) was allocated to the products or departments in the typical manufacturing business (Cokins, 2002). Over time the monetary importance of direct labour decreased as automation took the place of factory workers and support functions like operations, marketing, distribution, and engineering became more important (Cooper/Kaplan, 1988). In the 1980s when the overhead expenses in manufacturing increased to more than 50% of the total costs and were increasing rapidly, an inaccurate allocation was no longer acceptable for many businesses (Cokins, 2002).

#### *Developments of ABC over time*

Today it is common knowledge that ABC helps to make better informed decisions regarding products, staffing, investment, and budgeting (Cooper, 1988). But while the vast majority of scholars seem to agree with the fact that ABC is superior to traditional cost systems from an information perspective (Weygandt et al., 2010, Baker, 1998), there are still criticisms against the concept which caused a gradual evolvement of ABC over the years. Due to the fact that ABC was criticized for its lacking decision usefulness for managers, ABM (activity-based management) emerged in the 1990s. This concept which is also referred to as ABC/M points out the evolution from the cost focused ABC to a more performance oriented decision support tool (Hopper et al., 2007). Whether the new way of thinking which was promoted as ABC/M made a relevant difference in theory or practice however can be questioned as it did not change much of the weaknesses of the approach which were pointed out by Kaplan/Andersson (2013). They argued for example that ABC requires too many resources

(mainly staff). Further, they see data accuracy problems and increased fraud risks as data entries are made by members of staff who may behave opportunistically. This is even more problematic as management often has to rely on the data entered by the staff as it is hardly possible to validate all the entries. Next they claimed that ABC demands much of the information technology (IT) infrastructure and the responsible department staff as the data must be stored, processed and reported in order to be useful for decision making. Also ABC systems are usually inflexible as changes are expensive to make. And finally they see the ignorance of unused capacity in the method as problematic. These factors are suggested to be solved by the next evolutionary step of ABC, time-driven activity-based costing (TD-ABC) which was introduced in the early 2000s and aims to solve the above problems by using time estimates per production unit and cost estimates per time unit (Kaplan/Andersson, 2013).

### 3.2.2 Use of ABC in the private sector

Many authors have analysed the adoption of ABC in the last two decades. For example Innes et al. (2000) compared the adoption rate of ABC in 1994 and 1999 in large firms from United Kingdom (UK). They found that the share of companies using ABC decreased from 21% to 17.5% and that the portion of companies considering a use of ABC decreased also from 29% to 20.3%. Further findings show a decreasing use of ABC across sectors. Thereby the financial sector exceeds the manufacturing- and the non-manufacturing sector in both surveys. They also found that smaller firms are less likely to use ABC in general compared to larger firms, which even show an increasing ABC adoption rate. The results of this study show that ABC is not a new tool which has certainly reached the peak of its use in certain areas at that time. While other studies which were conducted in Anglo-Saxon countries do not make similar comparisons they find similar adoption rates. Indeed 14% in Canada (Armitage/Nicholson, 1993), 18% in the United States (US) (APQC/CAM-I, 1995), 20.3% in New Zealand (Cotton et al., 2003), and 36% in Malaysian manufacturing firms (Maelah/Ibrahim, 2007) are found.

It has to be noted that the above cited authors used different categories of ABC adoption and conducted the studies partly in different ways and under different conditions. Despite of these factors which certainly limit the comparability we can roughly conclude that adoption rates of ABC in the private sector were mostly below 30% until ten years after the introduction of ABC.

Interestingly, significantly higher rates were observed in Germany with 52% of large industrial companies using ABC in 1996, 47% in 2001 and 31% in 2009 (Horvath & Partners, 2011).

One way to explain the above differences in adoption rate over time and between countries is the life- and hype cycle logic of Turney (2008). First, he describes a hype cycle of ABC as starting with a technology trigger in the mid-1980s continuing with a peak of inflated expectations in the early 1990s followed by disillusionment and gradual recovery of the visibility of the tool (see also Figure 5). The hype cycle can certainly explain a quick increase of adoption rate in the early 1990s after the new technique came up. In fact, it contradicts the

idea of contingency theory to a considerable extent since it illustrates how a major majority of the organisations are applying the same tool at the same time. To be in line with contingency theory, that would mean that these organisations all have the same contingencies at the same point in time which is rather unlikely. Hence, the hype cycle concept implies a trend-driven adoption of the management tool instead of a purpose-oriented choice. And also the significant differences that seem to exist between sectors and countries can be explained through hypes in certain areas while other areas remained untouched.

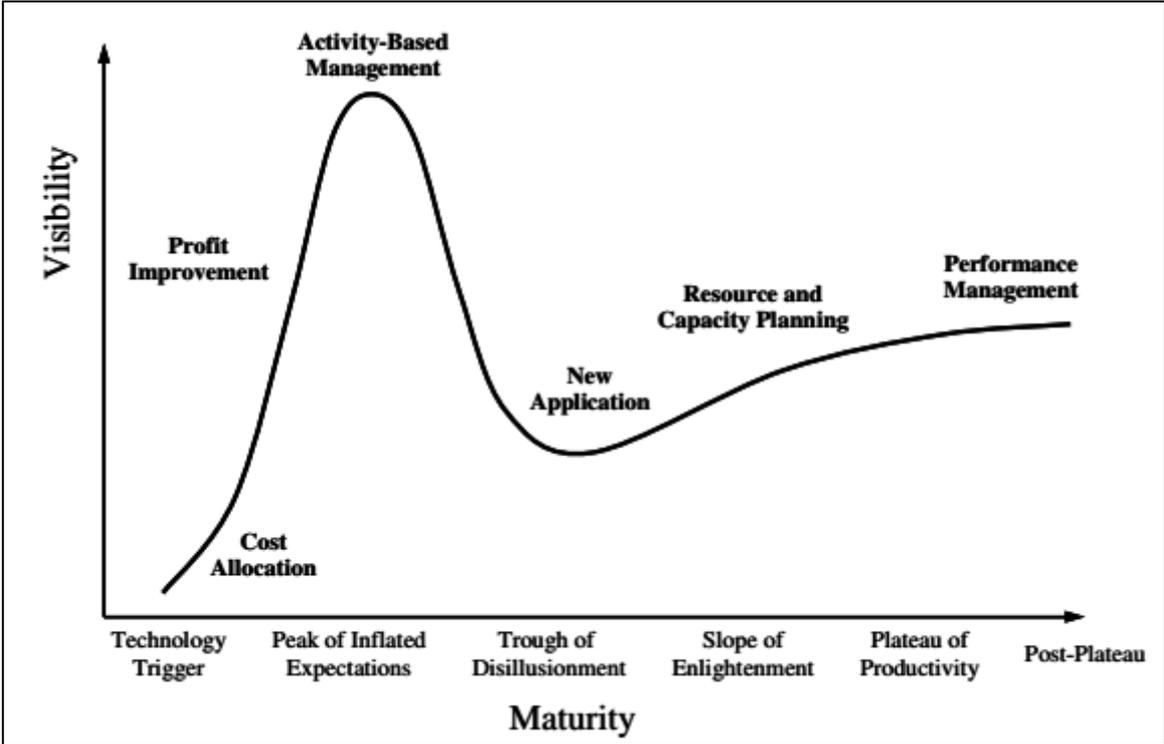


Figure 5: Hype cycle of ABC (Turney, 2008)

### 3.2.3 Empirical evidence for Advantages and Disadvantages of ABC

*Advantages of using ABC*

Even in case of a rather low adoption rate (Innes et al., 2000) research has shown that users of ABC systems are usually satisfied with the adoption and value the technical characteristics of the system higher compared to traditional methods. This is shown for example by Byrne et al. (2009) for Australian ABC adopters. Their survey participants respond that ABC supports the quality of decisions, efficiency and waste reduction, innovation, and cross-functional collaboration and communication on an organisational level. And also on an individual level they see performance improvements with regards to both time and quality which relate to ABC implementation. Innes et al. (2000) find in their survey among large UK firms that cost reduction, pricing and performance measurement were the most important reasons for ABC adoption. The advantages of ABC compared to traditional methods were also empirically

analysed by McGowan (1998). She found that both users and preparers of ABC information who had undergone a change in the costing system were generally in favour of ABC compared to the (traditional) predecessor system. Both groups of individuals in her study agreed that ABC information is more accurate, reliable, timely and understandable and therefore supports their daily work as well as the organisation in general. These findings are largely in line with the ones of Byrne et al. (2009) who finds additionally better accessibility of information as an advantage of ABC which was tested by McGowan but could not be confirmed.

#### *Disadvantages of using ABC*

Despite the abovementioned technical disadvantages of the concept ABC which led to the development of TD-ABC also more practical disadvantages are to be considered. Indeed the potential cost savings should, at least in the long run, be higher than the remarkable amount of initial and recurring costs of ABC. Such systems mostly require changes in IT systems, additional personnel and training for current staff (Innes/Mitchell, 1995; Bagur et al., 2006; Brown et al., 1999). Not much empirical data was found concerning other disadvantages like wrong entries, the misinterpretation of data, and the missing guideline for appropriate choices of activities and cost drivers. These factors however can be seen as covered also by the argument of high resource consumption as a correlation between higher expenses and a more accurate and better controlled ABC system is likely.

How these advantages and disadvantages apply within a particular organisation is of course dependent on many factors, some of which we will discuss in the next chapter.

### 3.2.4 Enabling factors and challenges for ABC implementation

While some of the aforementioned contingency factors of management control like size, culture, and strategy may apply on a general level, also more specific conditions which influence the likelihood and success of an ABC implementation have been found.

#### *Enabling factors of ABC implementation*

Cagwin & Bouwman (2002) find that financial success of an ABC implementation is more likely if the implementing organisation fulfils the criteria of high complexity, high cost importance and low level of intra-company transactions. Complexity is thereby defined through attributes relating to the diversity of the product related internal requirements. Based on their approach a more complex organisation would have bigger differences between the production volumes, lot sizes and support requirements and would more frequently change products. Secondly, the importance of costs for the firm is a success factor of ABC. If the organisation faces cost reduction pressure due to competition and at the same time has to rely on accurate product costs which are also used for pricing decisions the likelihood of a successful ABC implementation is higher. Finally they consider a low share of intra-company transactions (of total sales and purchases) as success criterion of an ABC implementation. While complexity is considered an enabling factor for ABC success the processes in the

delivery of services and in production should be rather standardized (Armstrong, 2002). Further Shields (1995) considers non-accounting ownership and Cagwin & Bouwman (2002) consider sophisticated IT infrastructure and the absence of excess capacity as enablers of ABC success. Innes et al. (2000) find additionally that top-management support is important for a successful ABC implementation while they cannot confirm the importance of user- or consultant involvement which had been suggested by McGowan & Klammer (1997). Also they find no relationship between the perceived ABC implementation success and the duration for which the technique has been implemented. This is contrary to the claim of Cagwin/Bouwman (2002) that the cost-benefit relation of ABC improves over time. Another factor which seems to have an influence on the decision to implement ABC or the success of an ABC implementation is the size of organisation (Armitage/Nicholson, 1993; Akinyomi, 2014) which is in line with the contingency factors that were mentioned earlier. However Akinyomi (2014) claims that this result, which he finds in a study of Nigerian manufacturing firms, may rather relate to the higher complexity and the greater availability of resources in larger firms than to the factor 'size' per se. Finally organisations which face high competition (Anderson, 1995) resulting in greater cost pressure as well as a high level of overhead costs (Gupta/Galloway, 2003) are more likely to introduce ABC.

A last point which got much attention in the past, was the function and the role of leadership for the implementation of innovations and for the encouragement of change within an organisation, (Holt et al., 2007). Therefore, the attitude of top-management in terms of ABC must be considered as an important pre-condition for a successful implementation of ABC. If top-management is not fully convinced of the underlying concept but rather implementing it e.g. because the tool currently experiences a great popularity, it will most likely not succeed in obtaining the necessary support among the workforce.

#### *Challenges for ABC implementation*

The list of success factors already implies that there may also be conditions under which an ABC implementation is not successful or not considered at all. For example Cobb et al. (1992) suggest that a lack of internal IT resources and staff is the main cause of ABC problems (Innes et al, 2000). This argumentation is largely in line with Taba (2005) who points out that high initial costs for implementation and training, as well as a good amount of maintenance costs are hindering ABC adoption. Further Argyris/Kaplan (1994) see internal resistance to change as major challenge during ABC implementation. This argument is taken up by Malmi (1997) who provides a more detailed explanation how internal resistance can hinder the ABC implementation. For example he sees economic reasons such as too high resource consumption occurring due to the use of ABC as reasons of ABC failure since more efficient alternatives exist. Also political reasons like the fear of unfortunate changes in transfer prices or a bad incentive structures are to be considered as potential reasons for ABC failures. Finally, Rundora/Selesho (2014) find that non-users of ABC weigh implementation barriers, mainly the lack of knowledge, generally higher than users of ABC.

Even though some of the aforementioned authors distinguished between different stages of ABC implementation, we listed their findings all together on a general level which is in line with our more general research approach. Similar to Maelah/Ibrahim (2007) when analysing

Malaysian manufacturing companies, we expect the majority of our sample to be non-adopters of ABC. This will be pointed out below when ABC in the public sector and the context of the German public sector will be discussed.

In summary the idea of Cooper/Kaplan (1999) is that the optimal cost system should be the minimum sum of the costs of avoidable costing errors and the costs of the costing system. This simple idea is one way of explaining the differences that exist in the consideration of the above factors and the implementation of ABC. This implies that organisations which either have less additional costs to expect from an ABC implementation (e.g. due to the existence of sophisticated IT systems, etc.) or have a higher exposure to errors due to misallocation of costs (e.g. due to a high portion of overhead costs) would be more likely to introduce ABC.

#### *Contributions of ABC for decision-making in terms of Cost, Time and Quality*

There are prior research, which has addressed the benefits of ABC in terms of the dimensions cost, time and quality. It seems to be common sense that ABC has a positive impact on all three dimensions no matter if private or public sector (Günther, 2003; Isemann et al., 2011). In order to classify ABC as management control tool, it must be clarified to which extent single dimensions profit from ABC. The most obvious benefit of ABC is commonly seen as better cost management. That is not surprising since the original paper of Cooper and Kaplan (1988) is based on that idea and the main benefits in this field were already pointed out above. More difficult is the evaluation of the contribution of ABC to the dimensions time and quality. Gering (1999) claims from practical experience that ABC has a moderate impact on time and a significant impact on quality. ABC is considered as being compatible with important quality concepts such as TQM (Novicevic/Antic, 1999; Necula, 2009). However, there is also evidence on an indirect influence of the use of ABC on improvements in terms of time-efficiency (Norris, 1993). Moreover, Kaplan and Anderson (2013) expanded the concept of ABC through the introduction of TD-ABC, which includes time measurements of business processes as essential elements. The municipalities in this study were asked for ABC in general without mentioning TD-ABC. However, one of our pre-interviews revealed, that time measurements were done during the preparation of the implementation phase of ABC. Hence it can be seen, that the way how ABC is implemented may vary and may include a stronger focus on the time dimension as a proxy and cost driver for performing an overall cost allocation. The rise of TD-ABC could have probably enhanced the connection between ABC and the time dimension and thereby having aroused a more concrete influence. That is why due to the rise of TD-ABC and its close connection to ABC in general, the time dimension might have gained in importance also when using no specific TD-ABC management approach but just as a variation of ABC in practice. All in all, the cost dimension can be expected to be most relevant in terms of ABC benefits. Concerning time and quality, it is hard to formulate any expectations since there are arguments for both sides. The rise of TD-ABC might have connected the time dimension closer to the general concept of ABC so that time as second-relevant dimension would not be surprising.

### 3.3 Public sector context of ABC use

#### *Background of ABC use in the public sector*

Although the purpose of public management is not profit maximization, cost management in public administration has always been a controversial topic not only since the outburst of the financial crisis followed by a considerable increase in public debts. Already the rise of the new public management debate was driven by a bigger need for outcome control, public accountability especially in terms of budgets and a more effective and efficient use of resources (Lapsley, 2008). As a result of the implication of new management practices the identification and understanding of costs should be enhanced and more sensible cost accounting should be established with resemblance to cost centres (Hood, 1991).

The rise of NPM was positively influenced by a perceived crisis of the welfare state in the 1980s. That led to a wave of sympathy towards the establishment of private management practices in the public sector especially in Anglo-Saxon countries with a neo-liberal government like the UK (Drechsler, 2005). Hence, several countries performed public management reforms (Pollitt/Bouckaert, 2011). Among the countries which adopted the new public management approach to the highest extent, were mostly Anglo-Saxon countries like UK, New Zealand, Canada and Australia but also Sweden (Hood, 1991).

One crucial idea in order to increase the efficiency of the public sector was to create competition. Although elements of competition were existing in public administrations for a long time e.g. in Germany, the direct consequences of being uncompetitive were weak. Especially from the Anglo-Saxon part of the world, concepts like public choice theory and compulsory competitive tendering (CCT) have spread. Public choice theory is stressing that citizens must have the possibility to choose from different suppliers of public services. CCT describes the possibility for private companies to participate in the provision of originally public services. Such competition will directly affect the public administrations motivating them to improve their processes. Since pure market competition is not always applicable in a public sector context, quasi-market (internal competition) and non-market competition (internal benchmarking) is often in place (Reichard, 1998; Musil, 2005; Brede, 2005). The competitive situation in the public sector is certainly not comparable with that in the private sector facing the challenge of hyper competition but the rise of NPM clearly reveals a tendency towards a much more competitive business environment. That constitutes the need for modern management control tools and new management styles in the public sector.

