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Recommended Citation

Epple, Johannes; Bischoff, Stefan; and Aier, Stephan, "Management Objectives and Design Principles for the Cost Allocation of Business Intelligence" (2015). *PACIS 2015 Proceedings*. 187.

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MANAGEMENT OBJECTIVES AND DESIGN PRINCIPLES FOR THE COST ALLOCATION OF BUSINESS INTELLIGENCE

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Abstract

Today business intelligence (BI) systems, which provide management with decision-supportive information, are considered to be a prerequisite for organizational success. In contrast to the operation of BI, BI system management is still an emerging topic in information systems (IS) research. Even though the cost management of BI systems is highly relevant for practice, the field is widely unexplored. Cost allocations for BI systems are supposed to enhance transparency, create cost awareness and support the management of resources of the BI system. In our research we have conducted two focus group studies to examine the basis for BI cost allocations. First, we derive management goals and design principles for a BI cost allocation from an exploratory focus group. In a second step, we evaluate the goals and the design principles in a confirmatory focus group. Our research provides valuable insights on the application of BI cost allocations from our focus groups and contributes a basis for the design of BI cost allocation methods.

Keywords: Cost Allocation, Business Intelligence, Focus Group, BI Management.

1 INTRODUCTION

Today BI is acknowledged as an umbrella term for “technologies, applications and processes for gathering, storing, accessing and analyzing data to help its users make better decisions” (Wixom & Watson 2010, p. 14). BI systems are supposed to create value through the analytical use of the information obtained from these systems. BI is thereby considered to be a prerequisite for organizational success (Wixom & Watson 2010). Beyond the supposed value of BI, the expenses for BI are still growing by significant rates, e.g. 8% in 2013 (Gartner Inc. 2014). However, the measurement of BI is considered to be a difficult task, but it is crucial for justifying BI investment decision as well as for managing BI processes (Lönnqvist & Pirttiäki 2006).

The cost of BI are in most cases overhead costs, i.e., costs that are not directly attributable to a product or service sold. In any case, there is a high need to internally allocate the costs of BI further, either to the cost object that is sold to an external customer or to the internal organizational unit that caused the costs. Cost accounting is a sub-discipline of management accounting and comprises among others the topic of allocating costs to costs objects or to those organizational units that caused the costs (Rao 2007). Cost allocation is supposed to fulfil various purposes e.g., to enhance transparency for the growing amount of BI costs, to provide the correct basis for calculation, to create cost consciousness, to uncover inefficiencies in the use of resources, or to create desired control effects for the management of the resources whose costs are allocated to other units (Klesse 2007). Therefore, cost allocation for BI costs is an appropriate means to enhance transparency and contain desired control effects for the management of the growing portion of BI costs.

The topic of BI cost allocations is located at the interface between cost accounting and IS research, and moreover, BI services (Vargo & Lusch 2008) appear to be of particular interest to cost accounting and IS research, due to a BI system’s nature. First, the output of a BI system is information for which traditional cost-oriented internal pricing mechanisms for goods and services do not apply. Inherent to this characteristic is that the usefulness and the benefits of a BI system depends on the decisions made based on the obtained information rather than in the use of the system itself (Benbasat & Zmud 2003). Second, the intention of a BI cost allocation method cannot be the restriction of use of resources, but needs to encourage users to use the system to the best of its capabilities. Thus, BI cost allocation should contribute to promoting the use of the BI system and not distract users from the system use. Further, the aspect of not distracting BI users is also important in the light of the voluntariness of use of a BI system. Third, the operation of BI systems involve a large monolithic cost block (Bischoff et al. 2014) that cannot be managed without transparency about the causes of the costs.

The review of related work (cf., section 2) reveals that only scattered attempts to build BI cost allocation methods exist and no comprehensive work could be identified, although several sources call for future research in the field of BI cost management (cf., section 2). Therefore, our research aims at answering the following research questions (RQ):

1. What are the management objectives for BI cost allocation?
2. What are the principles for designing a BI cost allocation method that addresses the underlying management objectives?

The answer to RQ1 is of particular interest, because the definition of the objectives of BI cost allocation is the essential starting point for the design of a BI cost allocation method. The design principles (RQ2) provide guidance for instantiating specific BI cost allocation approaches for given situations. We derive our findings based on empirical data of an exploratory focus group (EFG) conducted with BI specialists from five major banks. The findings of the EFG are evaluated in a confirmative focus group (CFG) with a different group of BI managers and BI specialists testing the findings’ validity. We add to the knowledge base on BI cost allocation and BI management and inform BI managers systematically designing BI cost allocation instances.

This paper is organized as follows: section two presents related work and provides the conceptual foundation. In section three we illustrate the research method applied in this paper. In section four we

present the results of the EFG and in section five we provide the evaluation based on the CFG. In section six we discuss our findings, their implications and the limitations of our research.

