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<http://aisel.aisnet.org/amcis2007/45>

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Public Sector Business Intelligence – An Open Source Approach

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ABSTRACT

Approaches to strategic Information Systems (IS) are standard in private organisations. In Public Administrations (PA), however, only first steps towards strategic managing support are undertaken. Deficits become apparent especially regarding new public management (NPM) approaches, such as new accounting systems or an output-oriented management. While PA are often obliged to implement such NPM approaches in order to collect management-relevant data, there is little support regarding how to employ these new structures in terms of strategic management. Here, Balanced Scorecards (BSC) can provide a valuable strategic management instrument. Core problems that such an approach faces in the domain of PA are domain specific requirements, data collection problems in a heterogeneous IS environment, and financial limitations due to budgetary restrictions. This paper presents a design science-oriented case study on BSC design and organisational implementation in a medium-sized local PA. It introduces a solution based on an Open Source Software (OSS) approach which 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.

Keywords

Open Source Software, Strategic Information Systems, Design Science Case Study, New Public Management, Public Administration.

INTRODUCTION

There is a high demand for strategic information systems (concepts and software) in public administrations (PA). New Public Management (NPM) and Electronic Government (eGovernment) are widely applied approaches to modernise PA into IT-based, networked, and market- and citizen-oriented organisations (Schedler and Proeller, 2003; Scherlis and Eisenberg, 2003). While organisation-external eGovernment services, for instance, involving citizens or businesses, have been intensively discussed (Cox and Ghoneim, 1998; Tung and Rieck, 2006), the public organisation-internal use of IT (Ang, et al., 2001), for instance, for management support, is less analysed though being evenly important. In recent years, PA were confronted with NPM concepts, such as product-oriented budgeting or double-entry accounting, which basically aim at providing data and improving the environment for an output-oriented management. Implementing these concepts is, for instance, for most German PA, 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 actually use this data and how to in fact implement and benefit from output-oriented strategic management (Schedler and Proeller, 2003), is underemphasised in public sector practice with a strategy deficit being the consequence.

Balanced Scorecards (BSC) are a valuable instrument addressing major management problems in private organisations (Kaplan and Norton, 1996a; Kaplan and Norton, 2000; Olve, et al., 1999). An empirical study conducted in major US-enterprises (Kaplan and Norton, 1996b) showed 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. These and other significant problems in management practice have lead to developing BSC as a strategic management and controlling instrument (Kaplan, 2001). Hence, BSC aims at balancing performance measurement between strategy and operations, taking into account various types of measures, and including different stakeholder perspectives (Kaplan and Norton, 1996b). At present, BSC is the most known and applied performance measurement concept in practice (Günther and Grüning, 2002).

Implementing BSC in PA is confronted with severe problems. While the BSC approach provides a valuable conceptual basis for strategic MIS in PA, major problems arise when it comes to an operative implementation:

- The need for domain specific adaptations is often underestimated (Busch, 2004; Rocheleau and Wu, 2002): While BSC is originally derived from the private sector, characteristics of public organisations are habitually not fully appreciated (Alt, 2004).
- A heterogeneous IS environment regularly leads to problems in systems interoperability (Becker, et al., 2004) and, thus, in (automatically) collecting BSC-relevant data.
- Budgetary restrictions, as omnipresent as in the majority of PA, necessitate low-cost solutions.
- Technological know-how deficits and a latent change resistance (Schedler and Proeller, 2003; Thom and Ritz, 2004) 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 balanced scorecard system in public administrations?* The line of argumentation addresses the following sub-questions:

- What are the basic principles of BSC implementation in PA?
- What are the characteristics of Open Source Software (OSS) and how is it applied in PA?
- Regarding a design science approach, how may web technology and OSS approach resolve major problems of BSC implementation in PA?
- What is the value added by integrating BSC and project management software?
- Which aspects of the design science case study can potentially be generalised and support further design-oriented strategic MIS projects in PA?

