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Designing Open Source Business Intelligence for Public Administrations

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Abstract

Business intelligence approaches are standard in private organisations. In public administrations, however, only first steps towards such intelligent managing support are undertaken. Deficits become apparent especially in the move of implementing new public management approaches, such as new accounting systems or an output-oriented management. While public administrations are often obliged to implement such approaches in order to collect management-relevant data, there is little support regarding how to employ these new structures in terms of an intelligent business management. Here, balanced scorecards (BSC) can provide a valuable business intelligence instrument. Core problems that such an approach faces in the domain of public administrations are domain specific requirements, data collection problems in a heterogeneous systems environment, and financial limitations due to budgetary restrictions. Our design science-oriented case study on BSC implementation in public administrations introduces a solution which bases on an open source approach and addresses the problem of data collection by BSC and project management software integration. A case study analysis identifies generalisable issues which can potentially be applied to other situational and organisational contexts.

Summary of Arguments

- Paradigmatic changes in public administration management, for instance, regarding the accounting system (Neues Kommunales Finanzmanagement) or output-oriented management (Neues Steuerungsmodell), reveal severe *deficits in strategic thinking in public agencies*.
- *Balanced Scorecards* (BSC), if adapted to the specific context of public administrations, are a valuable instrument for implementing strategic thinking in these organisations.

- An *integration of project management and BSC software* can be a feasible solution to the central problem of data collection in a heterogeneous information systems environment, such as in public administrations.
- *Open Source Software (OSS)* is a practicable, low-cost, and flexible alternative to proprietary solutions for business intelligence in public administrations.

1 Introduction

There is a high demand for business intelligence solutions (concepts and software) in public administrations. New Public Management (NPM) and Electronic Government (eGovernment) are widely applied approaches to modernise public administrations into IT-based, networked, and market- and citizen-oriented organisations [Falc02; ScPr03; ScEi03; TrWi01]. In recent years, German public administrations have been obliged to introduce concepts as product-oriented budgeting (*Produktorientierter Haushalt*) or double-entry accounting (*Neues Kommunales Finanzmanagement*) which basically aim at providing data and improving the environment for an output-oriented management. Implementing these concepts is for most German public administrations, by law, obligatory (e.g., in Northrhine-Westfalia by 2009, in Lower Saxony by 2010). On the other hand, however, the beneficial perspective, how to use this data and how to actually implement and benefit from output-oriented strategic management [ScPr03], is underemphasised in public administrations with a strategy deficit being the consequence.

BSC have been established as a valuable instrument addressing major management problems in private and public organisations [KaNo96a; KaNo00; OIRW99]. An empirical study conducted in major US-enterprises [KaNo96] has shown, for instance, that there exist significant deficits in actually aligning the business strategy and business operations, that classical financial measures often run too short when it comes to strategic management decisions, or that controlling and reporting systems are often perceived as too complex but insufficient when it comes to ad hoc requests. These and other significant problems in management practice have lead to developing BSC as a strategy management and controlling instrument [Horv01]. Hence, BSC aims at balancing performance measurement between strategy and operations, taking into account various types of measures, e.g. qualitative and quantitative, and including different stakeholder perspectives, e.g. customer or employee perspectives [KaNo96]. BSC is the most known and applied performance measurement concept [GüGr02] while its IT support is seen as a major success

factor [Buyt01; GüGr02]. Hence, a BSC establishes a possible conceptual basis for business intelligence and management information systems [Buyt01; OIRW99].

Implementing BSC in public administrations is confronted with severe problems. While the BSC approach provides a valuable conceptual basis for business intelligence solutions in public administrations, major problems arise when it comes to an operative implementation:

- The need for domain specific adaptations is often underestimated [Busc04]: While BSC is originally derived from the private sector, characteristics of public organisations are habitually not fully appreciated [Alt04].
- A heterogeneous information systems environment regularly leads to problems in systems interoperability [BADF05] and, thus, in (automatically) collecting BSC-relevant data.
- Budgetary restrictions, as omnipresent as in the majority of (German) public administrations, necessitate low-cost solutions.
- Technological know-how deficits and a latent change resistance in the public sector domain [Fisc02; ScPr03] suggest a technologically evolutionary, rather than a revolutionary approach.