2 RELATED WORK

We have conducted a systematic literature review according to Rowe (2014) as well as a hermeneutic literature review according to Boell & Cecez-Kecmanovic (2014). The need for future research on BI cost management is discussed in various publications, e.g., in order to foster executive and user commitment to BI (Clark Jr et al. 2007). Schieder and Gluchowski (2011) constitute that future research efforts are justified “to bring us closer to a long sought after means to assess and compare cost and benefit aspects of BI solutions” (p. 12). Our review of prior work uncovered that in practice-oriented journals scattered publications on the application of certain BI cost allocation approaches can be found (e.g., Grytz 2014). In addition, consulting companies publish papers stating the maturity of the topic of IT cost allocation (Deloitte 2011) and BI cost allocation in particular (Steria Mummert 2013) is still low. Consequently, we derive that there is a relevance of future research from the scientific community as well as from practice.

The basis for BI cost allocation can be found in accounting literature. In cost accounting research cost allocation aims at transferring costs internally from the unit providing the goods or services to the consuming units (e.g., from BI provider to BI consumer). In accounting literature the following general cost allocation methods are differentiated: no cost allocation (Verner et al. 1996), overhead rates (Coenenberg et al. 2009; Verner et al. 1996), internal activity allocation (Coenenberg et al. 2009; Verner et al. 1996), activity based costing (ABC) (Kaplan & Cooper 1998), and other more distinct methods like relative single cost calculation (Ewert & Wagenhofer 2011). These allocation approaches are discussed under a variety of synonymously used terms and they are archetypes that need further adaptation in order to be applicable to BI systems.

Although cost accounting has been widely researched in the management science of the 20th century and many theoretical groundwork has been published (e.g., Clark 1923; Vatter 1950; Kaplan 1984; e.g., Cooper & Kaplan 1988; Shillinglaw 1989), as a matter of course today’s current phenomena of IS research have not been considered in that era. From the perspective of IS research cost allocation gained recognition in the context of IT performance management. Hence, research on cost allocation of IT services in general (e.g., Verner et al. 1996; McKinnon & Kallman 1987; VanLengen & Morgan 1993; Ross et al. 1999; Rom & Rohde 2007; Laudon & Laudon 2006) and within various IS domains (e.g., Hosanagar et al. 2005; Brandl et al. 2007; Watson et al. 2004; Tang & Cheng 2005; Müller et al. 2011) can be found in literature. One common characteristic observed in the various use cases is that the applied cost allocation approach heavily depend on the situational context and its influencing factors, e.g., the system maturity, form of organization, or the type of services to be allocated. Thus, there is no “one size fits all” approach neither to IS cost allocation in general, nor to BI cost allocation in particular. Therefore, a BI cost allocation approach has to be discretely designed for the specific situation.

A BI cost allocation serves specific purposes and is no end in itself. The rationale behind a BI cost allocation is to achieve desired management impact in order to accomplish certain management objectives in specific situations. Existing literature partially provides conceptions about the underlying objectives of a BI cost allocation. Klesse (2007) describes the goals of a cost allocation for data warehouse (DWH) services, Ross et al. (Ross et al. 1999) describe conditions and implications of IT cost allocations, and Müller et al. (2011) build a matrix of appropriate allocation approaches and goals of lean management, but no research on the objectives of BI cost allocation can be found in literature so far.

The review of prior work revealed that only few sources give specific recommendations or guidelines on what to consider in the design of a cost allocation method for BI or IS, respectively. Verner et al. (1996) provide an overview of the different cost allocation methods for IS. Choudhary and Vithayathil (2013) state that the recommended organizational form of coordination for cloud computing is a profit centre and transfer the concept to BI. Various sources give examples for the implementation of a

specific cost allocation method in a given situational context (e.g., Grytz 2014; Rosenkranz & Holten 2007; Watson et al. 2004). Klesse (2007) describes basic requirements and prerequisites for the design of a cost allocation for DWH services and IT services, e.g., cost effectiveness, exactness and practicability of the cost allocation method. However, due to the special nature regarding costs, value, and use perspectives of analytical IS and BI (Chen et al. 2012) in contrast to other domains of IS the existing approaches are not applicable to BI in full extent. In summary, several sources contribute aspects to consider when designing a BI cost allocation method, but a comprehensive set of design principles for BI cost allocation is missing in literature.

3 RESEARCH METHOD

The paper at hand follows the design science research (Hevner et al. 2004; Winter & Baskerville 2010) paradigm aiming at providing a solution approach to the above described real-world design problem. While RQ1 is purely answered by assessment and description from the EFG and subsequent evaluation in the CFG, it aims at delivering a solid understanding of characteristics for the design of a BI cost allocation method by differentiating management objectives for a BI cost allocation. The answer to RQ2 comprises the design principles that are derived by interpretation from the observations in the EFG. The result of RQ2, the design principles, is a solution to a real-world design problem which is referred to as an artefact (March & Smith 1995) in design research. Subsequently, we introduce the method for our exploratory and CFGs and the artefact type of design principles.