Addressing this research objective, the methods chosen are that of conceptual and empirical research, the latter in terms of conducting and analysing a BSC implementation case study in a medium-sized German public administration. We consider the paper to contribute to and to be part of design science research in IS (Boland, 1989; Hevner, et al., 2004; March and Smith, 1995; Simon, 1981; Walls, et al., 1992). We will therefore provide a brief summarising assessment of this research, complying with the guidelines for evaluating design science in IS research (cf. Hevner, et al., 2004), within the concluding section.

BALANCED SCORECARD IMPLEMENTATION IN PUBLIC ADMINISTRATIONS

BSC is a well established performance measurement and strategic management instrument which aims at balancing strategy and operations (for a discussion on the relationship of performance measurement and strategic management see Kaplan, 2001). However, when BSC is applied in PA (for an example case study see Poister, 2005; for a theoretical framework see Skok, 1989), the need for domain specific adaptations is often underestimated (Busch, 2004; Rocheleau and Wu, 2002). While BSC is originally derived from the private sector, characteristics of public organisations are habitually not fully appreciated (Alt, 2004). For instance, recent research on the relationship between politics and administration (Aberbach and Rockman, 2006) has proven the specific conditions of decision making processes in public organisations (Heikkila and Isett, 2004) which necessitate an effective domain-specific adaptation of the BSC concept (for a critical perspective see Holmes, et al., 2006).

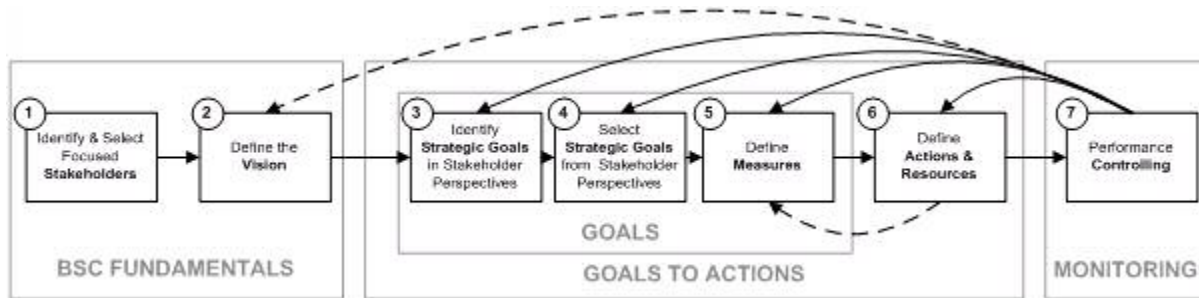


Figure 1: Schematic Balanced Scorecard Implementation Process (see Niehaves and Stirna 2006)

The BSC implementation process comprises several phases, each of them rendered by a specific task and concern. Literature provides us with a multitude of BSC implementation approaches (Kaplan and Norton, 1996b), 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. The tasks to be performed within a particular phase of the BSC implementation are often interconnected with each other so that several feedback loops may be compulsory (see again Figure 1). 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 (for details see Niehaves and Stirna 2006). The consideration of domain specifics throughout this entire process is essential (Alt, 2004; Busch, 2004; Rocheleau and Wu, 2002). Hence, for the PA sector domain characteristics in terms of the BSC as such as well as its development and implementation process have to be taken into account. For instance, PA perspectives, representing different BSC stakeholder groups, often differ from perspectives commonly applied in the private sector (for an exemplary BSC of a PA see Niehaves and Stirna, 2006). The political nature of decision making processes in PA as well as the differentiation between external (community) and internal (PA itself) stakeholders have to be addressed by a PA's BSC. Table 1 gives a review of a BSC implementation process focussing specifics of the PA domain.