Hence, the research question we seek to address within this paper is *how to design an integrated open source BSC system in public administrations?* The line of argumentation addresses the following sub-questions:

- What are BSC principles and their domain specific adaptations and what basic functionalities are to be covered within a BSC implementation process? (Sec 2)
- Regarding a design science case study, how can a web technology and open source approach resolve major problems of BSC implementation in public administrations? (Sec 3)
- What is the value added by integrating BSC and project management software? (Sec 3)
- Which aspects of the design science case study can potentially be generalised and support further related business intelligence projects? (Sec 4)

Addressing this research objective, the methods chosen are that of conceptual and empirical research. We will hence provide theoretical-logical arguments as well as empirical evidence by (briefly) conducting and analysing a BSC implementation case study in a public organisation. We consider the paper to contribute to and to be part of design science research in information systems [Bola89; HMPS04; MaSm95; Simo81; WaWE92]. We will therefore provide a brief

summarising assessment of this research, complying with the guidelines for evaluating design science in IS research [cf. HMPS04], within the concluding section (Sec 5).

2 Balanced Scorecards in Public Administrations

BSC is a performance measurement instrument which aims at balancing strategy and operations. It has been developed as a response to the discovery that, for instance, there exist significant deficits in actually aligning the business strategy and business operations, that classical financial measures often run too short when it comes to strategic management decisions, or that controlling and reporting systems are often perceived as too complex but insufficient when it comes to ad hoc requests [Horv01; KaNo96]. BSC aims, as the name of the concept reflects, at maintaining a balance “between short- and long-term objectives, between financial and non-financial measures, between lagging and leading indicators, and between internal and external performance perspectives” [KaNo96a, p. viii].

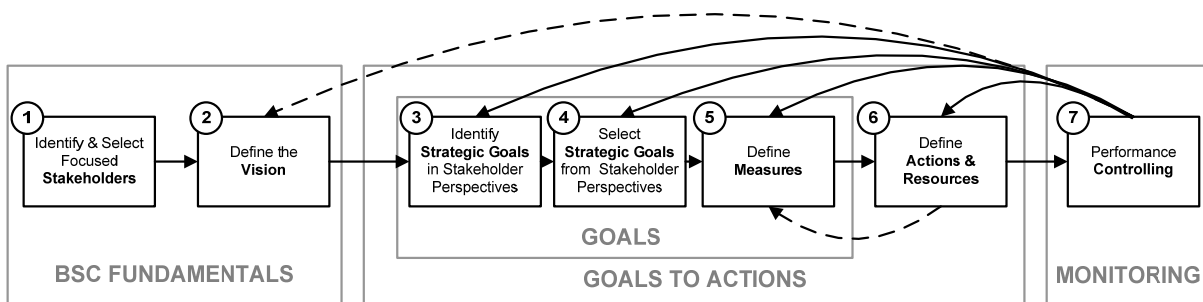


Figure 1: Schematic Balanced Scorecard Implementation Process

The BSC implementation process has several phases, each of them rendered by a specific task and concern. Literature provides us with a multitude of BSC implementation approaches [KaNo96], often featuring different granularity and practicality levels. Figure 1 outlines a schematic and archetypal BSC implementation procedure which takes into account the most common process features:

- 1) *Identify and Select Stakeholder Groups.* BSC seeks to balance between diverse stakeholder perspectives, including external and internal stakeholders. Starting the implementation process, it has to be decided upon which stakeholder perspectives ought to be taken into account. Financial perspective (‘How to deliver value to the shareholders?’), customer perspective (‘How to satisfy the customer needs?’), internal business perspective (‘Are we working effectively and efficiently?’), or innovation and learning perspective (‘What are emerging opportunities and challenges?’) are frequently taken into consideration. However, when it

comes to, for instance, BSC in public administrations, often the political or the citizens' perspective are considered as equally essential [Sche02]. Furthermore, it appears to be appropriate to differentiate between distinct 'customer' perspectives. As a consequence, five plus one perspectives are identified for a public organisation-wide BSC approach: Financial, employees, structures and processes (internal business perspective) in analogy to the original BSC concept. Additionally, the customer perspective has been differentiated into the citizens' and the businesses' perspectives. Furthermore, a political perspective was identified which varies from the other perspectives in the sense that the political perspective, as primacy of representative democracy, is 'superior' to the other perspectives (see also Point 3, Figure 2).