3.1 Focus Group

We follow a focus group-based approach to collect qualitative data. Qualitative techniques are appropriate for the development of theory (Bryman 1999). The strength of qualitative methods is the “capacity to explore human subject motivation and actions within a research study frame of reference” (Debreceeny et al. 2002). Further, the qualitative method of a FG supports the purpose of our research, because biases of individuals can be mitigated and consensus in the FG can be measured (Morgan 1997). Further, a FG offers the opportunity to discuss opinions and attitudes of the participants in an interactive setting. Consequently, the FG is particularly suitable for our purpose, because we aim at deriving new knowledge for an existing design problem in a controlled environment.

In our research we apply FGs to derive and evaluate management objectives and design principles for BI cost allocations. By means of an EFGs the researchers can “achieve rapid incremental improvements in artifact design” and “demonstrate the utility of the design” in a CFG (Tremblay et al. 2010, p. 602). According to Sonnenberg and vom Brocke (2012) FGs are an appropriate method in every evaluation step of the design process.

According to Tremblay et al. (2010) the participants of the EFG as well as the CFG shall have similar characteristics and be familiar with the field to which the solution artefact is applied – in our case BI. Tremblay et al. (2010) propose an eight-step approach for conducting a FG comprising the steps (1) *formulate research problem*, (2) *identify sample frame*, (3) *identify moderator*, (4) *develop and pre-test a questioning route*, (5) *recruit participants*, (6) *conduct focus group*, (7) *analyse and interpret data* and (8) *report results*. In our research we follow the approach proposed by Tremblay (2010) for the conduction of our FGs.

3.2 Design Principles

In design science research different artefact types are proposed by March and Smith (1995): constructs, models, methods, and instantiations. Beyond these four artefact types, Gregor and Hevner (2013) suggest additional design science research artefact types: design theories, design principles, and technological rules.

In IS literature design principles are established as an artefact type and sub-types of design principles are differentiated. Markus et al. (2002) define two sub-types of principles: “principles governing the development or selection of system features and principles guiding the development process” (p. 185). In our research we follow the definition provided by Gregor and Jones (2007) and Gregor et al. (2013) who distinguish:

- *principles of form*: refer to the general structure (e.g., the shape or architecture) of the design solution (Gregor et al. 2013)
- *principles of function*: refer to the general functioning (i.e., what it does and how it functions) of the design solution (Gregor et al. 2013)
- *principles of implementation*: refer to the process of implementation of the design solution in a specific context in practice (Gregor & Jones 2007)

Generally speaking, design principles shall give advice for the effective design and implementation of a solution in a specific context.

4 EXPLORATORY FOCUS GROUP

In this section we first describe the general setup and the procedure of the EFG. Subsequently, we discuss the assessment of the participants’ objectives for a BI cost allocation (RQ1) and derive the design principles (RQ2) from the EFG.

4.1 Focus Group Setup and Procedure

As described in section 3.1 we follow Tremblay et al.’s (2010) eight-step approach of FG design. Subsequently, we briefly present the setup and the procedure according to the eight steps.

- (1) *Formulate research problem*: the formulation of the research problem was prepared by the researcher in advance to the EFG as presented in sections one and two of the paper at hand. The goals of the EFG were to collect empirical data regarding RQ1 and to derive design principles from the discussions (RQ2).
- (2) *Identify sample frame*: regarding this step three decisions were taken. The research should comprise one EFG for artefact design. For the EFG a higher number of participants was desired than for the subsequent CFG in order to obtain rich insights from a broad sample. For the EFG a sample size of approximately 20 persons was desired. As type of participants we defined BI specialists as well as middle to high BI management. Thus, we could obtain the data from people who are directly involved and who are responsible for BI cost allocation.
- (3) *Identify moderator*: it was decided that one of the researchers takes the role of the moderator for the session. Following the recommendation of Tremblay et al. (2010) and Miles & Huberman (1994) and for reasons of the sample size two co-researchers were employed as further observers taking minutes of the discussion.
- (4) *Develop and pre-test a questioning route*: the agenda and the questioning route for the meeting was set up by the researchers in advance and discussed with other faculty members. The questioning route contained 13 questions for each participating company. The questioning route contained direct and indirect questions that aimed at obtaining general information about the BI cost allocation methods as well as at identifying goals of a BI cost allocation and general design patterns. Due to the high complexity of the topic the questions were distributed in advance to the participants to enable preparation to a certain extent. In addition, the participants of each of the five major banks were asked to prepare an introductory presentation about their BI cost allocation approach and the advantages, disadvantages and challenges they are currently facing. At this step the procedure differs from the pure form of the eight-step approach (Tremblay et al. 2010) which does not include the possibility of preliminary conversations in preparation of the FG (Krueger & Casey 2000).

