# EVALUATING E-GOVERNMENT

*A Process-oriented Approach*

Christian Seel, Oliver Thomas, Bettina Kaffai, Thomas Matheis

*Institute for Information Systems (IWi) at the German Research Center for Artificial Intelligence (DFKI), Saarbruecken (Germany), iwi@iwi.uni-sb.de, http://www.iwi.uni-sb.de*

Abstract: After the initial phase of E-Government and the exaggerated expectations for the new internet-based technologies, a pragmatic state of mind has evolved during the last few years. Thereby, it is especially the evaluation of the related financial benefits that has become a crucial aspect. The paper presented outlines a process-driven approach for the analysis of technology-driven performance impacts based on performance indicators. From a German perspective, existing evaluation concepts were concretized for the case scenario of German Plan Approval Procedures.[1]

Key words: Business Process Management, Process Performance, Public Administration, E-Government

## 1. MOTIVATION

With the rise of Electronic or E-Government, public administrations (PAs) all over the world are forcing the usage of modern information and communication technologies (ICT). Aiming at an increase in efficiency, cost-effectiveness and transparency, the highest objective is to achieve the transaction-oriented and seamless integration of all parties involved. This requires well-defined approaches considering the organizational, as well as the technical perspective. In this context, process models constitute a well-proven and widely accepted instrument for merging technological and organizational aspects. In general, they can help PAs to revise their process struc-

[1] The results are based on the research project "RAfEG – Reference Architecture for E-Government", funded by the German Ministry for Education and Research.

tures, support change management and enable technical customizing and implementation.

In this context, the concepts from the area of the New Public Management (NPM), which aim e.g. at the creation of "lean" structures, constitute a precious enabler for the successful implementation of technical solutions and their usage [14] [15] and provide well-proven concepts. Since the late 1960's initial reform attempts were undertaken, but did not obtain the anticipated effect [1]. In the 1980's, the NPM initiated a reform process that continues even today and was introduced worldwide in PAs. It comprises administrative reform strategies led by an economical interpretation of administrative processes [18]. The core elements contain the setup of a decentralized management and organizational structure, the control of outputs, as well as competition and customer orientation [11]. Additionally, the NPM's basic principle of target-oriented management offers concepts and principles for controlling the efficiency and effectiveness-impact of E-Government solutions.

As to the last-mentioned aspect, adequate and approved performance indicators which complement the E-Government process structures should be incorporated into the models. By doing so, the control of process efficiency according to the PA's strategic goals is facilitated. In addition, benchmarking among various PAs can be easily conducted if their E-Government processes are based on common indicators and corresponding indicators. The indicators may as well be benchmarked with the same indicators in conventional processes that don't use ICT, thus showing the potentials of E-Government and justifying further efforts.

The presented paper outlines an approach for the setup of performance indicators as an integrated part of process models. In the first part, basic aspects of Process Performance Measurement within PAs are described. A case scenario from the German ministerial administration demonstrates the concrete realization.

# 2. FRAMEWORK AND APPROACHES

## 2.1 The House of Business Process Management

Experience in the area of business engineering show the need for a comprehensive, methodological framework in order to consider all the relevant factors for effective and efficient ICT usage. With the ARIS – House of Business Process Management (HOBE) shown in Figure 1, a widely accepted approach is available. Even if the concept was originally invented for

the business area, its basic logic is of common validity and can also be used in the field of PA [4].

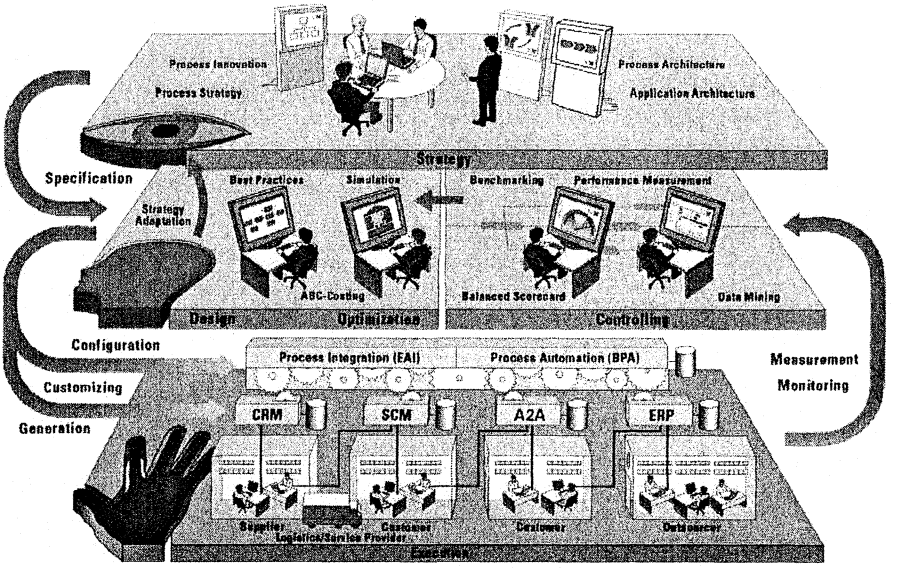



*Figure 1.* HOBE – House of Business Process Management [16]