A central project of new public management practices in terms of cost management was and still is the implementation of accrual accounting instead of cash accounting (cameralistics). Cash accounting means to register revenues or expenses only when a payment was received or made. The advantage is that it is easy to perform because there are not many choices to make and it is transparent and objective. On the other hand, it does not provide a lot of information about the economic activity of the organisational unit since expenses are not matched with the revenues they generate. That leads to a distorted picture of the actual income situation (Tudor/Mutiu, 2006). Accrual Accounting is supposed to give better information especially in the long-run. The information concern among others the efficient

use of resources also in accordance with legal and contractual requirements, timing and amount of cash flows, short- and long-term liquidity and performance measurement (OECD, 1993). An increasing implementation of accrual accounting in public administration throughout Europe started in the 1970s/1980s and reached its peak in the 1990s (Tudor/Mutiu, 2006). Germany started this process in 1998 through allowing the application of accrual accounting by law..

### 3.3.1 ABC as a tool of New Public Management

Also ABC played an increasingly important role in the course of the implementation of new public management practices during these decades. Even though ABC was originally designed for manufacturing companies it started also being used in the public sector. For example Jackson/Lapsley (2003) found in their study about the Scottish public sector that ABC was used by 32% of the organisations like local authorities, government agencies and health care as for budgeting and by 42% as a costing technique. Among the local authorities, 54% used ABC as a costing technique. This figure is even higher than what Innes/Mitchell (1995) found earlier for large companies in the UK. According to Jackson/Lapsley the use of ABC can be seen in line with the development of New Public Management (NPM). Therefore, as the UK is known for being among the trendsetters in NPM (Hood, 1995), it is not very surprising to find a rather high usage for Scottish municipalities. Also for another Anglo-Saxon country (Australia) Baird (2007) finds a high adoption rate of 66% of public sector organisations adopting ABC at least to a moderate extent which is still lower than the corresponding figure (77%) for private sector organisations.

#### *ABC in German NPM context*

It is interesting to analyse the use of ABC in the public sector mainly due to our expectation of municipalities to be rather cost focused (CIMA, 2010). Studies in private sector companies have shown that the second important category (after Profit and Revenue) in terms of measurement is cost control (Rigby/Bilodeau, 2013). Combining this with the missing profit maximization intention in the public sector, costs are assumed to be the major focus in the public sector which makes it a highly relevant context for the analysis of the cost dimension. Further the public sector has certain characteristics which support our research approach. For example the possibility to retrieve a complete list of municipalities and the data availability in general are clear arguments that make the research in this field easier than in the private sector.

It is interesting in particular to analyse the public sector in Germany as it used to be rather undeveloped in terms of NPM (Hood, 1995) and also in terms of accrual accounting as mentioned before. Furthermore, with regards to the rather conservative accounting system and the conservatism which can be observed in the German culture in general (Nobes/Parker, 2012) it is interesting to see whether hype tendencies for ABC can be observed even in this context.

A former study from 2005 found out that ABC is used in 22% of German municipalities. Further 30% was thinking about implementing it in the future (Deutsche Post AG on

OpenPR.de, 2005). The federal ministry of finance issued guidelines for the implementation of an appropriate cost and activity accounting (Federal Ministry of Finance, 2013). Many states took up this term and published handbooks on the modernisation of public accounting (e.g. Fiscal Authority of Hamburg, 1996, Ministry of Finance of Rheinland-Pfalz, 2000). All of them refer to products as crucial cost objects and when dealing with the distribution of direct and overhead costs a process-related approach is clearly expressed. Some handbooks also have own chapters about activity-based costing and the implementation of it. That shows the increased relevance of ABC and the political support of further implementations which should result in empirical evidence, showing a higher share of municipalities using ABC. Comparing the above cited public sector studies with the aforementioned evidence of ABC use in the private sector notable differences between the adoption rates are obvious when comparing the Anglo-Saxon part of the world to continental Europe, in particular Germany. While it appears that the use of ABC in Anglo-Saxon tends to be higher in the public sector than in the private sector, the opposite can be said about Germany. However among private sector organisations the use of ABC seems to be decreasing in the last decades. This is in line with the hype cycle concept and serves as evidence for a trend-driven adoption. Indeed the significant rate of abandoners of ABC can be seen as evidence for a lack of purpose-oriented choice of management control tools also in the public sector.

Germany is an example for the phenomenon that with the diffusion of ABC into many countries and translations into the respective native languages, the concept itself did not stay untouched. The linguistic approximation of ABC into German caused the term 'Prozesskostenrechnung' (process costing) to be the synonym of ABC. While it is generally acknowledged that this is the most appropriate way to translate the term (Weber/Schäffer, 2011), it has to be considered that a slight change in meaning may be caused. Firstly, the Anglo-Saxon ABC focuses clearly on the correct calculation of product costs for decision making whereas the German process costing is defined with less decision making focus, aiming for overall transparency instead. ABC is thereby primarily aiming for a fair allocation of overhead costs which are related to production while process costing focuses rather on the control of overhead costs in general. Further there is the methodological difference that when using ABC cost drivers cannot be assigned to activities across different cost centres while in process costing (German version), processes are considered regardless of the cost centre structure (Krump, 2013). Nevertheless in our pre-interviews the product focus of the process costing was emphasized. We can therefore assume that the version of ABC which is applied in some of the municipalities is even closer to the American ABC than to the process costing which is applied in many German private sector organisations, where costs are often rather assigned to cost centres than to products (Schröter, 2011).

### 3.3.2 Advantages and Disadvantages of ABC use in the public sector

While ABC originally targeted the traditional manufacturing business its use was extended also to the public sector. However, the use of ABC in the public sector makes sense as the major argument for ABC, the more accurate distribution of overhead costs, applies mainly in

personnel intensive industries such as the service sector, since a big portion of overhead costs is directly linked to this (Becker et al. 2009). That is clearly the case in public administration with personal costs accounting up 40% of total costs in municipalities (Fliedner, 2011).

Due to an increase in cost pressure, the covering of unit costs becomes more and more important. Although municipalities have other incentives for setting prices like regulatory policy reasons, the approach to a higher cost awareness and cost consciousness gets more and more attention. By capturing the unit costs more appropriately, ABC can contribute to a more effective and better justified pricing policy in public administrations (Littkemann et al., 2005). Through the implementation of ABC, more transparency and a better cost control, resulting in more efficiency and effectiveness in the administrative processes, can be achieved. The discovering of excess capacity through the analysis of activity quantity neutral and activity quantity induced costs plays a central role here (Littkemann et al., 2005). These data can be used to identify the productive potential of public administrations. On this basis, process optimizing could be performed (Stöger, 2013). That technique can also be used in order to increase the quality of services either through re-design (Becker et al., 2009) or an improved capital allocation going along with a better funding process (Oseifuah, 2013). In combination with the setting of objectives (e.g. time for responding to a request), complaints about unproductive civil servants could possibly be minimized. This data can further be used for a better cost planning for future periods.

A case study in a public company (theatre) showed the potential benefits of the use of ABC. The activity cost control and accounting could be made more reliable. Individual activity costs allowed the use of less cost drivers. That revealed the potential to reduce costs because the individual need of resources for different performances (products) could be identified (Breth et al., 2007).

Another aspect when assessing the use of ABC for municipalities is the economic justification of decisions (Littkemann et al., 2005). Especially in the field of public management in which politics are often the reason in decision-making processes, the economic reason is not always considered. ABC may increase cost transparency and the favourability of decisions from the economic point of view. That will make it harder for politicians to realise projects which have a more political character than they actually serve the society and future generations.

On the other hand, ABC must be implemented with regard to the public sector context. For instance, the definition of products must be done completely from the scratch because nothing comparable can be taken from private companies or other countries (Littkemann et al., 2005). Even the product range between municipalities within one country may differ, depending on the political focus.

A prerequisite for the proper use of ABC is a comprehensive cost centre and cost object accounting. Especially the traditional fiscal accounting can be an obstacle to this and therefore hindering a smooth implementation of ABC (Littkemann et al., 2005). That means that even more comprehensive actions have to be taken before ABC can be established in public administrations. Since ABC is rather expensive in its establishment anyway, the project can become a high burden for the communal budget. That requires a strong support from state-level agencies.

The strong linkages within the production process of public services make it difficult to assign activities to one single user (Littkemann et al., 2005). In combination with the large variety of products, which is characteristic for most municipalities, the cost accounting system can become hard to manage, requiring more resources than it actually sets free.

The suitability of ABC for certain kind of processes has to be considered. Firstly, it is important that there are different products with a different consumption of overhead costs in order to be able to use ABC reasonably. Second, a degree of homogeneity within the production process should be ensured (Littkemann et al., 2005). Otherwise the use of ABC will become too complicated and the cost-benefit analysis of the implementation will turn into negative.

One of the main differences between the ABC adoption in the private sector and the public sector is found in the adoption phase. For example Krumwiede and Roth (1997) and others see an internal initiation-/consideration phase in the beginning of the ABC adoption process in the private sector. Indeed the fact that somebody (from the management) in an organisation generates the idea of adopting ABC in order to achieve a certain goal e.g. cost leadership seems natural as a starting point. However, this may be fundamentally different in a public sector context as the decision is made on a different level. In Germany for example the decision whether municipalities are supported when introducing ABC is made on state level and this is mostly an important pre-condition for the realisation of such a project. This lacking flexibility of public sector has also been pointed out by Vazakidis et al. (2010). Nevertheless they conclude by recommending the use of ABC in the public sector.

#### *Enabling factors of ABC use in a public sector context*

Considering the above enablers of an ABC adoption in the private sector we see that municipal organisations fulfil several of them. First the high share of overhead costs (Becker et al., 2009) and the high complexity are definitely found in municipal organisations. The latter can be illustrated with the diversity of the products that a municipality delivers. In Germany municipalities are obliged to cover certain areas of public service like wastewater disposal, local elections, care facilities, social issues, and public schools. While the aforementioned duties are covered by the municipalities autonomously there are several mandatory responsibilities which are assigned to the municipalities by specific state laws, for example registration, civil protection, and building supervision. Further most municipalities voluntarily take over other responsibilities like cultural institutions, twinning agreements, or promotion of the economy (MIK NRW, 2015). Second the absence of profit focus in the public sector (Littkemann et al., 2005) implies that cost management, which is also among the most important business performance areas for private sector organisations (Rigby/Bilodeau, 2013), is in focus instead. While costs were traditionally important in the public sector and may have gained in importance due to the rise of New Public Management and also the financial crisis, the main focus of public sector organisations remain the interests of society and public welfare (Littkemann et al., 2005). While some intra-organisational transactions occur in municipalities, their presence cannot be treated similarly to a private sector environment. Due to the lacking profit focus and the absence of bonuses for the management the fear that transfer prices may change is estimated to be less relevant. However as there are transfer prices used in the public sector (Abraham et al., 2008) and due to the before mentioned increasing cost pressure, some internal resistance against ABC may occur due to

the fear of restructuring which may be initiated by appropriate cost distribution. Concerning the factors of top-management support and non-accounting ownership, the public sector context is fundamentally different from the private sector. Since the state largely decides about the support of an implementation of ABC there is neither a huge support from the municipal accountants and management team to be expected nor a particular resistance of other teams. However as it is critical in private sector organisations if only parts (e.g. the accounting department) supports an innovation it is definitely a risk that the new ABC system would be imposed on the municipalities 'from above' which could of course cause a general resistance within the municipal organisation (Federal Ministry of the Interior, 2009). Finally the IT infrastructure in the German public sector which had been criticized in the past can, despite recent improvement initiatives ('E-Government'), still be regarded as underdeveloped compared to private sector standards (Handelsblatt, 2007). Additionally to the enablers in a private sector context also the support of politicians is to be considered in a public sector context (Bagur et al., 2006). As municipal organisations consist mostly of a mix of politicians and civil servants the support of both groups is important.

As top-management support plays a crucial role in private sector organisations, it must also be considered in the public sector (Fernandez/Rainey, 2013). For sure do public managers not experience the same scope of action as their pendants in the private sector. However, there is local autonomy existing in the public sector. That was pointed out in particular for the case of Germany as context of this study. Since financial matters belong to the areas in which some autonomy is granted to municipalities, public managers might be able to influence the strategy in this regard to a certain extent. That means that their attitude will automatically be of importance when it comes to decisions on the financial management of their municipalities.

### 3.4 Summary of previous research and expectation building

It has been shown how contingency theory has evolved over time and how the iron triangle can be seen as a framework within the management control context of contingency theory. Further we have covered the tool ABC in depth discussing the general idea of the tool as well as its application both in the private and in the public sector. We have also listed a variety of factors which may influence the decision to implement ABC and its success. The theoretical chapter serves now as basis for our empirical study for which we will use the background knowledge in order to put our own findings into perspective. Indeed the information which we collected above about the public sector context in general and Germany in particular as well as general characteristics of organisations adopting ABC in comparison with the non-adopters is transferred to our empirical study. While the factors relating to Germany and the public sector can be seen as given by the sample selection other organisational characteristics of the individual municipalities and personal characteristics of the respondent will be collected through the questionnaire. These contextual factors will serve initially as explanatory variables for the adoption/non-adoption of ABC and the general opinion about

ABC. In a second application factors describing further the purpose and the success of ABC use will be linked to the contextual factors, to the general opinion of the respondents about ABC, and to our expectations concerning the relationship between ABC and the dimensions of the iron triangle. As applying a specific contingency theory always means to limit the factors which are in scope for an analysis we try to keep the variety of factors included in our survey as diverse as possible. This will allow us to either question results of prior research, if unlikely selections are made by the respondents, or to confirm results of other researchers if the choices are in line with their theories.

Not all of the abovementioned contingency factors are relevant in our context. For example multinationality is not particularly suitable for the public sector context of this thesis as only one country is investigated. Nevertheless we identified contingencies which can be transferred from a private sector context to the public sector context. For example organisational design, strategy, cultural differences, technology and partly competition are seen as relevant also in a public sector context. However these factors are not expected to differ highly across the German municipalities. Therefore they can be seen as included in the choice of context, which is the reason why they are not part of the questionnaire. The same applies for some of the factors which were identified as enablers of ABC use, such as the high importance of costs, a low share of intra-organisational transactions and a high complexity. These factors which largely support the idea that a reasonable share of ABC users can be found in the public sector are seen as given through the context and not further examined in the empirical study. And also disabling factors like internal resistance are not further investigated due to a different focus of our research combined with the expectation to find rather similar internal attitudes towards changes in the costing systems across the different municipalities.

From the remaining factors we build the following expectations which are examined in the following descriptive analysis. The number and abbreviation of the expectations will be used later in the analysis section in order to facilitate the orientation within the discussion. In brackets behind every expectation is the chapter mentioned, in which the theoretical foundation for the corresponding expectation was laid.

#### Categorisation of ABC based on the dimensions of the iron triangle:

- Expectation 1 (Exp. 1): It is possible to classify ABC as it is applied in practice based on the three dimensions cost, time and quality. [chapter 3.1.4]
- Expectation 2 (Exp. 2): ABC is most useful for the management of costs, followed by quality- and time management (Gering, 1999) [chapter 3.2.4]

#### Use of ABC in Germany:

- Expectation 3 (Exp. 3): ABC use in general: The rate of ABC users is expected to be higher than 22% which was found in a prior study (Deutsche Post AG on OpenPR.de, 2005) [chapter 3.3.1]

- Expectation 4 (Exp. 4): The areas of ABC use, based on the statements we got from the pre-interviews and literature, are [chapter 3]:
  - Restructuring projects
  - Management of operations
  - Transparency
  - Benchmarking for information purposes
  - Asset accounting
  - Fee management
  - Benchmarking for incentive purposes
  
- Expectation 5 (Exp. 5): Based on the conservatism (Nobes/Parker, 2012) and the backwardness of the German public sector (Hood, 1995) compared to other contexts of ABC use we would expect to find different hype cycle tendencies than Turney (2008). [chapters 3.3.1 & 3.2.2]
  
- Expectation 6 (Exp. 6): We expect the satisfaction of ABC users to increase over time Byrne et al. (2009). [chapter 3.2.3]
  
- Expectation 7 (Exp. 7): Users are more optimistic concerning the applicability of ABC in public sector organisations than non-users. This expectation is based on the resistance to change and the lacking knowledge of non-users (Rundora/Selesho (2014), Argyris/Kaplan (1994) and Malmi (1997)). [chapter 3.2.4]

The above expectations are analysed by using univariate methods.

For the multivariate regression analysis concerning the use of ABC in Germany (dependent variable: *USE\_ABC\_binary*) the predictor variables which have been identified are listed in table 4 below.