- (5) *Recruit participants*: for the recruitment of participants we used contacts from an ongoing project, in the course of which workshops with BI representatives from major banks are conducted at regular intervals. The BI representatives were invited to kindly participate in our FG research project. Table 1 provides an overview of the participants of our EFG. The group consisted of very experienced managing BI staff with a deep understanding of the processes in their organization. In Table 2 the company profiles of the participants' banks are summarized. Due to their size each of the five banks has a significant BI organization or even several distributed BI units, respectively.
- (6) *Conduct focus group*: the FG took place in June 2014 during a regular meeting of the workshop community. The FG lasted for three hours and was held in German language. The fact that the participants already knew each other from previous sessions of the workshop made the get-to-know part of the FG obsolete and an atmosphere comfortable for an open discussion was guaranteed. For the session a seating at tables in U-shape was established which should be fun to the participant and stimulate active participation (Stahl et al. 2011). For the opening of the session an impetus presentation was held by the moderator which already fostered an active discussion. Subsequently, one or two representatives of each bank introduced their BI cost allocation approach and the challenges they are facing. Afterwards, the answers to the preliminary questions were introduced by each bank and subject to further discussion. Two researchers independently took notes, which were consolidated with the conceptions of the moderator after the FG. The documentation of the contributions by several researchers and the subsequent consolidation avoids misinterpretations (Miles & Huberman 1994), serves for documentation purposes and ensures reliability. After the EFG a summary of the discussions was sent out to the participants asking for addition comments or objections.

Participants of exploratory focus group			
#	Company	Current position	Years of experience in BI
1	Bank A	Deputy BI competence centre manager	22
2	Bank A	BI solution manager	9
3	Bank A	Assistant to BI competence centre manager	4
4	Bank A	Deputy BI competence centre manager	17
5	Bank A	BI self-service manager	6
6	Bank A	Assistant to BI competence centre manager	8
7	Bank A	Technical data warehouse project manager	27
8	Bank A	BI solution manager	29
9	Bank A	BI solution manager	13
10	Bank A	BI solution manager	23
11	Bank B	Head of Enterprise Architecture Management	15
12	Bank B	BI solution manager	26
13	Bank B	BI solution manager	28
14	Bank C	DWH/BI architect	32
15	Bank C	Head of BI architecture	10
16	Bank D	Head of BI competence centre	13
17	Bank E	BI development manager	8
18	Bank E	IT organization – Head of BI	14

Table 1. Participants of EFG

Company profiles – participants of EFG			
#	Bank	Employees 2013	Balance sheet total 2013
1	Bank A	approx. 60,000	approx. \$ 1,000 bln
2	Bank B	approx. 50,000	approx. \$ 600 bln
3	Bank C	approx. 48,000	approx. \$ 900 bln
4	Bank D	approx. 44,000	approx. \$ 250 bln
5	Bank E	approx. 30,000	approx. \$ 500 bln

Table 2. Company profiles of participants of EFG

The steps (7) *analyse and interpret data* as well as (8) *report results* are subsequently conducted and presented in the section 4.2 for RQ1 and in section 4.3 for RQ2.

4.2 Management Objectives of BI Cost Allocations

In the following, we first present the management objectives of BI cost allocation prevailing in the companies of our EFG. Afterwards, we discuss the results obtained.

Bank A has a long established BI landscape with a vast amount of BI systems and a very broad range of offered BI services. The applied BI cost allocation methods have grown with the BI landscape and have been continuously adapted. To date, *Bank A* runs a variety of different cost allocation methods for different BI services comprising internal activity allocations based on a service catalogue as well as different service level agreement offerings. Further, several assessments with different actual and planned consumptions (overhead rates) are in place. The objectives for conducting BI cost allocations for *Bank A* are to **allocate the costs according to the cost-by-cause principle, enhance transparency** and to **control the efficient use of resources**. In addition, for *Bank A* BI cost allocations are supposed to contribute to **exploiting BI to its full potential** by drawing conclusions about usage behaviors.

Bank B employs a decentralized BI landscape with several BI applications running in the business units. The central BI department provides the backend architecture and supports the business units as a business partner. The only BI cost allocation method employed is an assessment based on planned consumptions. The objectives of the BI cost allocation for *Bank B* are to **enhance transparency** and to **create cost awareness** among the BI consuming business units.