Table 1: Public Administration-Specific BSC Implementation Process

Phase	Issues	Involved parties	Public administration specifics
(1) Identify & Select Stakeholders	Identification and selection of relevant stakeholder groups for public administrations	<ul style="list-style-type: none"> _ Top Management (here: political power, e.g., most commonly a mayor), _ BSC Project Management 	<ul style="list-style-type: none"> _ Citizens and businesses can be regarded as external ‘customers’. _ BSC approaches in public organisations must address a specific political perspective regarding the primacy of representative democracy. _ A differentiation between internal perspectives (public administration) and external perspective (community) is essential.
(2) Define the Vision	Definition of a long-term and sustainable vision for the organisation	<ul style="list-style-type: none"> _ Top Management, _ Stakeholder Representatives, _ BSC Project Management 	<ul style="list-style-type: none"> _ While political power can change every legislative period, a vision is a longer-term perspective. A public administration vision should thus span over various political streams. _ Possible differentiation between a general vision (for the community) and a derived internal vision (for the public administration). Commonly, the latter is a means to an end.
(3) Identify Strategic Goals in Stakeholder Perspectives	Identification of the goal landscapes for each stakeholder group	<ul style="list-style-type: none"> _ Management Representatives, _ Stakeholder Representatives, _ BSC Project Management 	<ul style="list-style-type: none"> _ While certain stakeholder groups actively articulate their goals, others are rather implicit. A democratic culture regularly requires stimulating an involving discussion. _ At present, a strategy gap exists in many public administrations. The use of creativity techniques might be applied to support a necessary paradigm change.
(4) Select Strategic Goals from Stakeholder Perspective	Selection of strategic goals that should be pursued	<ul style="list-style-type: none"> _ Top Management, _ BSC Project Management 	<ul style="list-style-type: none"> _ Decision making processes are essential to a democratic political system. Thus, BSC-based management has to consider the political nature of decision making processes in public administrations. Here, a political perspective does not only generate strategic goals, but also decides upon which strategic goals from the stakeholder perspectives should be taken into account.
(5) Define Measures	Definition of suitable measures to monitor the goal achievement	<ul style="list-style-type: none"> _ Management Representatives, _ Employees involved in the processes, _ BSC Project Management 	<ul style="list-style-type: none"> _ As public administrations in many countries are concerned with defining measures in the course of new public management approaches, integrating these efforts can avoid additional work. _ Defining measures is a pragmatic choice. To avoid additional (manual) work for data collection the question arises of which measures can be automatically data-supported, for instance, by integrating application software and data bases. As the IS landscape is often very heterogeneous in public administration interface design and data integration can be a severe problem.
(6) Define Actions & Resources	Definition of actions that need to be done in order to achieve the goals; Definition of resources to be used	<ul style="list-style-type: none"> _ Management Representatives, _ Employees involved in the processes _ BSC Project Management, 	<ul style="list-style-type: none"> _ Balanced scorecards support strategic management activities (in public administrations). While most operative processes in public administrations are daily routines, processes and projects that actually change the system of practice (for instance, a neighbourhood development project) commonly bear a greater strategic relevance and are, thus, more frequently considered in the BSC management approach. _ Resource interdependencies ought to be taken into account.
(7) Performance Controlling	Are the goals achieved? What problems occurred? Where to aim improvements?	<ul style="list-style-type: none"> _ Management, _ Controlling, _ BSC Project Management 	<ul style="list-style-type: none"> _ Regularly, new public management (NPM) approaches which address controlling issues to a certain extent have been adopted by public administrations. An integration of both NPM and BSC controlling efforts can avoid additional work and create acceptance. _ BSC-based strategic management is a continuous activity. In order to assure a feedback process and continuous improvement, (new) balanced scorecard and existing political decision making processes have to be jointly analysed and designed.

OPEN SOURCE SOFTWARE IN PUBLIC ADMINISTRATIONS

The term ‘Open Source Software’ (OSS) describes a software concept which comprises a particular licensing model, distribution model, and development model. Furthermore, OSS literature and practice also relate to this concept as “free and open source software” (Fitzgerald, 2006; Gay, 2002). This variation stresses the idea of freedom as the very core of OSS transcending the mere disclosure of source code. Here, freedom is related to in a fourfold manner: OSS is unrestricted concerning its use and purpose of use, the analysis of its functionality, its distribution, and its adaptation (Free Software Foundation, 2004; Gay, 2002). Thus the unrestricted access to a tool’s source code is merely a precondition to the second and the fourth aspects. In order to warrant the formerly specified freedom, OSS is released under certain licences approved by the Open Source Initiative (OSI) (Carbone and Stoddard, 2001). Here, major licences include, for instance, the GNU Public License (GPL), the Lesser GPL (LGPL), the Artistic License, the Berkeley System Distribution (BSD), and the Mozilla Public License (MPL) (Fitzgerald, 2006).