<b>Predictor Variable</b>	<b>Description</b>
SIZE_inhabitants_coded (independent variable; X)	Is expected to influence ABC use (positively) based on several studies referring to size as influential factor for ABC adoption (e.g. Cagwin/Bouwman, 2002; Innes/Mitchell, 1995; Baird, 2007) [chapters 3.1.2 & 3.2.4] This is also part of univariate analysis (Exp. 8)
Budget size (EUR) (independent variable; X)	Is expected to influence ABC use (positively) based on several studies referring to size as influential factor for ABC adoption (e.g. Cagwin/Bouwman, 2002; Innes/Mitchell, 1995; Baird, 2007) [chapters 3.1.2 & 3.2.4]
BUDGETEXCEED_coded (independent variable; X)	Based on the research by Sartorius et al. (2007) and others, claiming that ABC is implemented in order to improve the

	budgeting we expect a higher use of ABC now if the budget was more often exceeded in the past. [chapter 3.1.2]
DOUBLE ENTRY BOOKK (independent variable; X)	This is a step in the German cost accounting reform (Brandl et al., 2003). It is expected that accounting is generally more developed in states which are on the latest stage in the cost accounting reform which is expected to serve as a proxy for the likelihood of using sophisticated costing methods like ABC. [chapter 3.1.3] This is also part of univariate analysis (Exp.9)
GEO_E_vs_W (independent variable; X)	Is expected to influence the ABC adoption (positively) due to the fact that the eastern part of Germany underwent fundamental structural change along with the unification of Germany 1990. That might open up more space for accounting reforms and makes employees in public sector more flexible in general (Rohrer, 2005). [chapter 3.1.3]
Hierarchy_Opinion (independent variable; X)	It is expected, that high ranked public managers who are convinced of the applicability of ABC in public sector organisations are more likely to support or even initiate the ABC implementation in their municipalities (Fernandez/Rainey, 2013, Holt et al., 2007). [chapter 3.3.2]

Table 4: Overview of independent variables and the respective expectation for the regression analysis

## 4 Results

### *Characteristics of respondents*

We received 72 responses which corresponds to a response rate of 31,6% across the three samples. Within the three samples, the response rates are 26,3% for large municipalities, 39,5% for mid-sized municipalities and 28,9% for small municipalities. The response distribution among the different states of Germany largely represents the distribution which could be expected based on our overall sample (i.e. large, mid-sized and small together). The highest deviation was noticed for Sachsen, from where 4% more answers were received than actually anticipated based on the sample. However, within the three samples there are cases, which show a clearly (5%) higher or lower response rate than expected from the sample. For small municipalities Rheinland-Pfalz (-13% deviation) and Bayern (-7%) are underrepresented and Baden-Württemberg (+7%), Schleswig-Holstein (+8%) and Niedersachsen (+7%) are overrepresented. In the mid-size sample, just Bayern shows a response rate deviation compared to the sample above 5% (+7% higher). In the large-size sample, Nordrhein-Westfalen is underrepresented (-14%) and Sachsen overrepresented (+10%) to a considerable extent. Bremen and Thüringen are slightly overrepresented (+6%) and Bayern underrepresented (-6%). In general the random distribution across Germany can be confirmed also from a geographical point of view as depicted in figure 6 below.

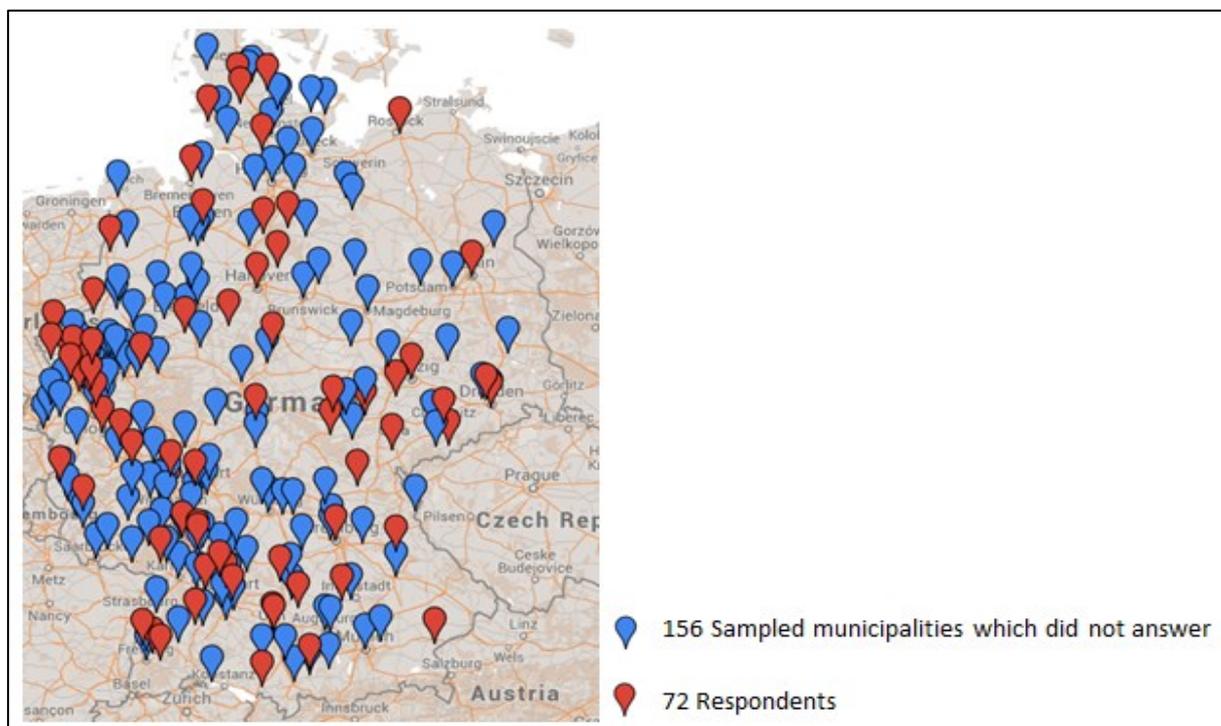


Figure 6: Geographical sample and response distribution

The vast majority of respondents (87,5%) are working within the finance department of the municipality. Around 64% of the respondents are taking positions on top- or middle-management level. The share of finance personnel as respondents is significantly lower in small municipalities (70%) than in mid-sized (97%) and large (91%) municipalities. Also concerning the hierarchical level differences can be noted between the three samples. While in large municipalities less than half of the respondents belonged to middle- or top management (37%) the share was a higher in mid-sized (77%) and small (60%) municipalities. 61,1% of the respondents have worked in the municipality for ten years or more.

Even though an evasive answer was provided for many questions (Q5-9, 10, 14, 15) most of the respondents answered the actual question by choosing one of the suggestions expressing their opinion or knowledge. The only remarkable exception was the question concerning budget exceedance for which 32% (23 out of 72) of the respondents chose the option 'I can't/Don't want to answer this question'.

## 4.1 ABC use in the German public sector

### 4.1.1 Use of ABC

According to the respondents, 16 of all the municipalities (26,4%) are using ABC at least to a certain extent. Large municipalities account for 50% of them, which makes this group with 41% of municipalities using ABC being the cluster with the highest share of ABC users. Among mid-sized and small municipalities, 20% report the use of ABC. The distribution among the samples is also depicted in figure 7 below. The chart also shows that the ABC users among the large municipalities rather apply the concept throughout the whole organisation (50% of the users) while in small and mid-sized municipalities ABC is, if at all, mostly used only in parts of the organisation. There is no case reported, in which ABC was introduced and abandoned later.

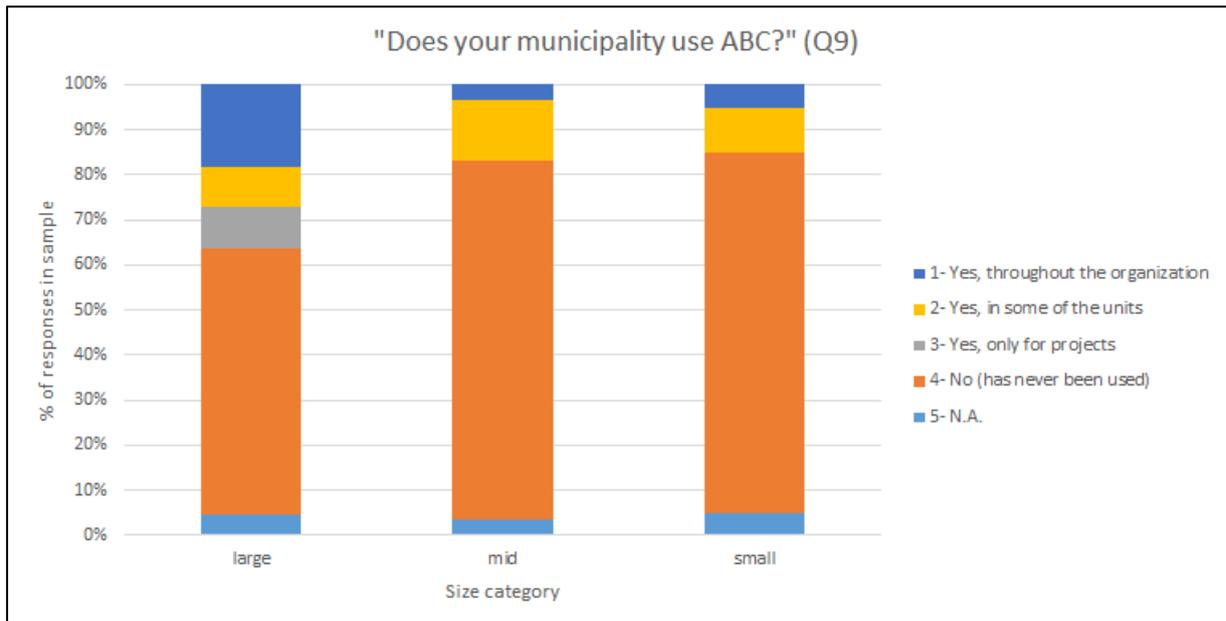


Figure 7: Use of ABC in German municipalities

When comparing those municipalities in which double-entry bookkeeping is mandatory and the ones with less developed standards for bookkeeping, the higher share of ABC adopters is found in the latter category (29% vs 17%).

Another finding concerning the use of ABC relates to the time of adoption. While most of the users of ABC adopted the method 15-20 years ago, also a recent increase in ABC adopters can be noted (see figure 8).

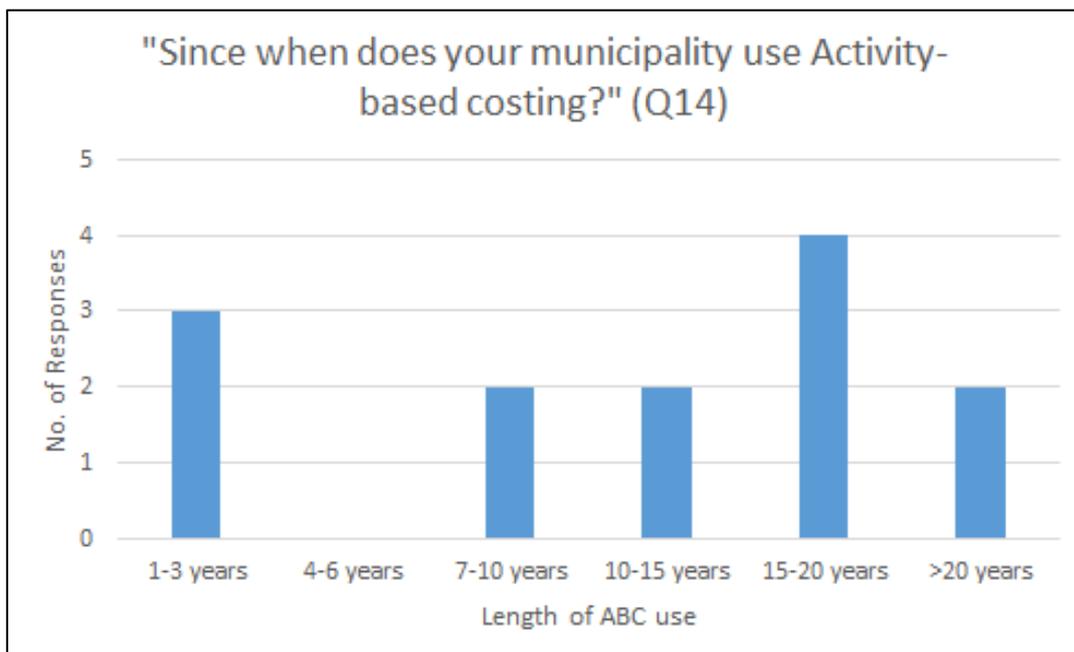


Figure 8: History of ABC use

#### 4.1.2 Purpose of ABC use

Our question concerning the specific use of ABC (Q10, see figure 9) revealed that the most prevalent use (73%) of ABC is related to fee management and transparency purposes. Other purposes which were mentioned in 25% to 44% of the cases are benchmarking purposes with incentive management, asset accounting and benchmarking for information purposes. The only answer which was not given using the pre-determined categories was ‘Statistics’, which can also be seen as related to information purposes. Only three out of 16 respondents report ABC being used for the management of operations in its municipalities.

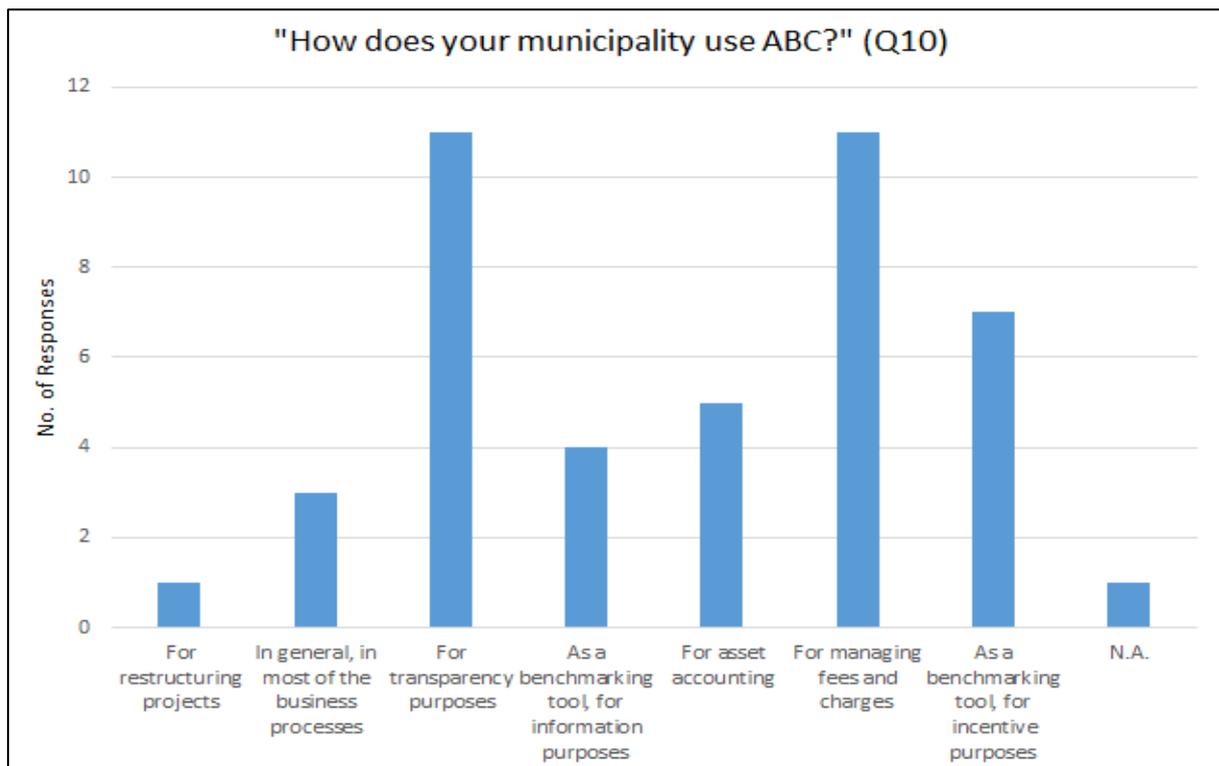


Figure 9: Areas of ABC use

The respondents also gave a clearer picture about the benefits of ABC by evaluating abstract (Q11) and concrete benefits of it (Q12, see figure 10). 15 out of 16 municipalities see better cost management as the main benefit of ABC, achieving an average rank score of 2,94 on a scale up to three. The responses concerning the other two dimensions are more heterogeneous. The importance of ABC in contributing to a better quality management ranks second with an average score of 1,63. Time management ranks third with a score of 1,44.

Among the more concrete benefits of ABC, transparency, better price and fee management and better budget allocations rank highest based on the median Likert scale value. With similar results but showing higher deviations among the respondents rank ‘more economical use of resources’, ‘economic justification of decisions’, ‘performance measurement’ and ‘more accurate financial forecasting’ all having a median equal or above four out of seven. A

rather low rank is given to 'increase in time efficiency/productivity', 'quality assessment of products/services' and 'service improvements for citizens'.