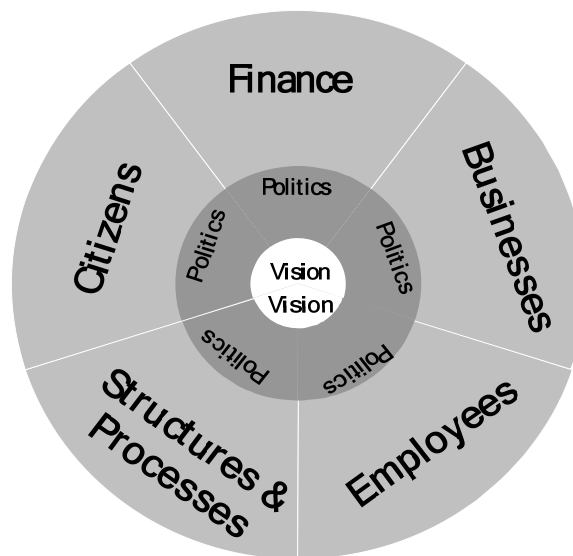


Figure 2: Balanced Scorecard Stakeholders

- 2) *Define the Vision.* The corporate vision is the first step towards policy within BSC: How does the organisation picture itself in a positive scenario in the long run? The vision functions as reference point for policy making, e.g. for defining strategic goals. Also with regard to the selected stakeholder groups, the goal here is to create a vision that is agreed on and widely accepted within the organisation. In many public administrations, the step of creating a common vision first opens the process of strategic thinking. At this point, often very divergent perspectives on the future development of a public administration become evident. Often two perspectives of the vision are differentiated from another: the internal perspective deals with the organisation, the public administration, itself while the external perspective is concerned with the public community (see again Figure 2).
- 3) *Identify Strategic Goals in Stakeholder Perspectives.* With regard to the corporate vision, policy making is taken one step further by identifying and discussing strategic goals that

ought to be pursued by the organisation. Here, the different stakeholder perspectives regularly frame the discussion of strategic goals, meaning: What are the strategic goals (abstract ‘demands’ at this point) stakeholder group X holds (implicitly and explicitly) with regard to the organisation? So-called goal landscapes for each stakeholder perspective can facilitate the discussion. Within public administrations, the defined perspectives (for instance, businesses) are still very heterogeneous. For instance, retail companies or agricultural companies might pursue very different goals regarding desirable infrastructures. Thus, it appears as very fruitful to conduct workshops with a selected group of representatives that defines such goal landscapes. As a second step, these goal landscape can be ‘filled’ with the help of specific workshops, interviews, questionnaires, document analyses etc. Here, identifying strategic goals (within stakeholder perspectives) is the first step to select certain goals.

- 4) *Select Strategic Goals from Stakeholder Perspective.* Based on the strategic goals identified within the stakeholder perspectives, certain goals have to be discussed, aligned, and selected to become part of the organisational policy. Often the goals identified are conflicting. However, some goal conflicts can be solved via discussion while other goals remain conflictory. In public administrations, this is a process that is regularly conducted by politics (democratic representative). In some cases, decisions can also be undertaken relying on direct democratic instruments.
- 5) *Define Measures.* BSC also features controlling characteristics. Thus, the definition of suitable measures for measuring if and how well particular goals have been achieved is the next step. As these measures are also sought to provide a motivational aspect, not only management representatives, but also employees responsible for achieving the goals are involved in defining them.
- 6) *Define Actions and Resources.* Defining measures and actions heavily depends on each another. Certain actions can efficiently be measured in only a certain way, some measures cannot be considered, if there is no data available. Therefore, a feedback loop is commonly recommendable. The group deciding upon actions and resources is often the same that defines certain goal measures. However, deciding upon what should be the ‘right’ things to do and what should be the ‘right’ resources for that is regularly an especially critical issue. In public administrations, one can regularly find evidence that these actions supporting BSC strategic goals often base on projects. As a consequence, project management and the definition of BSC-related actions are often strongly intertwined.

7) *Performance Controlling*. BSC aims at continuity. Therefore, a continuous performance controlling analyses if and how well the goals have been achieved according to the measures defined. Mostly in cases when problems occur, for instance, the measures have not been met, the resource limits have been exceeded, or the strategic goal has proven to be questionable, a problem analysis seeks to stimulate improvements. This often results in redefining goals, measures, actions, or resources. Besides these problem-driven improvements, also proactive steps can be taken, for instance, in terms of analysing and discussing on a regular basis if the strategic goals are still suitable or if environmental circumstances have changed. As a consequence of the strong interconnection between BSC and project management, performance controlling often heavily relies on project controlling.