Aside from these characteristics of OSS artefacts as such, the open source development process also reveals certain particularities. Opposed to proprietary tools, OSS development lacks central control (Senyard and Michlmayr, 2004). Software is developed by a community of independent programmers frequently globally distributed (Michlmayr, et al., 2005). Although this collective typically does not resemble the mythical image of a group of highly talented developers dedicating their services to an idealistic idea (Michlmayr, et al., 2005; Rusovan, et al., 2005; Schach, et al., 2002) open source communities still comprise heterogeneous groups of individuals often motivated by incentives different from monetary gain (Ghosh, et al., 2004). In consequence of such an environment the OSS development process is often been referred to as bazaar-like in contrast to a cathedral-like development approach of proprietary software tools (Raymond, 1999).

However, recently the OSS phenomenon evolves from its original roots into a more mainstream and commercial viable form. Opposed to software developed from “an itch worth scratching” (Raymond, 1999) by a classical open source community there are more and more OSS development projects motivated and organised in a more professional manner (Fitzgerald, 2006). Corporate firms have become interested in the OSS phenomenon considering how to gain competitive advantage from it. They try to leverage free community manpower or the OSS brand. In order to safeguard their interests these firms systematically employ developers for participating or taking in leading roles in OSS projects. This leads to development processes becoming less bazaar-like and an OSS portfolio shifting from mainly back-office infrastructure to more visible front-office applications (Fitzgerald, 2006).

A trend to a professional harnessing of the OSS phenomenon may also be observed in the area of PA. This holds good for both the European level and the national level. On the former one the Open Source Observatory¹ has been founded. This institution is intended to encourage the spread and use of OSS best practices in European PA. Furthermore, a guideline for partnering with free software developers has been published by the European Commission (Ghosh, et al., 2004). Here, detailed recommendations are given on how to attract OSS developers in favour of software projects for PA. On a national level the German Federal Ministry of the Interior published and widely spread a software migration guide (German Federal Ministry of the Interior, 2005) which, amongst others, focuses the switch to OSS solutions. Moreover, a multitude of OSS-related activities is initialised by a German OSS competence centre² which, relating to its mission, resembles the European Open Source Observatory (Marquardt, 2004). Aside from these initiatives encouraging the use of OSS in PA, literature and practice already provide us with first practical examples of successfully implemented free software applications in the public sector (see for instance Becker, et al., 2005).

OPEN SOURCE BSC SOFTWARE FOR PUBLIC ADMINISTRATION

IT-support in BSC implementation and maintenance has become an obligatory, in that valuable, part of almost every BSC project (Günther and Grüning, 2002). Such systems allow for an efficient documentation and versioning of an enterprise BSC and foster its development process by providing graphical means to illuminate a scorecard structure. Furthermore, they offer a technical infrastructure supporting scorecard communication among all organisational entities of an enterprise. The provision of means for real time monitoring of key performance indicators is also one of a BSC software tool’s main advantages. Contemporary tools integrate data from operative systems or data warehouses for keeping objective compliance under surveillance and thus foster a real time exception handling and irregularity escalation.

¹ See <http://ec.europa.eu/idabc/en/chapter/452>.

² See http://www.kbst.bund.de/cln_006/nn_836964/Content/Software/OSS___Kompetenzzentrum/oss.html.