The BI landscape of *Bank C* is on a relatively high maturity level with well-established BI systems across the entire bank. In contrast to *Bank A*, *Bank C* only uses the cost allocation method of an assessment based on actual consumptions to allocate BI costs. They further differentiate different BI applications for which the costs are allocated by the assessment cycles. *Bank C's* objectives for employing the BI cost allocation are to **enhance transparency**, to **allocate the costs according to the cost-by-cause principle** and to **earn a profit for the BI department** which should be used for future investments.

The BI competence center of *Bank D* is very much driven by external pressure from the regulatory environment. Most of the current BI applications are installed only to comply with regulatory requirements, e.g., BCBS 239, Basel III or AnaCredit. Nevertheless, the BI costs are allocated to the BI using departments – in the case of *Bank D* the units that have to fulfill the regulatory requirements. The used allocation method is an assessment based on planned consumptions. The pursued objectives of *Bank D* are to **enhance transparency**, to **create cost awareness** and to **allocate the costs according to the cost-by-cause principle**.

Similar to *Bank B*, *Bank E* also has a much decentralized BI landscape in place. *Bank E* uses the most rudimentary BI cost allocation method with an assessment based on planned consumptions that do not reflect the actuals consumptions by far. The main objective of *Bank E* for the BI cost allocation is to **credit 100% of the BI department** and to debit the BI using business units. Further, *Bank E* aims at **creating cost transparency**. However, the allocated costs play no role for the debited departments,

because they are shown “below the line” and have no influence on the target structure and incentive system.

Although the accomplishment of the objectives lies beyond the scope of the paper at hand, it needs to be mentioned that in the majority of the cases the employed BI allocation methods are not appropriately designed to achieve the objectives set. The participants of the EFG unanimously agreed that in every bank there is a high potential for improvement regarding the design of the BI cost allocation method in order to achieve the management objectives.

All of the participants approved that **creating cost transparency** is one of the main objectives of their BI cost allocations, since the BI services are very complex by nature and cause high costs which are often subject to internal discussions in the companies. Participant #14 from Bank C mentioned that for Bank C “the creation of cost transparency for BI costs is the major objective, because especially for BI the management does not know for what exactly the costs occur and how much they spend in particular for the different BI services.” The further objectives of **creating cost awareness** in the BI consuming departments, allocating the BI costs according to the **cost-by-cause principle** and **exploiting BI to its full potential** are complementary with the creation of cost transparency.

Although the BI departments of all of the banks are organized as cost centers, the participants from three banks confirmed that for the BI department it would be helpful to **earn profits** for future investments. The remaining participants argued that this is not the business purpose of the BI departments, especially since they are all treated as cost centers, and in a profit center organization this objective might be appropriate. Participant #13 stated that this wish is an “attempt to avoid budgeting discussions” which are normal to take place in every company, but which are especially hard to justify for BI, because of the intransparent character. The participants agreed that the through a cost allocation created transparency could also assist for the budgeting discussions, but all participant would prefer to be able to earn profits instead of long-lasting budgeting discussions.

The discussions about the objectives of *Bank E* showed that, if the main objective of a BI cost allocation is **100% crediting of the BI department**, it is mutually exclusive with the other objectives, because it leads to a simplified allocation method that cannot achieve further objectives. In the case of *Bank E* the BI cost allocation method is employed as an end in itself.

The results from the EFG regarding RQ1 show that the objectives for a BI cost allocation are partially congruent with the objectives found in our review of prior work (e.g., Klesse 2007; Müller et al. 2011), but become a special context for BI cost allocations. Further, the objectives of **earning profits** and **100% crediting** of the BI departments are particularly applicable in specific design situations. Therefore, we conclude that an evaluation in the CFG shall further enlighten our results.

4.3 Design Principles for BI Cost Allocations

From the discussions in the EFG about objectives and specific designs of BI cost allocation combined with our review of related work we derive design principles of BI cost allocation. We distinguish principles of form (cf., Table 3) and principles of function (cf., Table 4). Subsequently, we present the principles and provide complementary elucidations.

#	Principles of form
1	The BI cost allocation method must be transparent and traceable for all parties involved.
2	The allocated costs for BI must be visible and manageable for the receivers.
3	Overly complex allocation logics need to be avoided as they are counterproductive and not economic.
4	A profit center is the preferred form of organization, but the form of organization of the BI unit has to be aligned with the overall management accounting and steering logic of the company.
5	If an internal activity allocation is applied to allocate BI costs further, a service catalogue and service level agreements should be in place.
6	The selected allocation method should incorporate the BI system’s contextual factors.

Table 3. Principles of form for a BI cost allocation method

Principle of form 1: EFG revealed that the BI cost allocation method shall enhance the transparency about the BI costs. This principle is targeted at a higher level of abstraction, i.e. the cost allocation itself. From the discussions in the EFG we conclude that in many cases the allocation logic is not clear to the people involved in the allocation on sender-, receiver- and executing-side.