The tasks to be performed within a particular phase of the BSC implementation are often interconnected with each other so that several feedback loops can be compulsory. Furthermore, the parties involved within the particular steps vary, however, stimulating and guiding a discussion among these parties is constantly the critical but often the least methodologically supported concern. An interconnection with project management can be a valuable way to save extra work, in the sense that project management is conducted anyways and thus provides relevant performance data to the BSC system.

3 Open Source BSC Software for Public Administration – A Design Science Case Study

Information Systems supporting the BSC implementation process have become an obligatory, in that valuable, part of almost every BSC project [Buyt01; GüGr02]. Systems of this kind allow for an efficient documentation and versioning of an enterprise BSC and foster its development process by providing graphical means illuminating a scorecard structure. Furthermore, they offer a technical infrastructure granting communication of a scorecard among all organisational entities of an enterprise. Moreover, providing means for real time monitoring of key performance indicators is one of the main advantages of a BSC software tool. Contemporary tools integrate data from operative systems or data warehouses for keeping objective compliance under surveillance and foster a real time exception handling and irregularity escalation.

Aside from the exigency to adapt the BSC concept to the specific context of public administration, the application of BSC software tools in this sector has to accomplish some domain specific requirements, as well. In the course of this section, we will pinpoint these context specific

needs and demonstrate how utilising web technologies, developing software on the basis and under the licence model of OSS, and integrating BSC and project management may help to meet these requisitions. Furthermore, the presentation of a case study is subject matter of this section. Here we demonstrate how former findings aided the successful conduction of a BSC implementation project for a medium-sized German public administration.

1) Web technologies

Applying web technologies for the development of a BSC software tool in the domain of public administration meets the prevailing situation of shrinking budgets in this sector.

First, most of the components necessary for setting up a web information system are free of charge. For instance, the Apache web server, being the most popular system of its kind, may be used without paying any licence fees. Second, as almost every public administration is hosting a web site the IT infrastructure necessary for operating a web information system is already in place. Therefore, the complexity of additional maintenance efforts is kept to a minimum. This aspect also holds good as the centralized architecture of web information systems limits administration and maintenance tasks to the web server side. As contemporary operation systems already provide web browsers, the installation of a web based software tool does not impose any further requirements on the client systems.

Extending the repository of every day software tools in public administrations on the basis of web technologies lowers user acceptance barriers. Especially in a surrounding characterised by latent change resistance as such in public administration [Fisc02; ScPr03], implementing a system which easily integrates with users' existing working environment fosters their acceptance. This holds good for web information systems. As users can handle a web based BSC software tool by using well-known concepts like navigation via back and forth navigation keys and setting bookmarks, convincing them of supporting the BSC idea and inducing commitment for the new strategic initiative becomes easier.

2) Open Source Software

Budgetary limitations in the public administration sector and the early status of the BSC adaptation process to this particular domain favours reverting to OSS and developing tools under Open Source licences. The term Open Source describes a software concept which comprises a particular licensing model, distribution model, and development model. In the context of OSS, several licensing models exist. Most of them accord to the Open Source Definition (OSD) which was developed by the Open Source Initiative (OSI)

[FeFi02]. Core issues are the right of unrestricted editing and adaptation, free distribution and use regarding the software as well as the source code [Reit04]. Every user (and developer) has the right to copy the software as often as needed. Furthermore, licenses allow to take the source code, to derive a new software product from the former, and to redistribute the new software using the same label [Schi02]. OSS development is a communicative process often characterised by a lack of central control [Koch03]. An OSS-community normally comprises several developers which regularly work independently from each other developing particular parts of the software. Moreover, an incremental and rapid publication of new releases is symptomatic for an OSS development process. Raymond stressed this fact by characterising open source development with the phrase “Release early, release often” [Raym99]. Thus, altered requirements or identified bugs are converted into new releases instantaneously. All in all the community-like OSS development process leads to the fact that several ideas as well as interests are considered during software development pursuing a best-of-breed approach. Open source code is generally more open to program testing and bug fixing. Another advantage of OSS is the fact that most developers are highly motivated due to their often intrinsic motivation as they often use their own software.