However, technically implementing BSC software tools in public organisations is confronted with severe problems. While a domain-specifically adapted BSC approach provides a valuable conceptual basis for business intelligence in PA, major problems arise when it comes to an operative technical implementation. The application of BSC software tools has to accomplish some domain specific requirements. Budgetary restrictions, as omnipresent as in the majority of PA (Pollitt and Bouckaert, 2005), necessitate low-cost solutions. Technological know-how deficits and a latent change resistance (Schedler and Proeller, 2003; Thom and Ritz, 2004) suggest a technologically evolutionary, rather than a revolutionary approach. A heterogeneous IS environment regularly leads to problems in systems interoperability (Becker, et al., 2004) and, thus, in (automatically) collecting BSC-relevant data. The prevailing ‘backwardness’ often to be observed in public organisations’ IT infrastructure hinders the automatic surveillance of BSC goal compliance. Both PA processes lacking a sufficient support by IS and the application of proprietary stand-alone software solutions (Becker, et al., 2005) impede self-controlled provision of data for BSC measurement. Furthermore, the technical environment in which PA specific BSC tools have to be implemented is currently subject to a substantial shift. Due to recent changes related to software standards and attitude towards OSS in the PA sector it is hard to predict how the software environment will evolve for this domain in the long run (Bahr, et al., 2000; Ghosh, et al., 2004; Statskontoret, 2003; Wheeler, 2005). Aside from technological instability, unsteadiness in the conceptual adjustment of BSC to the PA domain also imposes some specific requirements on its technical implementation. Due to the early status of the BSC adaptation process readjustment of developed IT solutions is in all probability. The design of such a system will probably take course in a trail and error process of assimilations. In a nutshell, the development and implementation of a BSC software tool in the PA sector is confronted with an environment characterised by:

- Financial restrictions,
- a lack of technology affinity and latent change resistance,
- a heterogeneous and changing information system infrastructure, and
- ongoing adaptation of the BSC concept to the PA sector.

The utilisation of web technologies, developing software on the basis and under the licence model of OSS, and integrating BSC and project management adequately addresses these PA specific particularities (see Table 2).

In order to test these hypotheses’ and theories’ feasibility we applied them in a design oriented case study in a medium-sized German PA in 2005. Our research relates to the area of design theory by contemplating on principles of how to design IS in the context of a specific domain (Gregor, 2006). The presented case study is thus not to be regarded as an extensive proof of theory, but as an initial step towards analysing its feasibility.

The environmental conditions for this project resemble the situation described in Section 1. The PA 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 above. However, due to budget limitations, utilising a commercial tool for this purpose was not feasible and therefore applying OSS became the favoured solution. A preceding evaluation revealed that there was no open source BSC software at that point of time. Therefore, a new OSS development project (BASIS – Balanced Scorecard based Information System) was initialised. It was benefited from basing the project on existing OSS solutions (PHP, MySQL, Apache web server, smarty template engine, PHPeclipse)³ and reusing the framework of an available open source application (dotProject⁴) for realising a modular software architecture.

³ See <http://www.php.net>, <http://www.mysql.com>, <http://httpd.apache.org>, <http://smarty.php.net>, and <http://www.phpclipse.net>. PHPeclipse is based on the open source platform-independent software framework eclipse (<http://www.eclipse.org>).

⁴ See <http://www.dotproject.net>.