Level one – the Strategy Level – builds the foundation for process-related activities. Aspects such as the identification of E-Government-relevant processes, corresponding process architecture or necessary applications are defined here. The overall administrative mission and strategy define the limits for the definition of process-related aspects. On level two – the Design and Optimization Level – the concrete appearance of E-Government processes according to the preferences defined at level one is fixed. Existing structures must be analyzed and – if necessary – revised. New processes for areas nonexistent in the past are defined according to optimization principles. In this context, the usage of reference processes allows the consideration of best practices and leads to time and cost advantages in designing process structures. The realization of these processes by selecting and using adequate technological concepts such as Enterprise Resource Planning or workflow or document management systems is part of the Execution Level. During their daily operations, the systems deliver a variety of data indicating the actual performance of the supported process structures. The performance information is transferred to the Controlling Level, which assures the analysis of the as-is performance. Here, the availability of process models that provide a set of performance indicators and basic principles for the measurement's realization is of crucial interest.

The ongoing comparison of the actual performance indicator's value with their performance goals allows a systematic and planned revision of the processes. These feedback-mechanisms support continuous process management based on exact and valid data. At the same time, the process performance shows the impact of the E-Government solutions and their effectiveness. Thus, the evaluation of the cost and efficiency-related measures, such as the average cycle time, calculation of the resulting cost structures and their comparison to the Return-on-Investment-related target values support the monitoring of the E-Government solution's profitability.

The aspects of the Process Performance Measurement as outlined above show the basic principle of comparing as-is measures to target values in order to define the degree of goal fulfillment. Starting with the aspects set on the first level of HOBE, the strategic goals must be "translated" into concrete measures and targets for operative process monitoring.

Reference Models can support this initiation of Process Performance Measurement by providing various sets of performance indicators and operational definitions for the measurement. According to the basic idea of reference modeling – the creation and application of common-type models valid for a class of application scenarios – the model's user selects the measures and then uses them as a basis for "customizing", according to the framework conditions of "his" administrational unit. Because of the actual lack of adequate reference models which meet the requirements of E-Government [12] [7] [19], integrated systems of reference processes, metrics and measuring procedures are missing. Additionally, the fields of NPM and E-Government are often strictly separated in administrational practice without using the complementary possibilities. Nevertheless, the design of best-practice measurement scenarios, their link to the identified E-Government processes, as well as concepts for the ongoing, system-based measurement are of crucial importance for controlling E-Government success. Various concepts are already available in the area of NPM which support the development of measurement approaches as part of reference models for E-Government. Focusing on the strategy and controlling levels, the following sections outline the development of measurement scenarios and demonstrate the potential of NPM-driven concepts for dealing with E-Government challenges.

## 2.2 Evaluating E-Government – Implications on the Strategy Level

As mentioned above, the first step on the strategy level is the identification of the relevant E-Government processes, as well as the definition of the corresponding process architecture. The aspect mentioned last is realized in a top-down approach that systematically specifies the various relevant proce-

dures from a high to a detailed level. The relevant specifications are deduced from the E-Government strategy, which should e.g. contain the ranking of administrative outputs according to their E-Government impact. Considering the services' specific target groups, the main success factors, such as cycle times, quality of service or cost efficiency, can be evaluated as a basis for the definition of target values indicating the performance of the E-Government processes.

Here, the Balanced Scorecard [9] concept could be useful in realizing the systematic link between E-Government strategy, process strategy and strategic targets. The Balanced Scorecard is a multi-perspective approach aiming, on the one hand, at the "balance" of a strategy by considering various perspectives and on the other, on the operationalization of the corresponding strategic goals and their "translation" into a set of measurable targets. Originally, the concept was developed for the business area and contained the financial, customer, business process and learning perspective. The perspectives are interrelated through cause and effect relationships showing the ability to realize the strategy and to monitor this relationship.