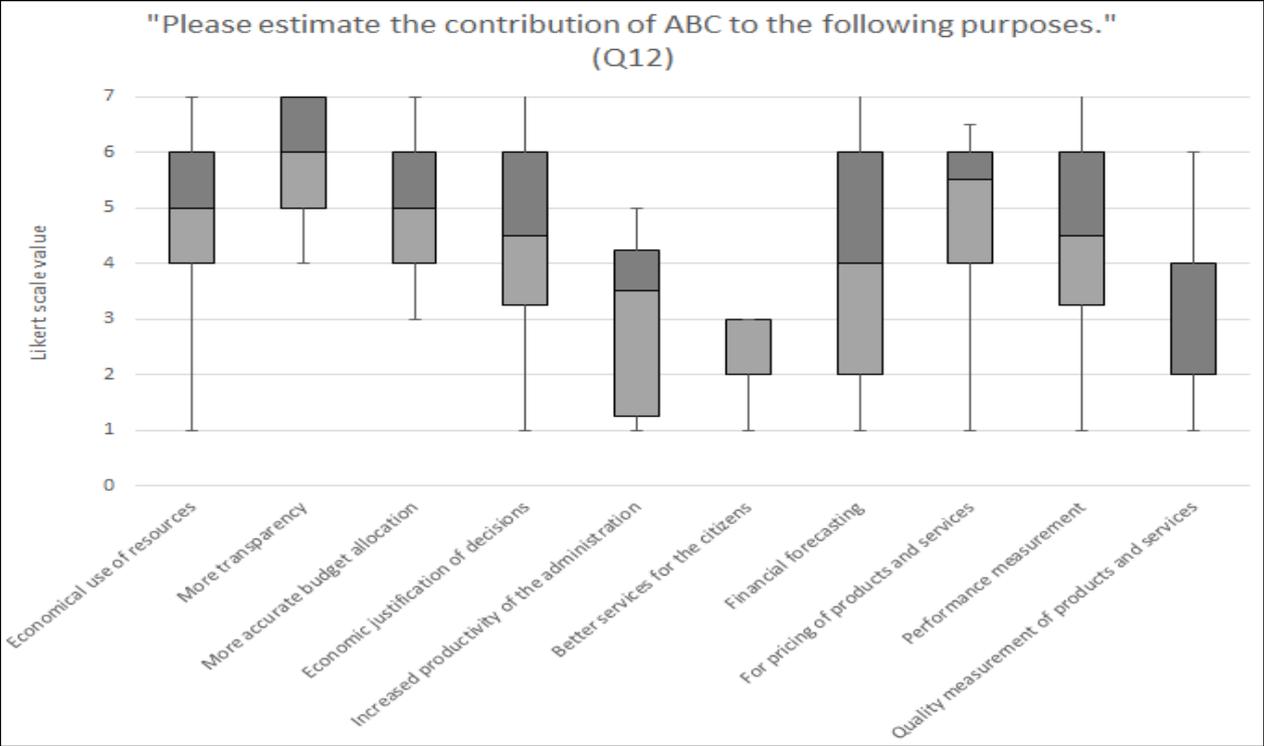


Figure 10: Different purposes of ABC use

### 4.1.3 Opinion about ABC use

13 out of 16 respondents are satisfied (four or more) with the use of ABC in their municipalities (see figure 11). Across the whole sample, slightly more than 50% deem ABC to be reasonable (4 or higher) to be used in public administrations. In particular it can be said that the adopters of ABC deem this management control tool to be more useful to be applied in the public sector than non-adopters.

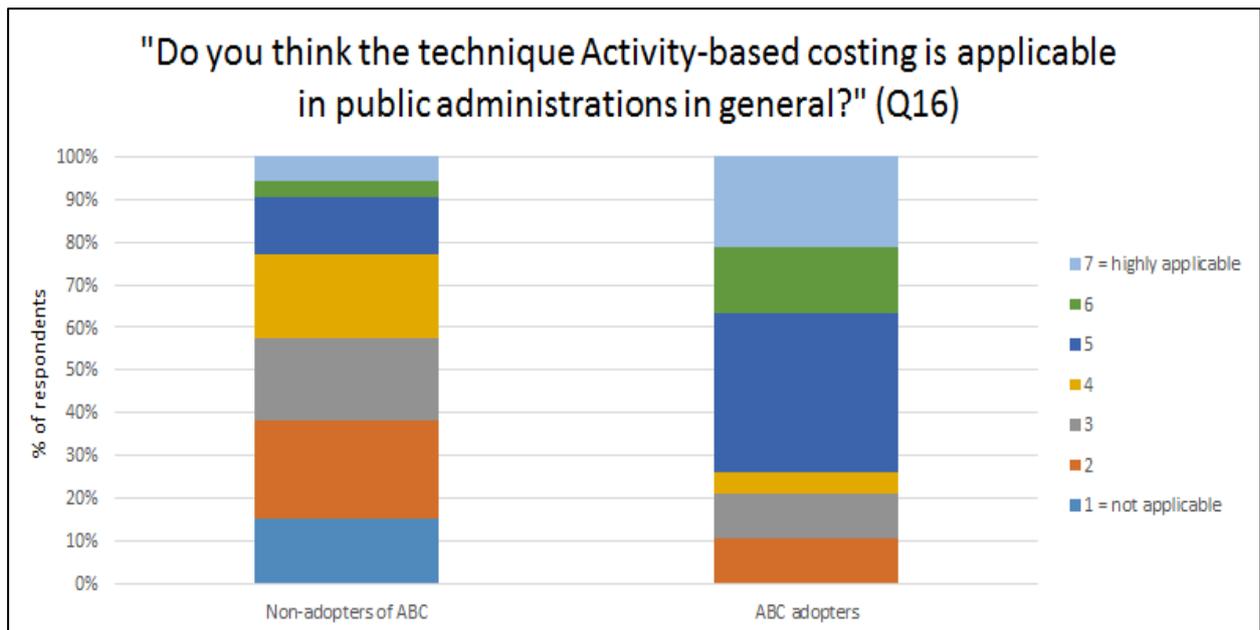


Figure 11: Opinion about usefulness of ABC in public sector in general

The general opinion about the applicability of ABC in the public sector that was found for the adopters is also reflected in the results which were found for Q16 (satisfaction) with two exceptions. The correlation between satisfaction with the use of ABC and the opinion about its applicability is positive and accounts for 0,4. For the adopters it can be noted that the satisfaction with ABC does not remarkably increase with the time elapsed since ABC adoption. Indeed the median satisfaction for recent adopters (1-3 years) of four (out of seven on the Likert scale) is only moderately lower than the value of 4.5 which is found for long-term users (20+ years). However, the dispersion of the satisfaction rating decreases over time.

#### 4.1.4 Regression analysis concerning use of ABC

Further statistical analyses were conducted in SPSS in order to analyse the influences of a set of independent variables on the use of ABC further.

In order to identify first tendencies of relationships among the different contextual variables a correlation matrix was created. Thereby in particular the relationship of the dependent variable *USE\_ABC\_binary* and the independent variables was investigated. As depicted in chapter three, causal relationships and evidence that the variables have an impact on the use of ABC were considered when selecting the set of variables for this correlation matrix.

As table 5 shows, the correlation with the use of ABC is strongest for the variables *Hierarchy\_Opinion* (0,279), *Size\_inhabitants\_coded* (0,186) and *Budget size* (EUR) (0,133).

Correlations									
			SIZE_inhabitants_coded	Budget size (EUR)	BUDGET EXCEED_coded	USE ABC_binary	DOUBLE ENTRY BOOKK	GEO_E_vs_W	Hierarchy_Opinion
Spearman's rho	SIZE_inhabitants_coded	Correlation Coefficient	1,000	.786	,078	,186	,251	,174	-,179
		Sig. (2-tailed)	.	,000	,517	,118	,034	,143	,133
		N	72	72	72	72	72	72	72
Budget size (EUR)	Budget size (EUR)	Correlation Coefficient	.786	1,000	,058	,133	,066	,244	-,160
		Sig. (2-tailed)	,000	.	,630	,264	,581	,039	,179
		N	72	72	72	72	72	72	72
BUDGET EXCEED_coded	BUDGET EXCEED_coded	Correlation Coefficient	,078	,058	1,000	-,033	-,001	-,047	-,029
		Sig. (2-tailed)	,517	,630	.	,786	,990	,697	,807
		N	72	72	72	72	72	72	72
USE ABC_binary	USE ABC_binary	Correlation Coefficient	,186	,133	-,033	1,000	-,179	,047	,279
		Sig. (2-tailed)	,118	,264	,786	.	,132	,697	,017
		N	72	72	72	72	72	72	72
DOUBLE ENTRY BOOKK	DOUBLE ENTRY BOOKK	Correlation Coefficient	,251	,066	-,001	-,179	1,000	,116	-,201
		Sig. (2-tailed)	,034	,581	,990	,132	.	,330	,091
		N	72	72	72	72	72	72	72
GEO_E_vs_W	GEO_E_vs_W	Correlation Coefficient	,174	,244	-,047	,047	,116	1,000	-,091
		Sig. (2-tailed)	,143	,039	,697	,697	,330	.	,447
		N	72	72	72	72	72	72	72
Hierarchy_Opinion	Hierarchy_Opinion	Correlation Coefficient	-,179	-,160	-,029	,279	-,201	-,091	1,000
		Sig. (2-tailed)	,133	,179	,807	,017	,091	,447	.
		N	72	72	72	72	72	72	72

Table 5: Spearman Correlation Matrix - Use of ABC and independent variables

Based on the correlation matrix, the variable *Budget size (EUR)* was excluded due to its high correlation with *SIZE\_inhabitants\_coded* (Rho = 0.786). This high correlation indicates that both variables are measuring similar things. Hence in order to avoid the problem of multicollinearity one of the variables should be excluded (Chen et al., 2003). The fact that *Budget size (EUR)* was chosen to be excluded is related to the higher correlation of the other size-variable, *SIZE\_inhabitants\_coded*, with the dependent variable as well as the fact that *Budget size (EUR)* is likely to contain outliers which may bias the result of the regression analysis (Menard, 2002).

The final logistic regression model is depicted in table 6. The model shows R squares of 0,17 (Cox & Snell) and 0,248 (Nagelkerke) and a significant Hosmer and Lemeshow test indicating the goodness of fit of the model.

Model Summary				Hosmer and Lemeshow Test			
Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square	Step	Chi-square	df	Sig.
1	69,693 <sup>a</sup>	,170	,248	1	9,404	8	,309

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than ,001.

Variables in the Equation									
		B	S.E.	Wald	df	Sig.	Exp(B)	90% C.I. for EXP(B)	
								Lower	Upper
Step 1 <sup>a</sup>	SIZE_inhabitants_coded	1,029	,455	5,103	1	,024	2,797	1,323	5,915
	BUDGETEXCEED_coded	,077	,339	,051	1	,821	1,080	,618	1,887
	DOUBLEENTRYBOOKK	-1,051	,632	2,767	1	,096	,350	,124	,988
	GEO_E_vs_W	,371	,777	,228	1	,633	1,450	,404	5,208
	Hierarchy_Opinion	1,621	,657	6,082	1	,014	5,059	1,716	14,917
	Constant	-3,712	1,557	5,686	1	,017	,024		

a. Variable(s) entered on step 1: SIZE\_inhabitants\_coded, BUDGETEXCEED\_coded, DOUBLEENTRYBOOKK, GEO\_E\_vs\_W, Hierarchy\_Opinion.

Table 6: Extract of SPSS Output - Logistic Regression Analysis on the use of ABC in German municipalities

As the above model's Wald test statistic shows, significant p-values for the variables *Hierarchy\_Opinion* (0,014), *SIZE\_inhabitants\_coded* (0,024), and *DOUBLEENTRYBOOKK* (0,096) can be observed on 10% confidence level. The corresponding 90% confidence intervals cover the ranges of 1,323-5,915 (*SIZE\_inhabitants\_coded*), 0,124-0,988 (*DOUBLEENTRYBOOKK*), and 1,716-14,917 (*Hierarchy\_Opinion*). The significant predictor variables show also the highest coefficients. While *SIZE\_inhabitants\_coded* (1,029; Odds ratio: 2,797) and *Hierarchy\_Opinion* (1,621; Odds ratio: 5,059) both have positive coefficients *DOUBLEENTRYBOOKK* shows a negative coefficient (-1,051; Odds ratio: 0,35).

## 4.2 Categorisation of ABC into iron triangle

In order to compare the answers of Q11 and Q12 concerning the assignment of ABC into the three dimensions time, cost and quality, the Likert scale values from Q12 were transformed to ranks in order to achieve comparable values to the answers in Q11. Thereby the above categorisation which has been tested using Spearman's Rho was kept. Consequently the ranks were assigned based on the average Likert scale value of the groups which are outlined in table 2.

The categorisation of ABC into the iron triangle does not deviate significantly between the concrete (Q12) and the abstract (Q11) question as it can be seen in figure 12.

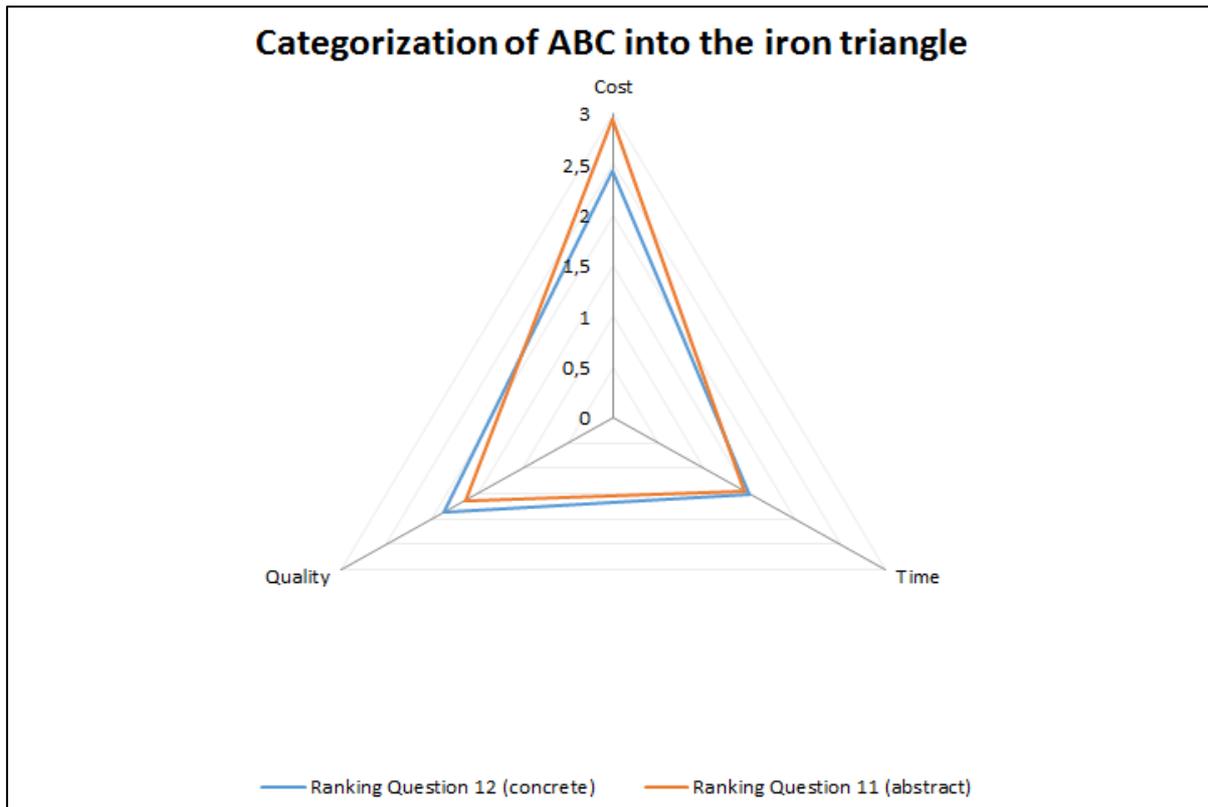


Figure 12: Categorisation of ABC into the iron triangle - ranking of abstract (Q11) and concrete (Q12) benefits

Based on both questions ‘cost’ ranks highest (2,94 in Q11 and 2,43 in Q12) followed by ‘quality’ (1,63 in Q11 and 1,88 in Q12) and ‘time’ (1,44 in Q11 and 1,50 in Q12).

# 5 Analysis

The goal of achieving a reasonable response rate was reached. Indeed a response rate of around 30% as it was achieved in this study can be seen as good compared to other student papers even though it is not considered as acceptable for published papers or in professional business research in general. Nevertheless also some published papers reach even lower response rates (Bryman/Bell, 2011). Further due to their position in the finance department and their relatively long work experience (mostly more than 15 years for the respective municipality), the respondents of municipalities using ABC can be expected to possess good technical knowledge about it. Therefore it is reasonable to assume that their answers to our questionnaire are of a high credibility and quality. So the aim of having as many respondents as possible, having experienced the change from traditional cost accounting to cost and activity accounting by using ABC (see chapter two) was reached to a considerable extent since more than 50% of the respondents work longer in the municipality than ABC is used there.

In order to draw conclusions about the above stated results of the three sub-samples will be considered both separately and combined. Due to the low number of ABC users (16 in total across the three samples) questions relating to the specific use of ABC (Q10-14) will be discussed for all three samples combined.