Principle of form 2: the participants of the EFG argued that if a BI cost allocation is in place, it must trigger a certain steering/ management impact for the receivers. Therefore, the visibility of the allocated costs for the receivers is a further important factor.

Principle of form 3: among the participants the common sense evolved that the cost allocation method shall be economic. Although BI is a complex domain, too complex allocation methods are considered to be counterproductive.

Principle of form 4: while the participants argued that the under prevailing conditions they have not the right to earn profits, it was agreed that they would prefer to be organized as a profit centre. Participant #4 argued that “if we were organized as a profit center, the BI consumers would directly be aware how much the BI services cost and think about the value of the additional information or their requests. Thus, cost-value considerations for BI would be automatically established.”

Principle of form 5: this principle is a result of the discussion about the allocation logic of Bank A whose allocation logic is currently very advanced. The participants of the remaining banks agreed that the practice of the cost allocation logic of internal activity allocation can be considered best practice.

Principle of form 6: from the practice of Bank A it also became evident that the prior consideration of contextual factors, like e.g., system maturity or management objectives, leads to superior results in the design of the BI cost allocation method.

#	Principles of function
7	The BI cost allocation method should not restrict users from system use, and should not negatively influence value generation through BI, but foster use of the BI system and services.
8	A BI cost allocation should not be an end in itself, but be a means to realize certain management goals.
9	The transparency about BI costs and BI services must be clearly enhanced through the cost allocation method.
10	The cost allocation of actual costs should not be used to fund future BI projects in a cost centre organization. Profit centres and investment centres can “sell” their BI services with margin.
11	The allocation logic should also be applied to the planned values. The BI provider and the BI consumer must be held responsible for the variances.

Table 4. Principles of function for a BI cost allocation method

Principle of function 7: this principle is very crucial for the allocation of BI costs. Participant #16 stated that “the usage of BI must not be restricted by the cost allocation. BI is different from other internal services, since the value through BI is created by the decisions made based on the obtained information.“ He gave the compelling example that “for internal catering services it makes sense to restrict the usage, but not for BI.”

Principle of function 8: the participants agreed that the objective of 100% crediting of the BI department is not sufficient for designing a BI cost allocation method, but it must have an impact.

Principle of function 9: it was unanimously decided by the participants that every BI cost allocation should enhance the transparency about BI costs and BI services.

Principle of function 10: this principle is the group’s common denominator after the discussion about earning profits in a BI department the participants.

Principle of function 11: participant #5 asked the group what their measures for performance evaluation on sender and receiver side are. After discussing how the participants calculate their plan values and enriched by a best practice example of Bank A the group agreed that the allocation logic of the actuals also needs to be applied for planned values and the variances are the primary performance measures.

The presented design principles seem not in all cases to be BI-specific, but in some instances generally applicable to cost allocations. However, these are the results of the EFG, which need further evaluation in the CFG.

5 CONFIRMATORY FOCUS GROUP

In this section we again first present the setup and the procedure of the CFG. Subsequently, we discuss the results of the evaluations regarding RQ1 in section 5.2 and regarding RQ2 in section 5.3.

5.1 Focus Group Setup and Procedure

For the CFG we also follow the eight-step approach according to Tremblay et al. (2010). Below, we introduce the specifications of the steps for the CFG.

- (1) *Formulate research problem:* the research problem for the CFG was to evaluate the management objectives and the design principles derived from the EFG in order to confirm and/or refine the results and designs from the EFG (Hevner 2007).
- (2) *Identify sample frame:* for the CFG we aimed at recruiting a highly specialized participants in order to obtain a focused discussion. Therefore, the sample should consist of experienced personnel from BI management and the size should not exceed the size of the EFG. In contrast to the composition of the EFG, it was desired to recruit participants from diversified industries to eliminate the banking-specific bias.
- (3) *Identify moderator:* as moderator for the CFG the same researcher as for the EFG was chosen. In the CFG again two further researchers were installed as observers taking notes. One of the two observes was a co-researcher, the other one was an independent researcher to ensure objectivity.
- (4) *Develop and pre-test a questioning route:* the agenda and the evaluation route for the CFG was set up and reconciled with the co-researchers and the independent researcher prior to the CFG. First, an impetus presentation was held in order to establish a common understanding for the very specialized topic of BI cost allocations. To avoid bias in the subsequent discussion of the participants the topics of management objectives and design principles were directly and indirectly excluded from the presentation. The questioning route regarding RQ1 first contained an assessment of the management objectives for a BI cost allocation of the participants. Afterwards, the management objectives from the literature review and from the EFG were presented to the CFG and a gap analysis with a discussion was conducted. In regards to RQ2 the single design principles derived from the EFG were discussed individually with the participants of the CFG and evaluated in the dimensions comprehensibility, practicability, importance, and BI specificity. The choice of the dimensions aimed at evaluating the importance of the principles, if it is generally applicable or BI-specific, and if the participants consider it to be successfully realized. At the end of the session the participants had to complete a questionnaire with their demographic information.
- (5) *Recruit participants:* as the platform for conducting the CFG the researchers had the possibility to use a highly specialized practitioner-oriented conference on BI and DWH. The session was announced in the conference program to be for the target audience consisting of BI leaders and management accountants. The participants had to subscribe to the session in advance to enable the researcher to verify the suitability of the group for conducting the CFG. In total we obtained 13 subscriptions in advance, whereof eleven participants attended the session. Table 5 gives an overview of the participants and their company profiles. The industry backgrounds of the participants are very heterogeneous, but all participants had a relevant management role in companies with significant BI organizations.
- (6) *Conduct focus group:* the CFG was conducted in November 2014 during the above mentioned conference for BI practitioners. It lasted 90 minutes and was held in German, although the material for presentation and evaluation was prepared in English. Due to the relatively small