Table 2: Public Administration-Specific BSC Software Tool Implementation

Concept	Addressed issue
Web technology	<i>Financial restrictions</i> _ Most of the components necessary for setting up a web IS are free of charge as they are developed under an OSS licence. For instance, the Apache web server, being the most popular system of its kind (Fitzgerald, 2006; Netcraft, 2006; Wheeler, 2005), may be used without paying any licence fees. _ As almost every PA is hosting a web site the IT infrastructure necessary for operating a web IS is often already in place. Therefore, the complexity of additional maintenance efforts is kept to a minimum. _ The centralised architecture of web IS 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.
	<i>Latent change resistance</i> _ Implementing a system which easily integrates with users' existing working environment fosters their acceptance. This applies for web IS which are handled by a commonly used browser. _ As users can operate 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.
	<i>Changing IS infrastructure</i> _ By applying web technologies for the development of new applications these become independent of the underlying software. The necessary software infrastructure for web applications being a web server and a browser exists for almost every operation system. Thus, a PA investing money in web technology-based applications stays flexible in future decisions related to changes in its software environment.
Open source software	<i>Financial restrictions</i> _ In the very core of the OSS concept is that this kind of software may be employed free of charge. Thus, the initial investment in an OSS solution is limited to the necessary IT infrastructure. This fact carries weight especially for systems serving a huge number of users as licence fees often are regulated by this factor. _ The internet offers an abundant source for free documentation and assistance for solving installation and maintenance issues. However, a sufficient degree of technical know-how within PA 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. _ Due to further cost advantages in system maintenance OSS is regularly found to outperform proprietary solutions concerning their total cost of ownership (Wheeler, 2005).
	<i>Ongoing adaptation process</i> _ Due to its incremental and rapid development process (Raymond, 1999), resorting to OSS supports flexible reaction to altered requirements. Raymond stressed this fact by characterising OSS development with the phrase "Release early, release often" (Raymond, 1999). Due to a prompt and independent peer review practice within open source communities, altered needs or identified bugs are instantaneously converted into new releases (Michlmayr, et al., 2005).
BSC and project management integration	<i>Heterogeneous IS infrastructure</i> _ Actions defined to accomplish BSC objectives often show features characteristic for projects. They have a specific objective – a BSC objective – to be accomplished under certain temporal and resource restrictions (for the definition of a project see Kerzner, 2003; PMI, 2004). Thus, supporting the execution of the specified BSC actions via a project management software tool offers the ability to automatically obtain BSC relevant data. 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.
	<i>Latent change resistance</i> _ Assigning projects to organisational objectives explicates the contribution every employee participating in a project makes to the fulfilment of the overall vision. Everyday operative work becomes directly linked to strategic targets preventing the BSC concept from being misunderstood as an abstract concept out of touch with reality. Therefore, the integration approach caters for a higher degree of user acceptance and commitment to the concept of BSC.

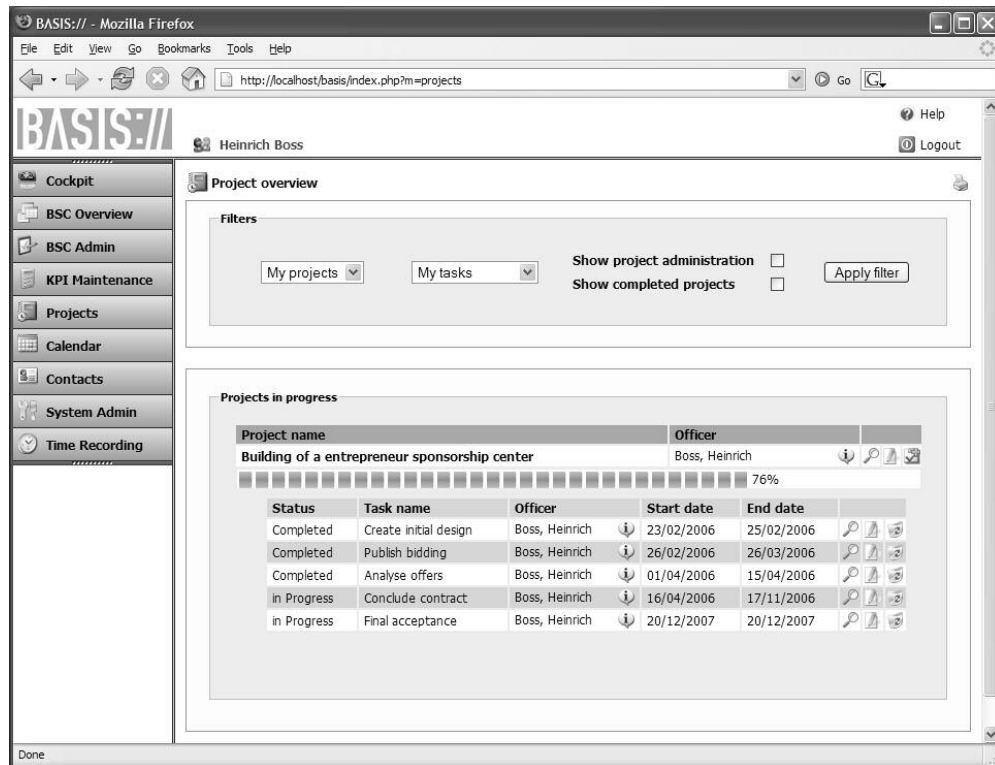


Figure 2: BASIS Project Management

BASIS provides a wide range of functions presented by a clear user interface. As explicitly demanded by the PA 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. 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 (see Figure 2). Here, Key Performance Indicators (KPI) function as a central construct. The progress of tasks as well as the adherence to budget and time restrictions is supervised and evaluated by the system. On this basis, a variety of KPI are derived pointing out possible negative effects on the attainment of BSC goals.