## 5.1 Categorisation of ABC based on the dimensions of the iron triangle

### 5.1.1 Analysis and interpretation

The results of the conducted survey are compared to the expectations, which were formulated based on the literature review. The benefits of ABC as a costing tool could be expected unambiguously and were confirmed by the results of the study (Exp. 2). The high score on the cost dimension and the gap to the other dimensions speak a very clear language concerning the main benefit of ABC. Although the highest score concerning the concrete use of ABC is attributed to 'transparency' which has been categorized as a quality related characteristic, the overall ranking of the ten chosen items are supporting the findings of Q11 (see figure 12) in general as it is depicted in table 7. All cost-related benefits are taking the ranks two to seven and are therefore clustered together close below the top of the ranking. Also the result of Q10

confirms the importance of ABC for transparency issues. But also other mainly performance- and thereby cost-related categories like Benchmarking and pricing score high. This clear result concerning the cost dimension confirms basically all studies, which were considered in chapter three (e.g. Cooper/Kaplan (1988), Innes et al. (2000), Gering (1999)). Indeed concerning the dimensions quality and time, the findings are more ambiguous. Looking at the plain figures, quality ranks higher than time when taking the average as well as the median. The difference between these two dimensions is not very big, which was somehow anticipated by the inconclusive findings from the literature review, which did not allow for formulating any straightforward expectations. Therefore, the findings imply a somehow equal suitability of ABC for the management of time- and quality-related issues with a slightly higher potential for the quality dimension. That is in line with Byrne et al. (2009), who found time- and quality-related improvements through the implementation of ABC but without a clear ranking

<b>Rank</b>	<b>Item</b>	<b>Dimension</b>	<b>Median</b>	<b>Average (Rank)</b>
1	Transparency	Quality	6	5,94 (1)
2	Better Pricing	Cost	5,5	4,75 (4)
3	Economical use of Resources	Cost	5	4,94 (2)
3	Better Budget Allocation	Cost	5	4,81 (3)
5	Economic Justification of decisions	Cost	4,5	4,31 (5)
5	Performance measurement	Quality	4,5	4,31 (5)
7	More accurate financial forecasts	Cost	4	4,06 (7)
8	Increased time-efficiency	Time	3,5	3,44 (8)
9	Better service quality	Quality	3	2,81 (10)
10	Service quality assessment	Quality	2	3 (9)

Table 7: Ranking ABC benefits based on Q12

### 5.1.2 Adaptation of the framework

The prominent position of the item 'Transparency' appears outstanding compared to the other items which were assigned to the quality dimension. Also it is questionable whether this assignment is suitable (Exp. 1). The importance of transparency can be considered as a result of the NPM discussion. As depicted in chapter three, an essential part of NPM methods is to increase competition either through the opening of the markets of public services or through

the use of benchmarking. Either way, higher transparency is a pre-condition for the implementation of true NPM. Since ABC, coming originally from the private sector, entered public administrations in the course of the NPM discussion, this high ranking of transparency adds on very well to the theoretical discussions of chapter three mentioning real market competition as not often possible for public sector services as many of them are inherent responsibilities of public administration. Hence, quasi-markets must be established as a surrogate. Transparency seems to be one of the essential means in order to create competitive pressure through the possibility to be compared with other municipalities or parts of the public administration (Musil, 2005) and to gain or to lose in legitimacy within the population (OECD, 2001).

Due to the otherness of the item 'Transparency' compared to the other items belonging to the quality dimension, it must be discussed if this result speaks in favour of transparency as an own dimension of management in the public sector context. Since the other three dimensions are still of relevance, the triangular model is expanded to a diamond, as it has been done by other researchers in the past like Shenhar (2012) or Haughey (n.d.). In this case, only Q12 could be evaluated in the same way as it was done for the triangle (blue line in figure 12) in order to form the diamond model for the tool ABC. The transformed data and its illustration result in the following model, shown in figure 13.

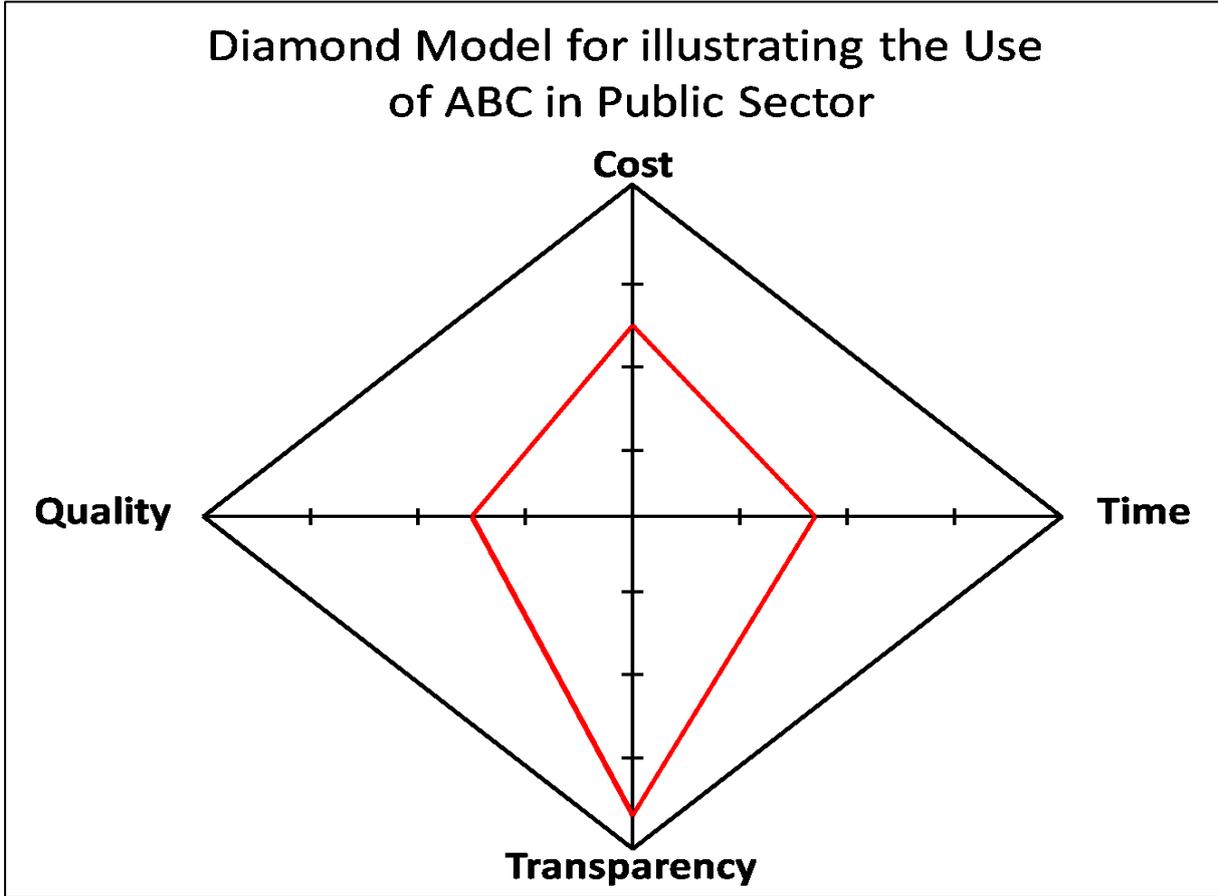


Figure 13: The 'diamond' model for Public Management

Figure 13 shows that according to the new model, ABC is considered as most beneficial for creating and managing transparency in German municipalities (score 3,625 on a scale from zero to four). The cost dimension is still of high importance (2,5) but is not in such a prominent position as in the triangle model. The time dimension now ranks higher than quality, since it was mainly transparency, which increased the score of the quality dimension disproportionately high. However, the difference between time and quality is rather low (1,625 vs. 1,5625).

Another reason may be a different notion of the technique of ABC coming along with translation issues to the word 'Prozesskostenrechnung'. As depicted in chapter three, the German term is interpreted slightly different compared to the English term. One additional association in the German use of the term is linked to transparency. If considering the theoretical explanations however, the English and the German term are both seen as words for the same technique and notion in theory. The analysis of the linguistic use might refer to an existing unconscious practical notion behind it. Nevertheless, there is no obvious and strong evidence that 'Prozesskostenrechnung' is linked to very different characteristics than ABC in a way, which constitutes an explanation for the empirical findings of this study.

## 5.2 Use of ABC in Germany

### 5.2.1 Analysis and interpretation

Compared to the 22% adoption rate of ABC in the German public sector in 2005 (Deutsche Post AG on OpenPR.de, 2005) our study shows a slight increase with 26,4% for all 3 samples combined. According to the prior study ten years ago 30% of the municipalities planned to introduce ABC 'in the near future', so the increase of roughly 4% can be seen as rather low. The reasons for that are difficult to find. The resistance towards change might play a significant role here. The great majority of this study's ABC adopters, in line with the findings by Byrne et al. (2009), are satisfied with its use. And in fact most of those adopters believe that ABC is applicable in public sector organisations in general with two exceptions. These exceptions may relate on one hand to implementation problems in the specific municipality (low score in Q13 and high score in Q16) which the manager believes are due to internal reasons which cannot be transferred to other municipalities. On the other hand civil servants from municipalities scoring high on Q13 and low on Q16 may believe that the municipality was successful in implementing ABC due to characteristics which make it different from other municipalities even though the concept itself is not generally suitable in the public sector. For both cases the abovementioned enablers and challenges for ABC implementation could be causes. Indeed as pointed out in chapter three many of the enabling factors, such as complexity, internal IT infrastructure and resource availability can be seen as related to size. Nevertheless the vast majority of the adopters scored high on both questions (Q13 and Q16).

While the above factors are more likely to be fulfilled in larger organisations, also the downsides, for example the resistance to change, may be stronger in larger organisations. In fact due to the size of a large municipality it can be assumed that the decision-maker(s) may not be the same person or group of people as the implementer(s), whereas in smaller organisations one and the same person or a small team may decide and implement a costing technique. Besides personality and mentality of the civil servants in charge, reluctance to change is likely to be situated mainly on state-level as the decisions to support an ABC adoption are made there. However the fact that we cannot confirm the expectation of finding a higher ABC adoption rate in states with more developed accounting systems is surprising (Exp. 9). It implies that the introduction of ABC is independent from the use of double-entry bookkeeping. This may be explained by the fact that the introduction of double-entry bookkeeping does not seem to be a suitable indicator for the introduction while it is not sure either if it is a suitable proxy for the stage of development of the accounting system in general. This was described in the presentation of the univariate findings as well as in line with the regression analysis. The on 10%-level significant p-value of 0,096 in combination with the negative coefficient (-1,051) shows an opposite effect. Thus municipalities in states which have not implemented double-entry bookkeeping are more likely to use ABC than municipalities in double-entry bookkeeping adopter states. These results may question the approach in Germany regarding double-entry accounting as pre-condition for modern cost and activity accounting (Brandl et al., 2003), which rather supports the line of reasoning of researchers like Meynhardt/Schulze (2010), who consider these two fields as independent of each other on a technical level. However, it seems to be more likely that the self-determination of municipalities gives a better explanation for this phenomenon. Since state-level agencies cannot force municipalities directly to manage their financial issues in a certain way e.g. by using ABC but just express recommendations, the decision is still up to the persons in charge on the municipal level (Baier, 2002). This autonomy is one of the reasons for including the variable *Hierachy\_Opinion* into the regression analysis. The significant p-value of 0,014 (on 10%-level) in connection with the positive coefficient of 1,621 may indicate that high-ranked civil servants with a positive attitude towards ABC increase the likelihood of an implementation. However it has to be interpreted with caution. Due to the influence from the state and due to the influence of other people in the same municipality it remains unclear how much influence a high-ranked finance official can possibly have on the implementation of a costing technique. Further, in line with our argument that the use of ABC biases - or at least increases the opinion about it, the question could be raised whether the positive opinion had been manifested already before the implementation of ABC. Finally the expectation that geography, due to the historical background of Germany being separated into an eastern and a western part, could play a role for the ABC adoption could not be confirmed. Indeed with a p-value of 0,633 this variable is by far not significant on 10%-level. Concerning the generally low adoption rate of ABC (Exp.3) a possible reason might be the absence of well-functioning mechanisms for increasing competitive elements in the public sector. That might be influenced by the fact that the financial situation of Germany has improved in the last five to ten years in general, which might have eased the situation of municipalities as well (see figure 2). Therefore, external and internal pressure on the

municipalities might be too low in order to encourage reforms of the cost and activity accounting system.

As mentioned above size seems to be a very important predictor variable for the use of ABC (Exp.8). This is also supported by the result of the regression analysis, showing a (on 10%-level) significant p-value of 0,024 for the variable `SIZE_inhabitants_coded` together with a positive coefficient of 1,029. This underlines that the municipalities from the large sample use ABC to a considerably higher extent than small and mid-sized municipalities. Since the implementation of ABC causes also costs, it might be considered as not worth in smaller municipalities, in which the budget is lower and potential benefits are not similarly significant. The evaluation of the processes and activities however might not grow proportionally with the size of a municipality, since the product catalogue is quite similar e.g. in citizen centres. Therefore, a large municipality might realize many more benefits with less effort relatively seen compared to smaller municipalities. This high effort, also financially, could be a rationale for smaller municipalities not to consider the implementation of ABC. Another reason for the size-related differences could be a higher degree of education concerning new public management methods within public administrations of large cities. Small and mid-sized cities struggle to find qualified personnel as many qualified individuals rather move to big cities (Astheimer, 2012; Robert-Bosch Foundation, 2009). That might cause skills shortage in the corresponding areas and a higher concentration of skilled public managers in bigger cities. That concerns especially young people, who do not see their future in the rural area where they were born. These young people may have got to know ABC since it was included in their syllabi at the university while elder civil servants may lack this specific knowledge. Therefore, there might be a greater openness towards new public management methods like ABC among this group of younger public managers. This attitude is likely to decide about the implementation of ABC in the cases when the state has principally approved a cost accounting reform. However the results show that there is nearly no difference in the adoption rate of ABC between mid-sized and small municipalities. If the argument of the discussion in this paragraph, which is in line with the findings of Rundora/Selesho (2014), is valid, the problem of migration to the cities might be an equally big problem to both kinds of municipalities (medium and small).

Those municipalities, which use ABC, do it often in order to increase transparency, for fee management- and for benchmarking purposes with the intention to set incentives (based on the answers to Q10) (Exp. 4). The last point is to a certain extent contradicting to the discussion above about the optimization of processes and productivity, which is hard to enforce due to political reasons. In the pre-interviews it was stated, that the data obtained from ABC was claimed not to be used in order to set internal objectives to be reached by the employees but mainly for information purposes. Either this is operated differently across the country or the question was interpreted differently by the respondents. It is remarkable that the three main areas of use in terms of ABC are also ranked very high when it comes to the benefits of ABC (Q12). Transparency, improved price management and performance measurement obtain the highest score from the respondents. That may imply an appropriate use of ABC in German municipalities since the most important areas of use seem to be the most beneficial ones. While it is acknowledged in research that ABC is a suitable tool in line

with restructuring projects (also named: Business Process Redesign/Reengineering) (e.g. Scheer/Nüttgens (2000); Kettinger et al. (1997)) surprisingly less respondents use ABC for restructuring projects. This may be due to the lack of such projects at the time the questionnaire was answered. However in general this result is rather surprising if compared to results of Worrall et al. (1998) who claim the rate of restructuring projects in the public sector to be rather higher in the public than in the private sector. Indeed, respondents who use ABC in restructuring projects may not have ticked the respective box if they use ABC in all their processes as they may have assumed restructuring processes to be included in their answer. Also the purpose-related expectation that ABC is used by municipalities which often exceeded the budget in the past in order to improve their budgeting was not met (p-value of 0,821 indicating insignificance).

It is also interesting that only a small share of municipalities has introduced a municipal-wide ABC approach. Instead, ABC is used for the management of single areas. This finding can be interpreted for confirming a contingency approach for ABC. The suitability of a management control tool might be restricted to certain areas according to the nature of this tool so that a ubiquitous use may not be recommendable. Another quite important area of use of ABC is asset accounting. The information from the pre-interviews reveals that especially the maintenance of buildings is an important topic when speaking about cost reductions. A more efficient use of real estate property is considered as urgent and the calculation of imputed costs was introduced in order to get a more differentiated view on the advantages of owning real estate property. That includes costs like imputed rent or imputed interests. Apart from these elements belonging more to cost object accounting, the process view is taken in terms of maintenance activities like cleaning or maintenance repairs. ABC serves here in order to support make-or-buy decisions. The decision to use ABC in the field of asset accounting is in accordance with theoretical and practice-oriented discussions on the areas of use of ABC (McIvor et al, 1997, Li Tak Ming, n.d., Boissonneault, 1992; CIMA, 2008).

When looking at the date of introduction of ABC it becomes obvious that 50% of the municipalities which use ABC introduced it more than ten years ago. This may explain the slightly higher satisfaction rate since the results show, that the longer ABC was introduced the higher is the satisfaction and the lower becomes the standard deviation of the satisfaction (Exp. 6). These findings are in line with Cagwin/Bouwman (2002) among others, who claim the importance of a long-term use of ABC in order to develop its full potential.

If the data about the date of introduction is stylized according to the hype cycle concept of ABC introduced by Turney (2008), the hype cycle of ABC in municipalities (red curve in figure 14) seems to lag behind that of ABC in private sector (blue) (Exp. 5).