Against this background, the motivation for applying OSS in the area of public administration is manifold [BeRS04; Marq04]. The most obvious reason is related to the monetary dimension [DüWe04]. OSS may be employed free of charge and the internet offers an abundant source for gratuitous documentation and assistance for solving installation and maintenance issues. However, a sufficient degree of technical know-how within public administration is necessary to revert to OSS. Opposed to commercial software tools, OSS still requires kind of a do-it-yourself attitude for successfully harnessing its potential. In addition to the monetary advantages, the characteristics of its development process also militate in favour of applying OSS to meet the public administration particularities. Due to the recency of aligning BI concepts to the demands of the public administration sector, readjustment of developed IT solutions is in all probability. Aligning the BSC concept to the particular context of public administration will probably take course in a trail and error process of adaptations. Due to its incremental and rapid development process, the application of OSS supports flexible reaction to altered requirements [Fitz06]. As the development of BI tools looms large in the OS community [Klei06], it is in all likelihood that there will be a sufficient group of programmers promoting the flexible development of a BSC OSS tool.

3) *Integration of BSC and project management*

Integrating BSC and project management software tools makes for an efficient and effective way of deriving and automatically collecting BSC relevant measures. An effective provision of management relevant information necessitates a comprehensive business intelligence infrastructure comprising a data warehouse and ETL (extract, transform, load) interfaces to the data providing operative systems. However, the prevailing 'backwardness' of contemporary public administration's IT infrastructure hinders the automatic surveillance of BSC goal compliance. Both public administration processes lacking a sufficient support by information systems and the application of proprietary stand-alone software solutions [BADF05] impede self-controlled provision of data for BSC measurement. In order to ease the measure maintenance in an environment like this the integration of ratios derived from project management provides a fruitful loophole out of this problematic situation. As actions defined to accomplish BSC objectives often show features characteristic for projects, ratios reflecting whether actions are conducted properly can be utilised for BSC measurement. In this regard supporting the execution of specified BSC actions via a project management software tool offers the ability to automatically obtain BSC relevant data and bypasses the lack of an extensive business intelligence infrastructure. However, information on whether a project is on time and budget do not entirely substitute the original BSC measures but provide a fruitful source for additional strategic monitoring.

The Integration of BSC and project management software tools fosters user acceptance and commitment to the BSC strategic management approach. Assigning projects to organisational objectives explains the contribution the participating employees make to the fulfilment of the overall vision. Every-day operative work becomes directly linked to strategic targets preventing the BSC concept from being misunderstood as an abstract concept out of touch with reality. On the whole, the integration approach serves for a tighter interlocking of operative and strategic management.

The former findings served as guidelines for a BSC software tool development project we accomplished for a German public administration in 2005. The environmental conditions for this project resemble the situation described in Section 1. The public administration faced the challenge of adopting the BSC concept to its own domain specifics to pave the way for output-oriented strategic management. A BSC software tool should support the entire implementation process as sketched in Section 2. However, due to budget limitations, utilising a commercial

tool for this purpose was not feasible and therefore applying OSS became the favoured solution. Furthermore, the existing information system environment consisted of a heterogeneous pool of autarkic applications hardly interconnected.



Figure 3: BASIS cockpit

A preceding evaluation revealed that there was no open source BSC solution so far. Therefore, it was decided to start a new open source development project named BASIS – BALanced Scorecard Based Information System. It was benefited from basing the project on existing open source solutions and reusing the framework of an available open source application. For the development of the web system the open source scripting language PHP¹ was chosen. Our development environment comprises of the open source database management system MySQL, the Apache web server, and the integrated development environment PHPEclipse.² Due to the employment of a database abstraction layer and sticking with the W3C HTML standard³ different database management systems and web servers are also supported by our application. In order to design business logic and user interface independently from each other, the PHP template engine smarty⁴ was utilised. The generic framework of the open source project management tool dotProject⁵ was adopted for realising a modular software architecture. Furthermore, dotProject provided some software artefacts serving as a starting point for the development of the project management module to be integrated with the BSC solution.

¹ See <http://www.php.net>.

² See <http://www.mysql.com>, <http://httpd.apache.org>, and <http://www.phpclipse.net>. PHPEclipse is based on the open source platform-independent software framework eclipse (<http://www.eclipse.org>).