In the meantime, the benefits of this instrument of strategic management have become widely accepted – also within the sphere of the PA. Various examples demonstrate the successful usage, such as in US city administrations [8], the Austrian federal government [6] or various federal ministries in Germany [17]. In the context of E-Government, the Balanced Scorecard concept helps to operationalize the administration's E-Government strategy. In a first step, the high-level strategic goals are extracted or formulated and assigned to the perspectives, which must be explicated in advance (e.g. financial, process, technical and recipient's perspective). The verification of the interdependencies between the targets enables the proof of the strategy's completeness. Subsequently, a set of performance indicators covering the various perspectives is developed for each strategic goal in a top-down approach.

## 2.3 Evaluating E-Government – Implications on the Design Level

The design of the E-Government process on the design level is based on the specifications from the strategic level. From the areas of process and quality management, a wide set of procedure models is available which support the concrete project procedure. Referring to the usage of performance indicators, two areas of use are possible. First, an initial measurement of the as-is processes focuses the process outputs and leads to the evaluation of the actual process performance. Its comparison to the performance goals shows the necessity and potentials of the process optimization. Second, the data

analysis based on the process specifics and its inputs helps to find the so called "root causes", meaning the concrete aspects that are responsible for the performance gaps and that have to be re-designed in order to optimize the process structures. The result consists of adequate and E-Government-strategy conform process structures.

The definition of the measurement scenarios is tied closely to the activities on the controlling level of HOBE, because the ongoing performance measurement which monitors the new processes after the completion of the process design and the technical implementation is based on the specifications done during the optimization projects. Approaches which help to define the indicators are presented in the following section.

## 2.4 Evaluating E-Government – Implications on the Controlling Level

On the Controlling Level, the process-oriented measurement scenario is developed and implemented based on the findings of the design level. As mentioned above, the process output represents the object of consideration for the process performance's evaluation. Accordingly, the performance indicators represent so-called "output measures". Their target values are based on the – internal or external – requirements. The comparison to the as-is values shows the overall process quality and performance.

For the development of the measurement scenarios, possible indicators are collected in a first step, with regard to the strategic objectives, in order to build a basic pool. The most appropriate ones are selected according to their potential for indicating the performance and impacts of process adjustments. Thus, it is crucial to focus the "key"-indicators, concentrating on the relevant and easy collectible data [13]. Operational definitions, such as the description of the measure's characteristics, the availability and source of data, the measurement period or those responsible for the data collection are defined in the second step. Finally, the target values for each indicator are concretized on the basis of as-is values [6]. The ongoing comparison to these performance goals allows the evaluation of process performance. In addition, the as-is performance before implementing an E-Government solution – e.g. evaluated in the early process design phase – can be used as a so-called "baseline". The gap between this baseline and the as-is performance values after the E-Government implementation shows efficiency improvements or lacks and also allows the evaluation of the (financial) benefits.

The comparison of the as-is performance to the target values corresponds to the concept of benchmarking, which is a well-proven management instrument. The general intention consists in the analysis and improvement of organizational performance and the ability to execute. Based on performance

indicators, a comparison with "Best in class"-results enables the evaluation of improvement potentials [3]. The development of performance indicators and the corresponding measurement specifics for the benchmarking in PAs is subject to a variety of approaches especially on the municipal level. They provide "ready-to-use" measurement scenarios and can support the evaluation of relevant indicators. From the German perspective, the performance indicators provided by the German "IKO Net", initiated and coordinated by the KGSt, a public consulting agency for municipal administrations, represent a widely accepted approach. More than 1,600 municipal administrations are members of the IKO Net. The aim of this network is to provide a basis for municipal administrations which allows them to benchmark their performance in selected areas on a regular basis. The KGSt serves as a "catalyst" and provides a total of 56 sets of performance indicators and the corresponding operational definitions for 35 fields of administrative activities, such as human resource or waste management. The participating municipalities' measurement results are stored in a central database which is maintained by the KGSt and is used for interorganizational performance comparisons [10]. Because of its extent and usability, this concept was chosen to inspire the design of performance indicators as part of a process model which is the subject of the case study presented in section 3.

Additionally, concepts of quality management help to structure measurement scenarios and support the definition of adequate metrics. The Common Assessment Framework (CAF) shown in Figure 2, provides nine dimensions and the corresponding sets of criteria which enable the self-assessment and evaluation of strengths and improvement potentials for PAs. The CAF was initiated by the ministers of the EU in 2000 and is based on the model of the European Foundation for Quality Management and the performance ratios of the Speyer Quality Contest. The nine rating categories, assigned to the categories "Enablers" and "Results", focus on aspects of organizational development and contain criteria for performance ranking. The definition of the categories follows the basic logic as outlined in section 2.3: The evaluation of the results leads to the as-is performance ("Measurement"), whereas the analysis of the enablers shows the causes for the actual performance level ("Analysis"). The criteria used for the evaluation of the actual performance per category are explained within the CAF as questions and come with rating scales. During the self-assessment, the parties involved must answer these questions by using the scales [2]. As a consequence, the measurement of performance aspects, e.g. based on the indicators of the IKO Net, facilitate this process.