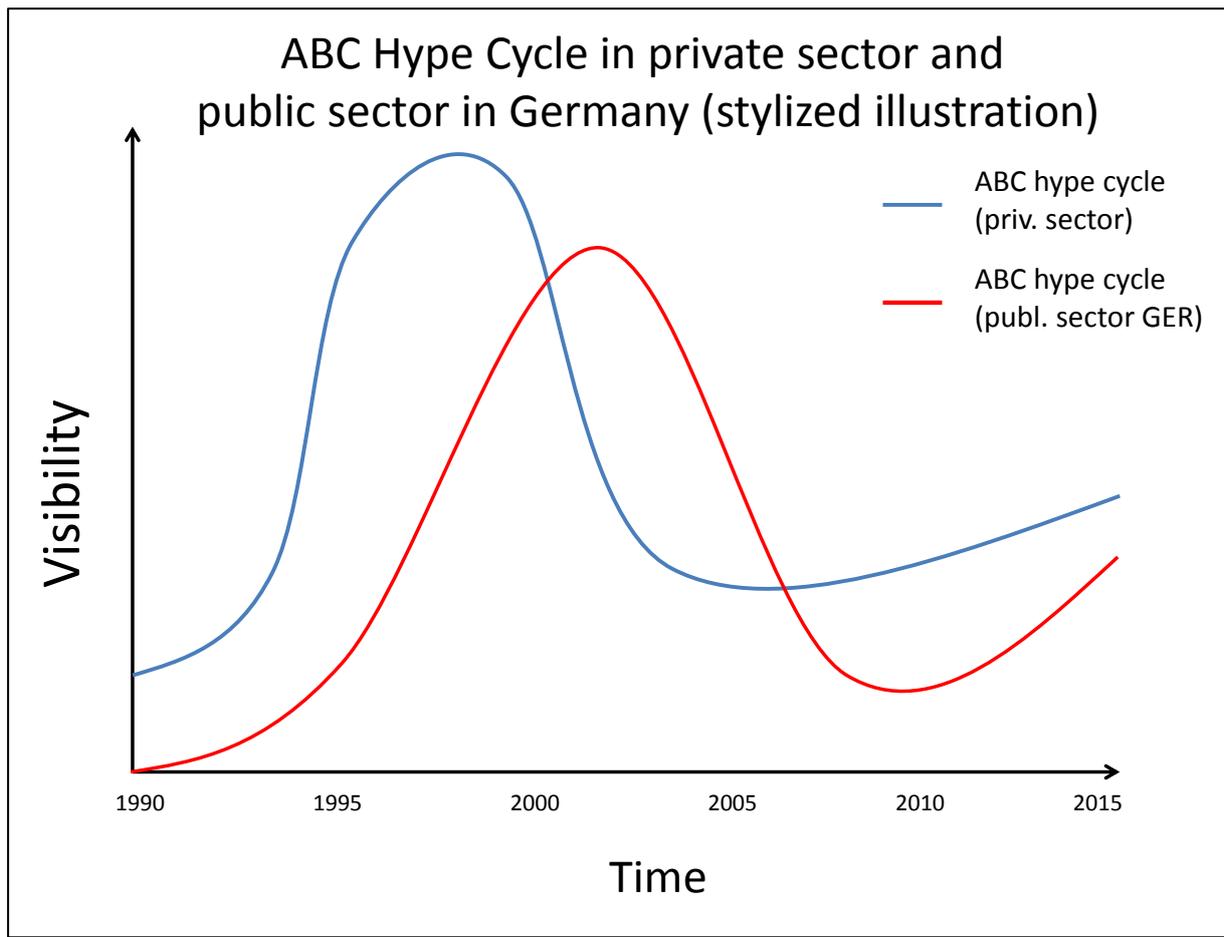


Figure 14: Hype cycle comparison based on ABC adoption in German public sector (own figure based on Turney (2008) and own empirical findings)

The curve for the private sector was assumed to start after the publication of the article series by Cooper/Kaplan (1988). Also the empirical findings on the adoption rate of ABC in the private sector over time were considered (e.g. Innes et al., 2000). The assumed lag of the public sector curve is underlined by the fact that many of the above cited private sector studies reported similar adoption rates compared to our 26,4% around 10 to 15 years ago while slightly lower rates were found around 20 years ago in the private sector. Despite the suitability of this reasoning it has to be kept in mind however that most of the studies were made under completely different conditions in completely different contexts and their comparability with our study is therefore very limited. Moreover the adoption rate in Germany is significantly lower than in other public sector contexts (e.g. UK). That makes the hype cycle logic only applicable for a smaller part of the overall population than in other contexts. Nevertheless our sample gives hints that for the last three years more municipalities started to adopt ABC compared to the 6 years before which is again in line with the shape of the typical hype cycle curve. In addition, the stylized hype cycle of ABC adoption in German municipalities based on the results of our study shows the peak around the year 2001. That implies that ABC was still very popular in 2005, to our knowledge the year of the last study on ABC in German municipalities, which led to the fact that many municipalities aimed at the

introduction of ABC. When the hype cooled down, the motivation and thereby the efforts decreased. That implies the risk, that an actual suitable tool for the management of crucial dimensions in the public sector was not considered any longer due to a decrease in popularity of the corresponding tool. Therefore, this study displays the potential of this tool to other municipalities which refused to implement ABC through the evaluation of the benefits of ABC by those which adopted it. By doing so, this study makes an argument for a purpose-oriented use of management control tools rather than for a trend-driven use as implied in the hype cycle.

The fact that no ABC-abandoners were found while some of the municipalities have been using the tool for more than 20 years as well as the recent increase in ABC use imply that the tool is suitable for the context at least to some extent. Indeed the respondents largely confirm the usefulness of ABC (Exp. 7). 81,25% of the ABC adopters are satisfied (four or above on the seven-point Likert scale) with the use of ABC in their municipality. This is also reflected in their general opinion about the applicability of ABC in the public sector. In contrast, non-adopters are more critical towards the use of ABC in the public sector. Only 42,3% support (four or above on the seven-point Likert scale) the use of ABC in the public sector. Nevertheless no abandoners of ABC were part of our sample which indicates that, once implemented, ABC is kept with rather high satisfaction. It can only be speculated about the causes of this result. It is for example thinkable that municipalities which are satisfied with the use of ABC infer from themselves to others and expect ABC to be applicable in general even though it may not be the case. Also it is thinkable that the satisfaction and the positive opinion of the ABC adopters is subject to their own bias, justifying their decision to use ABC. Since it is only partly their own decision a bad opinion about the ABC use could also be caused by a general disagreement with the state decisions or it may be caused through individual implementation problems. The negative opinion of the non-adopters could on one hand be due to a comprehensive analysis of the tool which came to the conclusion that the tool is not suitable in their case. It might also be traced back to the lack of popularity of ABC as indicated by its current position in the hype cycle. Nevertheless it is also thinkable that a general resistance to change or lacking knowledge and awareness of the tool caused this attitude as pointed out by Rundora/Selesho (2014), who see especially lacking knowledge as reason for a negative attitude about ABC and for the existence of implementation barriers. Interesting are the two cases, in which ABC was implemented but scored lower than four concerning the satisfaction with its use. Although no details about these single cases are known to us, it can be possibly explained by the findings of Argyris/Kaplan (1994) and Malmi (1997) mentioning an ongoing internal resistance to a new costing management and implementation of new systems mainly due to a lack of knowledge. Generally, the findings are in line with the ones of Innes et al. (2000) which show a significantly more positive attitude of users compared to non-users. The share of more than 40% of non-adopter respondents with a positive attitude towards the use of ABC in the public sector may but does not necessarily indicate a further raise of the adoption rate in German municipalities due to the complexity of the implementation-related political processes (Rainey/Fernandez, 2013).

## 5.3 Limitations

As already state above especially with regards to the chosen method of a web-based self-completion questionnaire, the achieved response rate is seen as acceptable. Nevertheless one has to be aware of the limitations which come along with the around 70% non-respondents. It is impossible to prove that these members of the sample do not differ concerning the relevant attributes when compared to the respondents which is a limitation to the findings in general. Indeed we got the impression that among the deniers are rather non-users than users of ABC, which is backed by several email responses which we received saying that the municipality does not apply ABC and therefore sees no point in completing the questionnaire. Despite our reply to such emails that, for us, non-users are as important to complete the questionnaire as users, not all of them completed the questionnaire in the end. Also technical issues and local regulations may have played a role. In fact responses have shown that the link to the google form could not be opened by all respondents. Whether the attached word document reached all recipients through their firewalls is questionable as well.

Another limitation of this research approach and both frameworks that were used is that they allow for a categorisation of tools only based on their strengths. However it is thinkable that aspects of a tool are not only supporting or not affecting the fulfilment of the management goals in a specific dimension. In fact it may also be that the use of a tool negatively affects the goal fulfilment in a dimension. These potential goal conflicts are not considered when following the approach of categorisation which has been chosen in this thesis. On the other hand, we would expect that such goal conflicts would be represented in the overall opinion of the respondents about ABC as long as they concern important core areas of public administration in which a lack of suitability of a management tool would be noticed directly. For areas of low importance but suffering under the use of ABC, the cost-benefit relation might still be positive in total since ABC may provide benefits to the more important activities within the municipality. However in areas which are not paid so much attention to but still are of importance, the disadvantages of ABC will not be captured by the approach of this study.

The mentioned categories as well as other choices that were made by respondents in Q10 can be understood in different ways. Therefore the result of Q10 also shows the diversity of applications for which ABC is suitable. The list of areas of use will be naturally incomplete but as only one respondent added an item ('Statistics'), it must be assumed that the variety of options provided was sufficient for this kind of study.

Some assumptions are furthermore based on own interpretations. Especially the categorisation of responses above four as supportive or satisfied concerning the application of ABC does not necessarily need to be congruent with the respondents' notion about the scale.

As mentioned above, the response sample might be positively biased towards the use of ABC, so that the real adoption rate is actually lower than the findings suggest. In terms of the three single sub-samples (large, medium, small), it deemed to be not very sensible to make inter-

group analyses since the sub-sample sizes were very small (nine, six and four observations). That is why the focus was directed to a full-sample analysis.

Finally the choice to apply a logistic regression for the multivariate analysis concerning the use of ABC makes this study subject to the general limitation that statistical significance for predictor variables may be observed despite a missing causal relationship (Foster et al., 2006). This is suspected to be particularly relevant in the case of the variable *Hierarchy\_Opinion* which is found as significant predictor variable for the Use of ABC. From former studies it is known that users of ABC are likely to have a more positive opinion about the tool than non-users (Byrne et al., 2009). This implies that a high opinion comes rather with the use of ABC and does not cause the adoption of the tool. Despite the empirical evidence showing the opposite, the causal relationship of *Hierarchy\_Opinion* predicting *USE\_ABC\_binary* is thinkable but can neither be confirmed nor denied based on our analysis.

## 5.4 Critical reflection

### 5.4.1 A Framework for the classification of management control tools

The results presented and the analysis and interpretation must be complemented by a comprehensive discussion of the issues and circumstances which limit these results and the plain analysis.

One main methodological constraint is the assignment of the answers in Q12 to the cost, time, and quality dimension. The conceptions about what belongs to the single dimensions might differ between the researchers and the respondents of the survey. Especially the fact that not all respondents may understand the suggestions in the same way makes the findings hard to interpret. That might apply first and foremost the item ‘transparency’. From the pre-interviews, it was known to be an important item and out of the three categories, it fits best to the quality dimension according to our opinion. However, if the respondents would link transparency in the same way directly to it might be questioned. That limits the results concerning this item and was tried to be considered by developing the diamond model.

In the same way, the notion of time and quality might differ in the public sector context from the one in private sector. The main determinant of quality concerning public sector services could be a quick processing of the requests as the scope of the service is normally very clear defined without much space for deviations (e.g. new ID). However, in order to clarify this issue a customer survey among the citizens would be necessary. That is why the results concerning these two dimensions must be regarded by keeping this limitation in mind.

Concerning the concrete results, the first and most important limitation is the public sector context, in which the survey was conducted. The pre-interviews allowed greater insights into the daily business in public management. These insights provide several hints that a similar survey within the private sector could lead to different results than those received from public sector. One of them is the management of the time dimension as being encumbered by the

political situation and also by the organisational culture, which is prevalent in the public sector (Baier, 2002). It was confirmed to us that the evaluation of lead times for processes was performed during the implementation phase of the cost and activity accounting reform, which resembles the approach of TD-ABC. However, their use for improving time-related issues and productivity through process optimization turned out to be very difficult. A main obstacle was the resistance to change by the unions of civil servants, which feared private sector management methods getting a bigger role in public sector. That is in line with the report by Kinder (2005). Also the political situation was claimed to be an important factor because unpopular reforms in the public sector affect the popularity of the politicians in charge. Since the reform endeavours in the course of the introduction of ABC were already considered to be rather exceptional, the full deployment of it was not aimed at in the first step in order to avoid further disturbances. The result is, that the full potential of ABC will be most likely not be used in municipalities especially concerning the time dimension. Therefore it is problematic to draw conclusions beyond the public sector context.

Another important factor is the different set of dominant priorities in the public sector. Although an increasing profit awareness can be noticed since the rise of NPM which may be a decent approximation to the mind-set of private sector organisations, this attitude is certainly not as developed as in the private sector (Rkein/Andrew, 2012). On the other hand, there are characteristics, which are very important in public sector not being considered much or even avoided in the private sector. One example is certainly transparency. Indeed a considerable part of the legitimacy of democratic governments and administrations is to be transparent to the citizens (Curtin/Meijer, 2006). There is also an increasing demand for transparent information from the public in order to hold governments accountable for their actions (Michalski et al., 2001). This trend has also reached the private sector, considering debates about e.g. corporate social responsibility but it still is in its infancy compared to the public sector (Kowalczyk-Hoyer, n.d.). That might be influenced by the fact that transparency in private companies is often seen as a revelation of competitive advantages to the competitors in the market, motivating imitation of it and thereby making the business unviable for a transparent company (Barney, 1991). This existential problem is not part of the public sector culture. Instead, transparency has a big potential to increase the trust of the citizens in the current administration (OECD, 2001). That might be the reason why transparency takes an outstanding position in the results of the survey being ranked as most important benefit of ABC. That will be most likely be different in private sector organisations. Instead, a private company might not encounter the challenges which prohibit often the management of the time dimension when using ABC in public sector organisations. Presupposed that the changes are made in favour of a better corporate performance, members of private sector organisations show a lower resistance to change due to a generally higher working autonomy (Pomazalova, 2013). These circumstances could constitute a shift in the ranking of the time and quality dimension if the survey were conducted in the private sector.

In order to capture the importance of the item 'Transparency', the diamond model with transparency as own dimension was created. That should adjust the averages towards more correct results especially concerning the quality dimension, of which the score was determined by the item 'Transparency' to a considerable extent. However, considering the results of the diamond model, the higher appropriateness of them must be questioned. The

fact that quality ranks lower than time in the new model does not necessarily speak in favour of these results. In the course of this thesis, it became clear through the pre-interviews and through literature review, that the time dimension is not very much paid attention to in public sector operations. On the other hand, the difference between these two dimensions is not very high; therefore it is probably too strict to draw major conclusions from that especially keeping the discussion in mind about time as a possible determinant of the quality dimension.

The triangle as our chosen framework can also be seen as a limitation. It has been mentioned earlier that Neely et al. (1995) also consider flexibility as a fourth dimension of management objectives and also rather different ideas can be found. For example Shenhar et al. (1997) conclude efficiency, impact on customer, direct project and business success, and future outlook as relevant dimensions. The diversity of approaches questions whether the chosen one is really the most valid and most appropriate one. Indeed even the application of contingency theory as underlying concept for the creation of the triangle can be criticized. The recommendation that an organisation must try to fit its contingencies is partly considered as not very sensible. If an organisation identifies its contingencies, it will take some time to adapt management style, management control etc. to these contingencies. Once this adaptation is done, the contingencies might have changed since it is inherent to contingencies that they change and evolve during time. Therefore, the chase for an appropriate contingency fit might be an endless one (Donaldson, 2001). However, not all contingencies are changing in such a high pace. For instance the business industry should not change in short-term time ranges. In the same way, the use of certain management control tools should not be a short-term decision since the full potential of such a tool will never be exploited within a short timeframe as previous studies have shown (Cagwin/Bouwman (2002). According to our opinion, the determinants of the suitability of certain management control tools are not changing that quickly that a reaction to them is impossible. That implies that at least a quasi-fit of contingencies and management control tools is regarded as possible to achieve (Donaldson, 2001). Therefore, a framework about management control tools like ABC is not as exposed to this kind of critique as stated in classic argumentations against contingency theory.

#### 5.4.2 Use of ABC in Germany

First of all, this study does not allow any generalizations on the state of ABC adoption in Germany since the sample is not representative. It just provides some insights about a specific excerpt of German municipalities. In addition the non-response bias has to be considered (Armstrong/Overton, 1977). While no specific data collection or test in this respect has been done, the email responses gathered from civil servants replying to our email without answering the questionnaire serve as evidence for the fact that in particular those municipalities were attracted to fill out the survey, which are applying ABC in some way. Indeed we got replies from several civil servants saying that they will not participate since they do not use ABC. Some of them did not fill out the survey despite our reply emphasizing the importance of their inputs regardless of their use of ABC. Further email replies were gathered saying that the survey was not going to be completed due to time reasons or political

regulation not allowing participation, these points however do not seem to imply any systematic bias which affect our results.