group and the impetus presentation the moderator accomplished to establish a cozy working atmosphere already at the beginning of the session. In the interactive part for the evaluation of management objectives and design principles a very lively and open discussion took place, granting rich insights in the practices and angles of the participants. The co-researcher and the independent researcher took notes of the discussion and consolidated them with the conception of the moderator after the session. Some of the participants left their contact details to obtain a wrap-up of the session and to be engaged in more detailed analysis.

Participants of confirmatory focus group				
#	Current position	Years of experience in BI	Industry	Total sales of participant's company
1	Head of BI competence centre	15	Insurance	€ 10-15 bln
2	Head of BI solutions	11	In-house consulting	> € 100 bln
3	BI manager responsible for management accounting solutions	12	Logistics	€ 2-5 bln
4	Head of BI competence centre	18	Government	€ 101-500 mln
5	Deputy head of BI competence centre	17	Insurance	€ 101-500 mln
6	BI Senior manager	9	Consulting	€ 10-15 bln
7	Senior BI product manager	15	IT vendor	€ 50-100 bln
8	Head of BI competence centre	14	Banking	€ 20-50 bln
9	Partner/ head of BI solution	11	Consulting	€ 20-50 bln
10	BI manager	8	Automotive	> € 100 bln
11	BI project manager	10	Utility	€ 50-100 bln

Table 5. *Participants and company profiles of CFG*

The steps (7) *analyse and interpret data* as well as (8) *report results* are conducted and presented in the subsequent sections.

5.2 Evaluation of Management Objectives

As already described first the management objectives for a BI cost allocation of the participants of the CFG were assessed. Subsequently, the objectives obtained from the EFG as well as from an extensive literature review were discussed. In Table 6 an overview of the management objectives is provided. Surprisingly, the objectives (1)-(5) were directly confirmed by the CFG, whereof the participants unanimously attached the greatest importance to the enhancement of cost transparency, due to the same reasons like the participants of the EFG. Participant #1 put special emphasis on the importance of enhancing cost transparency about the cost for BI caused in decentralised departments. Further, the objective of exploiting BI's full potential of BI was unanimously confirmed and attached with high importance. However, participants #3 and #6 argued that exploiting BI's full potential is kind of wishful thinking, and the objective should be renamed to better exploiting the potential of BI.

Evaluation of management objectives for BI cost allocations			
Objective	Assessed in EFG	Confirmed in CFG	Existing basis in literature
(1) Enhance cost transparency	Yes	Yes	Yes (e.g., Müller et al. 2011)
(2) Create cost awareness	Yes	Yes	Yes (e.g., Müller et al. 2011)
(3) Cost-by-cause allocation	Yes	Yes	Yes (e.g., Müller et al. 2011)
(4) Exploit BI's full potential	Yes	Yes	-
(5) Efficient use of resources	Yes	Yes	Yes (e.g., Müller et al. 2011)
(6) Earn profit for BI dept.	Yes	Partially	-
(7) 100% crediting of BI dept.	Yes	No	-
(8) Restrict use of resources	No	Yes	Yes (e.g., Müller et al. 2011)

Table 6. *Evaluation of management objectives*

The objective (6) was only partially confirmed by the CFG, because the participant discussed that the insights from a BI cost allocation shall be used for issues regarding financing and investment decisions. At this point the participants reached the same common denominator like the participants of the EFG, but without arguing about the right for BI departments to earn profits. The objective of 100% crediting of the BI department was not confirmed by the CFG. After presenting the objective to the group, the consensus of the group was clearly that this should not be an objective for designing a BI cost allocation method, but in some cases the BI cost allocation gets “degenerated” (participant #3) to that objective. In addition, the objective of restriction of use of resources was brought up by participant #1, who argued that in their company the use of the central BI function is sometimes misused for unnecessary activities, e.g., design of unnecessary reports. This newly added objective is similar to the objective (5), but clearly aims at cutting the use of resources down to the necessary level. Since it only aims at restricting users from nonessential activities it is not contradictory to design principle #7.