³ See <http://www.w3.org/MarkUp>.

⁴ See <http://smarty.php.net>.

⁵ See <http://www.dotproject.net>.

BASIS provides a wide range of functions presented by a clearly structured user interface. As explicitly demanded by the public administration and consistent with the propositions stated above, the tool comprises a tight integration of BSC and project management functionality. The overall compliance with the defined BSC objectives is illustrated on a cockpit-screen serving as an entry point to the system (see Figure 3). Besides system and BSC administration functions, time recording, storage and maintenance of both contacts and events, the administration and monitoring of projects comprises a further corner stone of BASIS. The progress of tasks as well as the adherence to budget and time restrictions is supervised and evaluated by the system. On this basis performance indicators are derived pointing out possible negative effects on the attainment of BSC goals.

Both the specification of a BSC adhering the particularities of the public administration and the development of a conformable OSS BSC and project management tool took eight months in total. In this regard falling back on existing OS solutions and related assisting resources on the internet considerably saved time. At present the developed BSC and the supporting tool are successfully used in every-day business of the public administration. Although the developed web system does not act as an all-embracing BI solution it serves as a good starting point to gradually evolve IT infrastructure for backing public administration on its move to market- and output-oriented management.

4 Case Study Analysis and Results

According to Lee [Lee89] we will add a brief case study analysis in order to address the questions of repeatability and generalisability of the case study (results). Here, we will refer to four core questions in case study research:

1) What is the initial setting in the organisation (case study data) and in how far is it bound to specific situational and historical circumstances?

A core issue in the case study setting was the need for business intelligence systems resulting from severe societal, legal, and information-technological changes. Constraints for designing the desired system were mainly interoperability problems in a heterogeneous system environment (about 40 different information systems), budgetary restrictions, and a latent resistance to (technological) change. The described situation is not expected to alter significantly within a five year horizon; merely certain efforts to reduce the heterogeneity in the system landscape have been undertaken.

- 2) *Which (design) conclusions are drawn from the case study data and in how far are these conclusions bound to specific situational and historical circumstances?*

The main design decisions consist of pursuing the BSC concept, an open source approach, an integration of project management functionalities, and a web technology implementation. Here, especially the BSC concept can be understood as an initial approach to strategic management and business intelligence for public administrations [Alt04; Busc04; Sche02]. It is expected that, over time, other management functionalities can provide valuable extensions to this single-concept approach. Anyhow, still BSC is expected to be the major conceptual basis for business intelligence efforts in the organisation within a five year horizon. The open source approach, even if being considered as better-quality solution, will still have to practically prove its positive network effects in this particular setting.

- 3) *In how far do other settings (here: public administrations) show similar features and, thus, in how far is the case study setting generalisable?*

Especially medium-sized German public administrations share major features with the described case study setting. Not only that the services and processes that these organisations have to provide are existentially similar by law, they also have major problems in common, for instance, budgetary restrictions, heterogeneous systems environments [BADF05], or latent change resistance [Fisc02; ScPr03]. This being the overall trend, individual differences do evidently exist. However, especially their business intelligence maturity can be expected similar as, for instance, legal changes in accounting systems (*Neues Kommunales Finanzmanagement*) will affect most public administration within the same time horizon (depending on the state/Bundesland in most cases 2009 or 2010).

- 4) *Are the (design) conclusions made in the case study setting transferable to other organisational settings?*

The major design decisions in the case study setting consist of pursuing the BSC concept, an open source approach, an integration of project management functionalities, and a web technology implementation. Especially the integration of BSC and project management had major advantages in the particular case study setting (see again Sec 3). Firstly, project management software support was explicitly demanded by several employee(s)/(groups). Secondly, the given public administration had restricted resources available for the project so that a feasible and practicable alternative to a huge information systems integration (comprising, for instance, the population register, land register, (diverse) accounting systems, external data-

bases, finance monitoring system, council information system, etc.) was found. However, other BSC implementation projects chose dissimilar paths [Sche02], mainly against the background of different resource alimentations.

As a consequence, the case study setting can be – regarding its business intelligence maturity – considered as typical medium-sized German public administration. Major features affecting the design decisions will be apparent in most organisations of this kind within a five year time horizon. However, major differences in resource availability and financial support may affect design decisions, for instance, the open source approach or an integration of project management functionalities.