Moreover, the findings of our study are subject to the methodological limitations, which have been discussed in chapter two and which might result in distorted findings. Especially the interpretation of certain terms affects directly the answer of the respondents. In the centre of this study is the term ABC itself. It is not possible to ensure if the respondents have the same notion of it as we do although it was tried to do so by including a prefix to the questionnaire. In particular the danger to confound ABC and cost object accounting exists. This would affect other questions e.g. the duration of use of ABC, which would be probably much longer in the latter case than in the first one. Additionally in these cases, the statements about areas of application of ABC might be distorted as well. Concerning this question, the distinction between benchmarking for information purposes and benchmarking for incentive/management purposes might not be clear for everyone and especially for respondents not belonging to upper management levels.

The question about concrete benefits of ABC application is a very crucial one because it constitutes most of the findings on the use of ABC use Germany. There is a risk that not all relevant benefits of ABC in the public sector are included due to a lack of information. Although, previous literature review and pre-interviews shall have reduced the risk and also the findings seem to be quite consistent and not pointing at a huge omission here, the risk of incompleteness of available responses must be regarded.

Also the results of the logistic regression must be analysed carefully. Especially the wide range of confidence intervals even on a 10%-significance level limits the explanatory power of it. Therefore, these results might rather constitute a ranking among the investigated factors, making it possible to identify more and less important determinants for the use of ABC. However, they may not give a very exact mathematical evaluation of the contribution of every factor. That is why there is still a high degree of complexity in this field, which could only partly illuminated by this study.

In terms of analysis and interpretation it must be said, that the setup of the former study from 2005 about the use of ABC in Germany is unknown to us. So, just the results can be compared without knowing the circumstances under which the data was gathered. That makes it problematic to create a valid analysis since the other study could be much more encompassing but also much more selective than our study. Also the way how the data was gathered might be of importance, since the design of a survey is definitely affecting the results. Therefore in order to achieve a better comparability, it would have been necessary to know the approach of the former study and to replicate it, which is not the case and not the intention of our study but limits on the other hand the possibility to compare it to the other.

The results of the study with the highest explanatory power concerning the use of ABC in Germany are those concerning large municipalities since a complete survey was performed only for this group but not for the others

## 5.5 Implications for practitioners

This study was performed in order to develop not only a theoretical framework but also a guideline, which can be used in practice. Starting with the implications for public managers, the diamond model indicates the benefits, which can likely be expected to be realised through the use of ABC in any municipality. In case that a municipality struggles with topics like transparency or cost management, ABC should be taken on the shortlist of solutions, which are considered in order to address these problems. If quality management or time-efficiency are the crucial problems, other tools should probably be looked for, which have their particular strengths in these areas of public management. That also gives an impression about the sensibility of such a framework as a tool for managers. In case that this approach spreads and more management control tools are being classified in this or a similar way, managers could look for a suitable tool in a much more efficient way, having clear and simple classifications stemming from resilient data based on their colleagues' experiences.

In the same way as the triangle model was not really suitable for the public sector context, the diamond model on the other hand is not fitting very well into the private sector context. Especially the importance of transparency cannot be assumed as given when changing the context (Kowalczyk-Hoyer, n.d.). Therefore, the implications for managers of private companies are not as clear. However comparing the two models and their results in this study, the classification of ABC into the triangle framework might be more sensible to be used by private managers in terms of information quality as this framework fits better to the priorities in the private sector context than the diamond model. The results concerning the triangle framework might still give a rough direction, however it must be considered that this framework needs a test in a private sector context because especially the ranking of time and quality is likely expected to change. This is based on the abovementioned lower importance of transparency which would decrease the score of quality as well as the likely higher relevance of time which is backed by the emergence of TD-ABC as mentioned in chapter three.

None of these frameworks however can and will ever perform the identification of the needs of the organisations looking out for suitable management control tools. It is still the task of the managers to identify the directions, into which steps must be taken in order to achieve the targets of the organisations. Once this is done, such frameworks can provide guidance in the selection process of appropriate management control tools.

## 5.6 Contributions to the research area and directions for future research

This thesis contributes to the management control literature that a new way of dealing with management control tools is theoretically justified and tested empirically for suitability on the basis of the results. The way consists in merging those two fairly old approaches, the iron

triangle and ABC. With respect to the use of the iron triangle for the categorisation of management control tools this thesis sets a starting point in the management control literature for future categorisations of other tools. The empirical results of this study appear to be usable so that a categorisation into the three dimensions can be considered as principally sensible. In order to take account of several weaknesses identified, the original triangle framework was extended to a public sector-specific diamond model in order to take the contextual factors of the public sector better into account. The limitations of the method and of the questionnaire in particular were discussed extensively. Therefore, this thesis can be used as guidance for future research projects of a similar nature.

This thesis provides a quantitative classification of ABC within the three dimensions, cost, time and quality and into the diamond model with the additional dimension transparency. Both confirm the strong role of ABC as a tool for cost control. Furthermore, it highlights the potential of ABC to contribute to a better quality and time management as displayed in the still moderate score for the time dimension. Therefore it can be said, that ABC is a quite universal management control tool with a particular strength in cost management. The particular importance of transparency in the public sector considering the discussion about gaining legitimacy by public administrations among the citizens was highlighted through the extension of the model and the enormously high ranking of transparency in it, even higher than cost. That enhances the theoretical discussions about the crucial role of transparency for the future way of public governance by empirical results.

Further this thesis follows up on the empirical research about the use of ABC and the different conditions which serve as contextual factors and influence the outcome. Specifically the result of this study concerning the use of ABC in the German public sector updates the research in this field. That accounts in particular for large cities, whereas the overall sample does not provide the opportunity to make any generalizations. Size as an important contextual variable for the use of ABC was confirmed. However, considering the inconclusive findings about the other influential factors, further research on the determinants of use of ABC would be an important future contribution to the research area. Our experiences from the pre-interviews speak in favour of a qualitative approach using case studies for this purpose, since the gathering of information about the historical reasons of ABC implementation was very easy but were not suitable for supporting a quantitative approach in this respect. As ABC is seen as a rather modern management control tool, the findings of this thesis also touch upon the topic of NPM in Germany in general. Indeed the findings about the use of ABC can be compared to Jackson/Lapsley's (2003) study in Scotland and the study by Baird (2007) in Australia showing that the German public sector is still lagging behind in the use of modern accounting techniques compared to the NPM pioneers from the Anglo-Saxon countries. However not in all areas the development of NPM in Germany seems to be underdeveloped. For example the focus on transparency, which was found to be very strong in the German public sector, is also seen as an element of good governance in general and NPM in particular (Larbi (UNRISD), 1999). And finally also the fact that performance measurement is one of the main areas of application of ABC in Germany as well as the reported importance of ABC as a benchmarking tool are in line with the discussion around increasing competition in the public sector as a sign of NPM development (Reichard, 1998; Musil, 2005; Brede, 2005).

In general it can be suggested that also in German public sector the development of the adoption rate over time resembles the hype cycle concept of Rayner et al., (2005) or Turney (2008) albeit on a smaller scale if looking at the adoption rate. Therefore for those municipalities applying ABC, a rather trend-driven use of management control tools instead of a purpose-oriented decision for or against one of them can be assumed. As this confirms the need for more objectivised decisions in the field of management control, the relevance of this thesis is confirmed also with respect to the public sector.

Due to the limits of this research project the categorisation of management control tools other than ABC based on time, cost and quality could not be tested. Further research trying to classify other tools like TC into this framework would be interesting especially also in order to allow for further testing of the framework. A similar research about ABC but in private sector would be of interest as well in order to see if and how ABC would be placed into the triangle in this context. That would also give further insights into the suitability of the triangle framework, which still might be better applicable in public sector than the diamond developed in this thesis. In order to find out more about the explanatory power of this study, research done upon the notion of quality among public managers and among the citizens as customer of citizen centres would add on to the statements made in this thesis and making a quantitative approach more feasible by reducing the space of interpretation, which was encountered in this thesis.

Furthermore, other frameworks with the same purpose of classification of management control tools could be tested in order to make comparisons with the triangle about the suitability of them possible. That would possibly increase further the knowledge about management control tools and its practical implications for managers, which is the essential research area of this thesis.

## 6 Conclusion

By using experiences from the public sector in Germany with the use of the tool ABC, this thesis tested the iron triangle as a framework for the analysis of management control tools. This tri-dimensional framework with the dimensions cost, time and quality was found not to suffice for this categorisation. Indeed the item transparency, which was found particularly relevant in the context of German municipalities, could not be validly and satisfactorily assigned to one of the given dimensions. Therefore in the public sector context, the diamond model as developed in this thesis can be seen as a more suitable solution than the triangle for the categorisation of management control tools. Although the ranking of time and quality does not seem to be of superior quality when applying it, the illustration of transparency as own dimension adds value to the framework in this context.

Besides the outstanding importance of transparency which was not acknowledged when applying the triangle, the results do not differ much between the triangle and the diamond. It is confirmed that ABC is generally considered to be very beneficial for the management of costs. But also the quality of the management and services provided and the time-efficiency of the organisation are seen as moderately improved through the use of ABC in both models. The ranking in general and the rather low rank of the time dimension in particular may be a result of the public sector context in which the study was conducted.

Concerning the conclusions on the public sector context, the influential factors for the use of ABC remain rather unclear. Only for size sufficiently clear and reasonable evidence could be found that the use of ABC is dependent on it to a considerable extent. Furthermore, transparency seems to be an important motive of action within the public sector. That might be a result of the discussion about NPM and the need for benchmarking and competition in the public sector. Also the other benefits of ABC mentioned by the respondents are well in line with the aims of NPM in general. In the course of this study we also touched upon the topic of the deviation of ABC use over time which remains an interesting topic for future research. If looking at the adoption rate of ABC as a proxy for NPM however, a strong positive stance towards NPM methods in German municipalities could not be revealed by this study. Nevertheless hype cycle tendencies were found also in the German public sector.

The field of management control tools is of particular interest for the practical management of an organisation. It is of utmost importance to move away from a trend-driven use of management control tools towards a deeper analysis of their specific benefits for the individual organisation in specific situations. Especially in this rapidly changing business environment nowadays, the ability of performing such an analysis adequately and efficiently is of paramount importance. This thesis has set a starting point in suggesting a framework for this kind of analysis. It will be of interest also for further research to observe the development and to reveal potential benefits of a more purpose-oriented use of management control tools in contrast to the prevalent trend-driven use of them.

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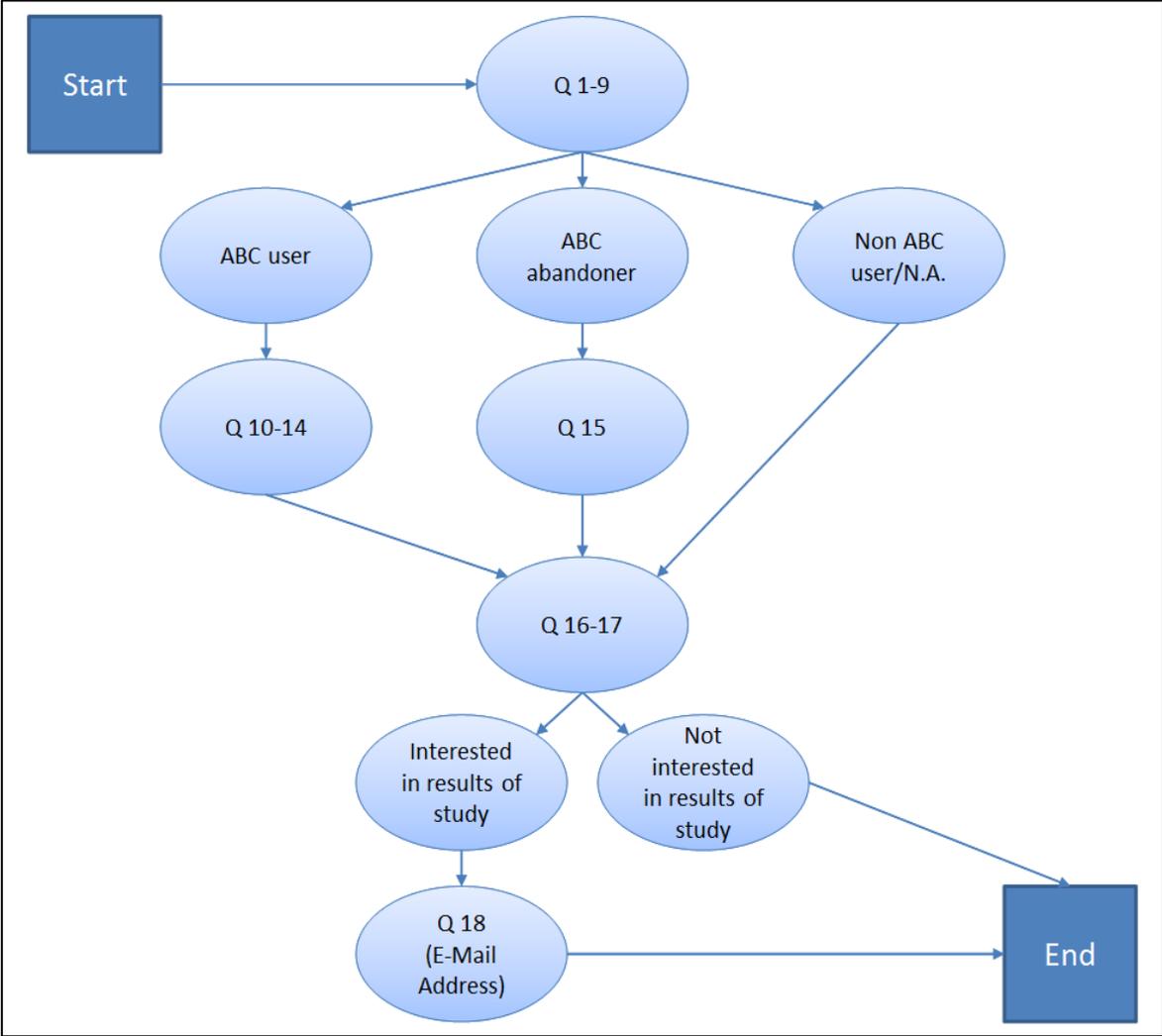
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# Appendix A – Flowchart questionnaire fill-in



# Appendix B – Questionnaire English

## Questionnaire: Activity-based costing in German municipalities

Advice before answering the questionnaire:

- With Activity-based costing (ABC) we mean a version of complete costing which is characterized by the assignment of direct and indirect costs to activities/processes based on their actual resource consumption. Example for a process: The application processing for identity cards. If your municipality applies cost center accounting/cost unit accounting without the inclusion of process oriented allocation of costs in line with the resource consumption of products or activities you should choose the option "No..." in the question concerning the use of ABC.
- The term [municipality] is used for the political and administrative unit for which you work.
- All questions relate, if not explicitly stated otherwise, to the municipality for which you work and your role as an employee of this municipality.

[Continue »](#)

## A: Questions concerning the organization (municipality)

Progress: 0%

### 1. Which municipality do you work for? \*

We need this information in order to match your response to match your response with other attributes (e.g. Bundesland) which we are not asking for in this questionnaire.

### 2. Please provide the postal code of your municipality. \*

We need this information in order to match your response to match your response with other attributes (e.g. Bundesland) which we are not asking for in this questionnaire.

### 3. How many inhabitants does your municipality have? \*

- <20'000
- 20'000-100'000
- >100'000

### 4. What is the approximate annual budget of your municipality? \*

in EUR

### 5. How often did your municipality exceed the annual budget in the last 10 years? \*

- Never
- 1-3 times
- 4-6 times
- 7-10 times
- I don't want to/can't answer this question.

« Back

Continue »

# Questionnaire: Activity-based costing in German municipalities

\* Required

## B: Characteristics of the respondent

Progress: 29%

### 6. On which hierarchical level do you work? \*

- Top management (lead of municipality)
- Middle Management (lead of sector)
- Lower Management (Project leader)
- Employee without managerial responsibilities
- I don't want to/can't answer this question.

### 7. In which segment of the municipality do you work? \*

- Construction, Traffic
- Education, Social issues
- Finance
- Administration/Secretary
- Justice
- I don't want to/can't answer this question.
- Other:

### 8. How long have you been working for this municipality? \*

- less than 1 year
- 1-5 years
- 5-10 years
- 10-15 years
- more than 15 years
- I don't want to/can't answer this question.

[« Back](#)

[Continue »](#)

# Questionnaire: Activity-based costing in German municipalities

\* Required

## C: Use of Activity Based Costing

Progress: 47%

### 9. Does your municipality use ABC? \*

- Yes, throughout the organization.
- Yes, in some of the units.
- Yes, only for projects.
- Not any more
- No (has never been used)
- I don't want to/can't answer this question.

« Back

Continue »

# Questionnaire: Activity-based costing in German municipalities

\* Required

## D: Specific use of Activity Based Costing

Progress: 53%

### 10. How does your municipality use Activity Based Costing? \*

More than one choice possible

- For restructuring projects
- In general, in most of our business processes
- For transparency purposes
- As a benchmarking tool, for information purposes
- For asset accounting
- For managing fees and charges
- As a benchmarking tool, for incentive purposes
- I don't want to/can't answer this question.
- Other:

### 11. Please rank the usefulness of ABC for the following areas. \*

Every value has to be assigned once.