Both the specification of a BSC adhering the particularities of PA and the development of a conformable OSS BSC and project management tool took eight months in total. In this regard falling back on existing OSS 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 PA. Although the developed web system does not act as an all-embracing BI solution it serves as a practical starting point to gradually evolve IT infrastructure for backing PA on its move to market- and output-oriented management.

CASE STUDY ANALYSIS AND RESULTS

According to Lee (1989), 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 strategic MIS 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 IS), 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 OSS approach, an integration of project management functionalities, and a web technology implementation. These design decisions have been taken into practice during the course of this case study. Here, especially the BSC concept can be understood as an initial approach to strategic management and business intelligence for PA (Alt, 2004; Busch, 2004; Scherer, 2002). 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 strategic MIS efforts in the organisation within a five year horizon. The OSS 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 European PA 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 (Becker, et al., 2004), or latent change resistance (Schedler and Proeller, 2003; Thom and Ritz, 2004). 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 will affect most PA within the same time horizon. Other BSC case studies do provide similar insights, even though there might be country-specific adaptations.

- 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 OSS 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 above). Firstly, project management software support was explicitly demanded by several employee(s)/(groups). Secondly, the given PA had restricted resources available for the project so that a feasible and practicable alternative to a huge IS integration (comprising, for instance, the population register, land register, (diverse) accounting systems, external databases, finance monitoring system, council information system, etc.) was found. These issues took place in the presented case study, however, other BSC implementation projects chose dissimilar paths (Scherer, 2002), mainly against the background of different resource alimentations.

As a consequence, the case study setting can be – regarding its strategic MIS maturity – considered as typical medium-sized European PA. 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 OSS approach or an integration of project management functionalities.

CONCLUSIONS AND FUTURE RESEARCH

There exists a high demand for strategic management and business intelligence solutions in PA. Here, BSC – adapted to the specific domain of PA – 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 PA:

- 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 PA.
- A conceptual combination of BSC-based strategic MIS 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 PA.
- Applying web technologies for PA 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 3).

In order to provide evidence supporting the concept feasibility, a case study implementation was conducted. Following the case study implementation, further evaluation is necessary (see, for instance, Gupta and Jana, 2003). 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.

In addition, PA research is inherently bound to country or regional specifics (if not explicit comparative research). To name a few, the administrative system, the organisational culture, or the legal framework are major circumstantial factors which may vary deeply. Though research has shown that the case study data and the design decisions are generalisable to European PA to a great extent (see previous Section), future research is necessary on how far these findings can be applied to US or Asian PA.

Table 3: Design Science Research Assessment

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 Ortner 2004). As a consequence, an aim is to create a language community relating to the issue of interest (Becker et al. 2006; Kamlah et al. 1973).
Addressing a relevant problem	<ul style="list-style-type: none"> _ A strategy gap exists in many public administrations. While some New Public Management approaches address the issue of strategic management, a full exploitation of available information technology is rarely to be found in public administration practice. _ While BSC acts as a strategic management concept, the need for its domain specific adaptations 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 public administrations, favour low-cost solutions.
Making a research contribution	<ul style="list-style-type: none"> _ A research contribution was made in terms of the design, case study implementation, and post-implementation analysis of an integrated BSC and project management software. It is based on an open source approach, employs web technologies and enacts a domain-specific BSC concept for public administrations. This domain-specific approach seeks to extend existing strategic management approaches in the public sector and to further take up New Public Management initiatives.
Choosing an adequate research method	<ul style="list-style-type: none"> _ Conceptual and theoretical-argumentative method as well as empirical case study implementation was chosen as research method.
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 retaining 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 in public administrations.
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). _ AMCIS 2007 Design Science track is chosen as presentation outlet as we expect valuable feedback from both public management and technology/information systems experts.

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