5 Conclusions and Future Research

There exists a high demand for strategic management and business intelligence solutions in public administrations. Here, BSC – adapted to the specific domain of public administrations – has proven to be a valuable approach enacting strategy and vision in daily operations. At this juncture, several key success factors were identified for the domain of public administrations:

- A strong involvement of employees and stakeholder representatives is crucial to the BSC project success. Defining the corporate vision (phase 2) is often the first step towards manifesting strategic thinking in public administrations. Very heterogeneous perspectives often become evident at this point of time which requires rich conceptual and motivational support. A conceptual combination of BSC-based business intelligence systems and project management can contribute to solving the data problem, avoid additional work, increase employee acceptance.
- OSS is in most cases low-cost and a valuable alternative to proprietary software products, also for business intelligence systems in public administrations.
- Applying web technologies for public administration information systems has proven to be a low-cost, but effective solution which is accompanied by a relatively high user acceptance also due to its recognition effect.

At this juncture, a brief paper self-assessment seeks to bring further clarity to presenting our research findings and follows Hevner et al.'s (2004) guidelines for design science research evaluation (see Table 1).

Guideline	Addressed in the paper
Epistemological Positioning	<ul style="list-style-type: none"> ▪ The epistemological position taken is that of linguistic interpretivism. Assuming that a real world' exists, the perceptions of it are influenced by the subject. The reason for such subjective perceptions of reality is assumed to be language differences, as languages not only provide representative means, but also form perceptions and constitute a differentiation instrument [in IS, see also Ortn04]. As a consequence, an aim is to create a language community relating to the issue of interest [BeNi07; KaLo73].
Addressing a relevant problem	<ul style="list-style-type: none"> ▪ The need for domain specific adaptations of BSC is often underestimated: While BSC is originally derived from the private sector, characteristics of public organisations are habitually not fully appreciated. ▪ A heterogeneous information systems environment regularly leads to problems in systems interoperability and, thus, in (automatically) collecting BSC-relevant data. ▪ Budgetary restrictions, as omnipresent as in the majority of (German) public administrations, necessitate low-cost solutions. ▪ Technological know-how deficits and a latent change resistance suggest a technologically evolutionary, rather than a revolutionary approach.
Making a research contribution	<ul style="list-style-type: none"> ▪ Design, case study implementation, and analysis of an integrated BSC and project management software which is based on an open source approach, employs web technologies and enacts a domain-specific BSC concept for public administrations
Choosing an adequate research method	<ul style="list-style-type: none"> ▪ Conceptual and theoretical-argumentative method as well as empirical case study implementation
Addressing the question of research rigour	<ul style="list-style-type: none"> ▪ It was sought to rigorously apply the conceptual and theoretical-argumentative method by remaining a high clarity of argumentation. Furthermore, empirical data collection within the case study was conducted rigorously against the background of the underlying linguistic interpretivist epistemology.
Designing an artefact	<ul style="list-style-type: none"> ▪ BASIS software as design artefact; an implementation of a BSC-based business intelligence system
Research evaluation	<ul style="list-style-type: none"> ▪ The first steps of research evaluation, implementing and evaluating the BASIS software in a medium sized German public administration in terms of a design science case study, yet indicated its feasibility. However, further evaluation is necessary.
Adequate communication of research	<ul style="list-style-type: none"> ▪ Clarity of argumentation was primary goal for research communication (see above) ▪ The business intelligence community on WI2007 is considered as adequate audience, potentially providing further feedback on special business intelligence issue, also from other domains than public administrations.

Table 1: Design Science Research Assessment

In order to provide evidence supporting the concept feasibility, a case study implementation was conducted. Following the case study implementation, further evaluation is necessary. For further future research, an analysis of OSS capability for other application areas in the field of eGovernment is to be conducted. Furthermore, OSS applications, such as the presented BASIS, should be made open to the public in order to facilitate a discussion of advantages, disadvantages, and application experiences. As the application of OSS looms large in the area of business intelligence at present [heis06; Klei06], further effort in integrating the BASIS application with existing OSS solutions is projected. Here, especially the connection with OSS data warehouses is in the focus of our endeavour to also foster the automatic provision of measures unre-

lated to project monitoring. Additionally, further management-oriented perspectives on OSS in PA are needed, for instance addressing Total-Cost-of-Ownership analyses.

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