	1 = ABC is least useful	2 = ABC is medium useful	3 = ABC is most useful
cost management	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
time management	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
quality management	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

12. Please estimate the contribution of ABC to the following purposes.\*



	1 = ABC not useful	2	3	4	5	6	10 = ABC very useful
Economical use of resources	<input type="radio"/>						
More transparency	<input type="radio"/>						
More accurate budget allocation	<input type="radio"/>						
Economical justification of decisions	<input type="radio"/>						
Increased productivity of the administration	<input type="radio"/>						
Better service for the citizens	<input type="radio"/>						
Financial forecasting	<input type="radio"/>						
For pricing of products and services	<input type="radio"/>						
Performance measurement	<input type="radio"/>						
Quality measurement of products and services	<input type="radio"/>						

13. How satisfied are you with the application of Activity Based Costing?\*

1 2 3 4 5 6 7

unsatisfied        highly satisfied

14. Since when does your municipality use Activity Based Costing?\*

- Since more than 20 years
- Since 15-20 years
- Since 10-15 years
- Since 7-10 years
- Since 4-6 years
- Since 1-3 years
- I don't want to/can't answer this question.

# Questionnaire: Activity-based costing in German municipalities

\* Required

## E: Former use of Activity Based Costing

Progress: 93%

**15. In case Activity Based Costing was implemented and is no longer used today. For what reason was it abandoned? \***

Several choices possible

- ABC was too complex/expensive.
- We were lacking the expertise for a good application of ABC.
- Political reasons
- I don't want to/can't answer this question.Frage nicht beantworten
- Other:

« Back

Continue »

# Questionnaire: Activity-based costing in German municipalities

\* Required

## F: General opinion concerning the use of ABC in public administration

Progress: 98%

**16. Do you think the technique Activity Based Costing is applicable in public administrations in general? \***

1 2 3 4 5 6 7

Not applicable        Highly applicable

**17. Thank you for your help. We will be glad to send you the results of this survey. Are you interested? \***

- Yes please. (E-Mail address required on the next page)
- No thanks.

« Back

Continue »

# Questionnaire: Activity-based costing in German municipalities

\* Required

## G: Contact information for survey results

Progress: 100%

**18. Please provide your E-Mail address so we can send you the survey results \***

The E-Mail will be sent to you in the beginning of June 2015.

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Submit

*Never submit passwords through Google Forms.*

# Appendix C – Questionnaire German

## Fragebogen zur Anwendung von Prozesskostenrechnung im öffentlichen Bereich

Hinweise zur Beantwortung des Fragebogens:

- Unter Prozesskostenrechnung verstehen wir eine Variante der Vollkostenrechnung. Dabei findet eine verursachungsgerechte Zuordnung von Einzel- und Gemeinkosten (z.B. Administrationskosten) zu einzelnen Aktivitäten/Prozessen statt. Beispiel für einen Prozess: Die Antragsbearbeitung für die Erstellung eines Personalausweises. Falls Ihre Gemeinde Kostenstellen-/Kostenträgerrechnung ohne den Zusatz der prozessgerichteten Verteilung von Gemeinkosten auf Produkte oder Aktivitäten verwendet, ist die Frage nach der Verwendung von Prozesskostenrechnung zu verneinen.

- Die Begriffe Gemeinde/Kommune werden synonym zur Bezeichnung Ihrer politischen Verwaltungseinheit verwendet.

- Alle Fragen beziehen sich, wenn nicht anders im Fragetext vermerkt, auf die Gemeinde bei der Sie arbeiten und Ihre Rolle als Angestellte/r dieser Gemeinde

Weiter »

# Fragebogen zur Anwendung von Prozesskostenrechnung im öffentlichen Bereich

\* Erforderlich

## A: Fragen zur Organisation (Gemeinde)

Fortschritt: 0%

### 1. Bei welcher Gemeinde/Kommune arbeiten Sie? \*

Wir brauchen diese Information um Ihre Antwort später allgemeinen Merkmalen (z.B. Bundesland) zuordnen zu können

### 2. Geben Sie bitte die Postleitzahl Ihrer Gemeinde/Kommune an. \*

Wir brauchen diese Information um Ihre Antwort später allgemeinen Merkmalen (z.B. Bundesland) zuordnen zu können

### 3. Wieviele Einwohner hat die Gemeinde/Kommune bei der Sie arbeiten? \*

- <20'000
- 20'000-100'000
- >100'000

### 4. Wie gross ist das jährliche Budget Ihrer Gemeinde/Kommune etwa? \*

in EUR

### 5. Wie oft wurde in Ihrer Gemeinde/Kommune in den letzten 10 Jahren das Budget überschritten? \*

- Nie
- 1-3 mal
- 4-6 mal
- 7-10 mal
- Ich kann/möchte diese Frage nicht beantworten.

« Zurück

Weiter »

# Fragebogen zur Anwendung von Prozesskostenrechnung im öffentlichen Bereich

\* Erforderlich

## B: Fragen zur beantwortenden Person

Fortschritt: 29%

### 6. Welcher Hierarchiestufe der Organisation sind sie zugehörig? \*

- Top Management (Bereichsleitung...)
- Mittleres Management (Referatsleitung...)
- Unteres Management (Projektleitung...)
- Angestellte ohne Führungs- oder Fachbereichsverantwortung
- Ich kann/möchte diese Frage nicht beantworten.

### 7. In welchem Fachbereich sind Sie tätig? \*

- Bau, Verkehr
- Bildung, Soziales
- Finanzen
- Sekretariat
- Justiz
- Ich kann/möchte diese Frage nicht beantworten.
- Sonstiges:

### 8. Wie lange arbeiten Sie bereits in dieser Kommune/Gemeinde? \*

- weniger als 1 Jahr
- 1-5 Jahre
- 5 - 10 Jahre
- 10 - 15 Jahre
- mehr als 15 Jahre
- Ich kann/möchte diese Frage nicht beantworten.

« Zurück

Weiter »

# Fragebogen zur Anwendung von Prozesskostenrechnung im öffentlichen Bereich

\* Erforderlich

## C: Verwendung von Prozesskostenrechnung

Fortschritt: 47%

### 9. Verwendet Ihre Gemeinde/Kommune bereichsübergreifend oder teilweise Prozesskostenrechnung? \*

- Ja, bereichsübergreifend
- Ja, in einigen Bereichen/Abteilungen
- Ja, nur für Projekte
- Nein, nicht mehr
- Nein (wurde noch nie verwendet)
- Ich kann/möchte diese Frage nicht beantworten.

« Zurück

Weiter »

# Fragebogen zur Anwendung von Prozesskostenrechnung im öffentlichen Bereich

\* Erforderlich

## D: Verwendung von Prozesskostenrechnung in Ihrer Kommune

Fortschritt: 53%

### 10. Für welchen Zweck verwendet Ihre Gemeinde/Kommune Prozesskostenrechnung? \*

Mehr als eine Antwort möglich

- Für Restrukturierungsprojekte
- Zum Management des operativen Betriebs
- Aus Transparenzgründen
- Benchmarking (Leistungsvergleich) zu Informationszwecken
- Anlagenbuchhaltung
- Gebührenmanagement
- Benchmarking (Leistungsvergleich) zu Steuerungszwecken
- Ich kann/möchte diese Frage nicht beantworten.
- Sonstiges:

### 11. Für welchen der folgenden Bereiche ist Prozesskostenrechnung am hilfreichsten, durchschnittlich hilfreich bzw. am wenigsten hilfreich? \*

Jeder Wert muss genau ein Mal vergeben werden.

	1 = Prozesskostenrechnung am wenigsten hilfreich	2 = Prozesskostenrechnung mittelmäßig hilfreich	3 = Prozesskostenrechnung am hilfreichsten
Kostenmanagement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Zeitmanagement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Qualitätsmanagement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**12. Bitte schätzen Sie den Beitrag von Prozesskostenrechnung zur Erreichung folgender Ziele in Ihrer Kommune ein. \***

	1 = Prozesskostenrechnung kaum hilfreich	2	3	4	5	6	7 = Prozesskostenrechnung sehr hilfreich
Sparsamerer Umgang mit Ressourcen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Größere Transparenz	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Genauere Budgetzuteilung	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
bessere Ermöglichung ökonomischer Entscheidungsbegründungen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Erhöhung der Zeiteffizienz/Produktivität der Verwaltung	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Verbesserung des Services für die Bürger	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
genauere Prognose der finanziellen Zukunft	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
exaktere Preissetzung von Produkten und Dienstleistungen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Leistungserfassung/-vergleich	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Erfassung der Qualität von Produkten und Dienstleistungen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**13. Wie zufrieden sind Sie mit der Anwendung der Prozesskostenrechnung in Ihrer Kommune allgemein? \***

1 2 3 4 5 6 7

unzufrieden        sehr zufrieden

**14. Seit wann verwendet Ihre Gemeinde Prozesskostenrechnung? \***

- Seit mehr als 20 Jahren
- Seit 15-20 Jahren
- Seit 10-15 Jahren
- Seit 7-10 Jahren
- Seit 4-6 Jahren
- Seit 1-3 Jahren
- Ich kann/möchte diese Frage nicht beantworten.

« Zurück

Weiter »

# Fragebogen zur Anwendung von Prozesskostenrechnung im öffentlichen Bereich

\* Erforderlich

## E: Ehemalige Verwendung von Prozesskostenrechnung

Fortschritt: 93%

**15. Falls Prozesskostenrechnung in Ihrer Gemeinde eingeführt wurde und heute nicht mehr verwendet wird, aus welchem Grund wurde die Änderung vorgenommen? \***

Mehrere Antworten möglich

- Prozesskostenrechnung war zu aufwändig.
- Uns fehlte die Expertise für eine sinnvolle Umsetzung.
- Politische Gründe
- Ich kann/möchte diese Frage nicht beantworten.
- Sonstiges:

« Zurück

Weiter »

# Fragebogen zur Anwendung von Prozesskostenrechnung im öffentlichen Bereich

\* Erforderlich

## F: Allgemeine Meinung zur Verwendung von Prozesskostenrechnung in Kommunen/Gemeinden

Fortschritt: 98%

16. Für wie sinnvoll halten Sie die Anwendung von Prozesskostenrechnung im öffentlichen Bereich? \*

1 2 3 4 5 6 7

nicht sinnvoll        sehr sinnvoll

17. Vielen Dank für Ihre Hilfe. Gerne lassen wir Ihnen die Resultate unserer Studie nach Abschluss zukommen. Haben Sie Interesse? \*

- Stellen Sie mir bitte Ihre Ergebnisse zu. (Angabe der E-Mailadresse auf der nächsten Seite)
- Nein danke.

« Zurück

Weiter »

# Fragebogen zur Anwendung von Prozesskostenrechnung im öffentlichen Bereich

\* Erforderlich

## G: Kontakt Information für Resultatübermittlung

Fortschritt: 100%

18. Bitte geben Sie Ihre E-Mailadresse für die Zustellung unserer Studienresultate an. \*

Die Zustellung erfolgt voraussichtlich Anfang Juni 2015.

« Zurück

Senden

Geben Sie niemals Passwörter über Google Formulare weiter.

# Appendix D – Cronbach's Alpha

1	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Dimension assignment =>	cost related	quality related	cost related	cost related	time related	quality related	cost related	cost related	quality related	quality related		
2	Scoring Question 12	Economical use of resources	Transparency	Accuracy of budget allocation	Economic justification of decisions	Increase in "time efficiency"	Better services for the citizens	Accurate financial forecasting	Pricing of products and services	Performance measurement	Quality assessment of products	Total (cost related)	Total (quality related)
3	Respondent 1	7	7	6	4	6	4	6	6	1	1	29	13
4	Respondent 2	4	5	3	3	3	3	2	4	4	3	16	15
5	Respondent 3	7	5	5	1	1	2	4	3	6	2	20	15
6	Respondent 4	5	6	4	5	4	3	3	5	4	4	22	17
7	Respondent 5	6	6	6	6	4	3	6	6	6	4	30	19
8	Respondent 6	6	7	6	5	1	2	6	4	1	1	27	11
9	Respondent 7	5	7	4	6	5	1	3	6	5	2	24	15
10	Respondent 8	5	6	6	6	6	5	6	6	6	6	29	23
11	Respondent 9	4	6	4	4	4	3	5	6	5	3	23	17
12	Respondent 10	5	5	5	4	3	3	2	4	4	2	20	14
13	Respondent 11	4	5	5	2	2	2	4	6	5	2	21	14
14	Respondent 12	2	6	5	6	3	1	2	6	6	2	21	15
15	Respondent 13	6	7	3	4	1	3	2	1	4	1	16	15
16	Respondent 14	7	7	7	7	7	7	7	7	7	7	35	28
17	Respondent 15	5	4	3	5	4	2	1	5	3	2	19	11
18	Respondent 16	1	6	5	1	1	1	6	1	2	6	14	15
19	Total	Σ 79	95	77	69	55	45	65	76	69	48	Σ 366	257
20	Variance	2,684	0,809	1,402	3,090	3,496	2,277	3,559	3,063	3,090	3,375	13,797	9,551
21													
22													
23		Cost factors	Quality										
24	k	5	4	=COUNT2(C2;G2;J2;K2)									
25	SUM var (s^2)	13,797	9,551	=M20									
26	var (s^2)	31,484	17,309	=VAR.P(H3:H18)									
27	Alpha	0,702	0,598	=(C24/C24-1))*(1-C25/C26)									
28													

$$\alpha = \left( \frac{k}{k-1} \right) \left( \frac{s_y^2 - \sum s_i^2}{s_y^2} \right)$$

# Appendix E – Spearman's Rho

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W			
1		Responses Question 12										Average Score Q12			Ranks Q12											
2		Economical use of resources	Transparency	...	...	...	...	...	...	...	...	...	Cost	Time	Quality		Cost	Time	Quality							
3	Respondent 1	7	7	6	4	6	4	6	6	1	1	5,8	6	3,25	3,25	3,5	2,5	14						=RANK.AVG(O3;O53:O518;0)		
4	Respondent 2	4	5	3	3	3	3	2	4	4	3	3,2	3	3,75	3,75	14,5	10	8,5						=RANK.AVG(O4;O53:O518;0)		
5	Respondent 3	7	5	5	1	2	4	3	6	2	4	4	1	3,75	3,75	11,5	14,5	8,5						=RANK.AVG(O5;O53:O518;0)		
12	...	5	5	5	4	3	3	2	4	4	2	4	3	3,5	3,5	11,5	10	12,5								
18	Respondent 16	1	6	5	1	1	1	6	1	2	6	7,4	1	3,75	3,75	16	14,5	8,5						=RANK.AVG(O18;O53:O518;0)		
20		Responses Question 11										Ranks Q11														
21		Cost	Time	Quality									Cost	Time	Quality											
22	Respondent 1	3	2	1									8	4	13									=RANK.AVG(O22;O522:O537;0)		
23	Respondent 2	3	2	1									8	4	13											
24	Respondent 3	3	1	2									8	12	5,5											
31	...	3	1	2									8	12	5,5											
37	Respondent 16	2	1	3									16	12	1									=RANK.AVG(O37;O522:O537;0)		
3		Ranks Q12		Ranks Q11			Abs Difference																			
4		Cost	Time	Quality	Cost	Time	Quality	Cost Diff	Time Diff	Quality Diff	Cost Diff^2	TimeDiff^2	Quality Diff^2													
4		3,5	2,5	14	8	4	13	4,5	1,5	1	20,25	2,25	1													
4		14,5	10	8,5	8	4	13	6,5	6	4,5	42,25	36	20,25													
4		11,5	14,5	8,5	8	12	5,5	3,5	2,5	3	12,25	6,25	9													
4		8	6,5	4,5	8	12	5,5	0	5,5	1	0	30,25	1													
4		2	6,5	3	8	12	5,5	6	5,5	2,5	36	30,25	6,25													
4		5	14,5	15,5	8	12	5,5	3	2,5	10	9	6,25	100													
4		6	4	8,5	8	4	13	2	0	4,5	4	0	20,25													
4		3,5	2,5	2	8	4	13	4,5	1,5	11	20,25	2,25	121													
4		7	6,5	4,5	8	12	5,5	1	5,5	1	1	30,25	1													
5		11,5	10	12,5	8	12	5,5	3,5	2	7	12,25	4	49													
5		9,5	12	12,5	8	12	5,5	1,5	0	7	2,25	0	49													
5		9,5	10	8,5	8	4	13	1,5	6	4,5	2,25	36	20,25													
5		14,5	14,5	8,5	8	12	5,5	6,5	2,5	3	42,25	6,25	9													
5		1	1	1	8	4	13	7	3	12	49	9	144													
5		13	6,5	15,5	8	4	13	5	2,5	2,5	25	6,25	6,25													
5		16	14,5	8,5	16	12	1	0	2,5	7,5	0	6,25	56,25													
58											Sum	278	211,5	613,5												
59											Sum*6	1668	1269	3681												
60											N (Count)	16	16	16												
											Rho	0,59	0,69	0,10										=1-(AA58/(AA59*(AA59*2-1)))		