5.3 Evaluation of Design Principles

The evaluation of the design principles was conducted in an interactive session in two groups. Therefore, we printed the design principles and the evaluation dimensions (comprehensibility, practicability, importance, and BI specificity) on posters and pinned them on two flipcharts. The two groups discussed the design principles independently with one of the researchers.

The consolidated results show that all of the design principles got an average to high ranking in terms of comprehensibility. The outcome regarding the verbalization of the principle is very satisfactory for us, since some of the understanding problems were due to translation difficulties and could be erased right away during the session.

The evaluation dimensions of practicability and importance are exclusion criteria, i.e., a low-rated evaluation in this dimensions leads to the elimination of the design principle. On the basis of low ratings and the interpretation of the discussions the design principles #4 (due to non-practicability) and #11 (due to unimportance/ implicitness) are eliminated. The remaining design principles all withstand the evaluation in regard to their importance and practicability.

The fourth evaluation dimension aims at distinguishing generalizable and BI-specific design principles. According to the evaluation the design principles #1, #3 and #8 are considered to be generally valid to IS cost allocations. The participants discussed that those principles are applicable to IS costs, and are probably transferable to other areas, but definitely not to all departments, e.g., for production departments different principles apply.

Consequently, the following (cf., Table 7) six design principles are considered to be especially important and applicable to a BI cost allocation.

#	Principles of form
2	The allocated costs for BI must be visible and manageable for the receivers.
5	If an internal activity allocation is applied to allocate BI costs further, a service catalogue and service level agreements should be in place.
6	The selected allocation method should incorporate the BI system’s contextual factors.
#	Principles of function
7	The BI cost allocation method should not restrict users from system use, and should not negatively influence value generation through BI, but foster use of the BI system and services.
9	The transparency about BI costs and BI services must be clearly enhanced through the cost allocation method.
10	The cost allocation of actual costs should not be used to fund future BI projects in a cost centre organization. Profit centres and investment centres can “sell” their BI services with margin.

Table 7. Design principles for a BI cost allocation method

6 DISCUSSION AND CONCLUSION

We base our research on an extensive review of existing literature and present relevant prior work. The applied research method follows the paradigm of design science, Further, we introduce the theoretical foundation for conduction of our FGs as well as the artefact type of design principles. From the EFG conducted with 18 experienced participants in the domain of BI in five major banks we derive six management objectives and eleven design principles. In a CFG with eleven participants of senior BI management from diversified industries the management objectives and the design principles are evaluated. The conduction of the FGs is accurately planned, performed in a lively atmosphere and rigorously analysed. In conclusion, we present a compelling list of eight management objectives for a BI cost allocation, six BI-specific design principles for a BI cost allocation method, and three general design principles for (IS) cost allocations.

Our research closes the identified gap existing in research on BI cost management. We contribute a solid basis for the design of a BI cost allocation method containing an exploration and evaluation of objectives and design principles for a purposeful design of a BI cost allocation method. The presented results deliver compelling answers regarding the existing real-world design problems regarding the objectives of a BI cost allocation, and provide assistance to BI managers and management accountants by presenting scientifically validated design principles. Further, certain generally valid design principles provide guidance for the design and application of cost allocations even in other (IS) domains than BI. The presented findings can be applied in practice, e.g., by taking the design principles into consideration as a “checklist” during the conceptual design of a (BI) cost allocation method.

The presented research is subject to a number of limitations. First, as inherent to research comprising qualitative data, different kinds of biases might slip in. Due to the fact that the EFG only consisted of employees of banks, there might be an industry bias in the data obtained from EFG. Further, subjectivity and misinterpretations are a potential risk adherent to qualitative data. However, to the best of the authors’ knowledge the industry bias is excluded from the interpretation of the results. The installation of several researchers taking notes independently (Miles & Huberman 1994) was definitely a valid countermeasure against potential misinterpretations and biases. Second, the study cannot claim for comprehensiveness, because it “only” comprises two focus group studies. Therefore, further research needs to revisit the topic. The decision to focus on particular parts of the BI cost allocation is due to the fact that almost no prior work contributing to the advancement of the topic can be found. Further, the high complexity of the topic requires a breakdown into sizable sets.

Nevertheless, future research shall address several aspects of a BI cost allocation that remain, due to the limited scope of this research project. First, research on contextual factors further influencing the design of a BI cost allocation method, e.g., BI system maturity or status of BI system acceptance, shall draw a comprehensive picture of the different design situations. Second, research on the method fragments, e.g., cost types, organizational aspects, and allocation mechanism shall provide further guidance for the purposeful design and configuration of a BI cost allocation method.

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