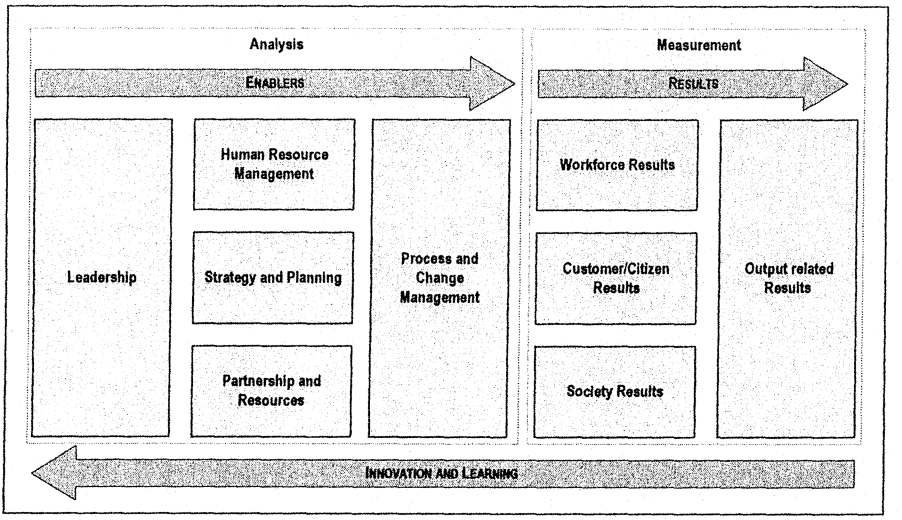



*Figure 2.* CAF – Common Assessment Framework [2]

The second part of the activities at the controlling level is the ongoing measurement and analysis of process performance according to the specified metrics and measuring principles. The collection of data can be realized in different ways depending on the PA's individual requirements. Accordingly, manual data collection and analysis can be carried out using questionnaires or scoring lists and spreadsheets as for example, provided by Excel. In order to use the automation potentials in deducing the relevant data from the executive systems according to the basic idea of HOBE, the usage of professional performance management tools is crucial.

The following case scenario demonstrates the development of a measurement scenario based on the outlined approaches for the domain of the Plan Approval Procedure within the traffic environment. The goal of the corresponding research project "RAFEG – Reference Architecture for E-Government" is the design of a comprehensive reference process model, as well as the implementation of a prototype which covers the corresponding technical components for the process execution. The reference model will – in addition to reference process structures – provide typical performance indicators and measurement concepts in order to allow a coherent process performance measurement.

## 3. CASE SCENARIO

The first step of the RAFEG project was the development of a process model for the case scenario of Plan Approval Procedures. These specific administrative procedures take place for all public construction efforts, such as the construction of streets, airports or railways and legitimate building projects as far as public interests are concerned [5]. In order to construct the process model for Plan Approval Procedures, three main steps were carried out as shown in Figure 3. First, the legal framework was analyzed in order to get an overview of the specific regulations affecting the processes. Based on this, in a second step, the development of an initial, component-based process scenario was realized which served as a basis for the as-is evaluation of "real life" procedures in various administrations on the German federal state level. Last but not least, the additional information gained here was integrated into the models in order to complete them.

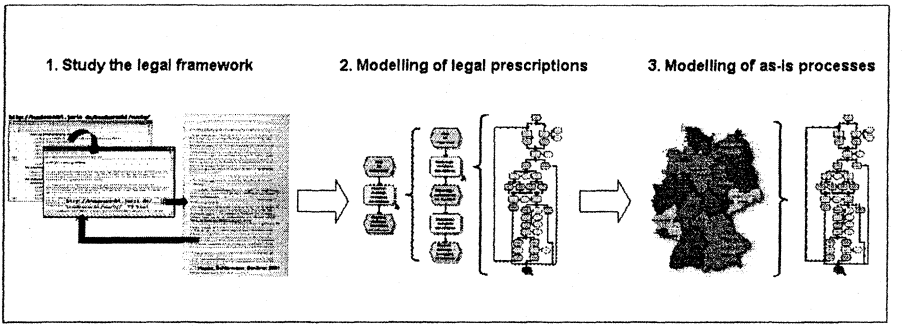



*Figure 3.* Project procedure – A detailed overview of the procedure for the development of the process model is documented in [19]

Figure 4 gives an overview of the process module "gather statements" which serves as an example for the development of the measurement scenario. Here, stakeholders such as for example, nature conservation organizations and public agencies, are invited to give their feedback based on planning documents specifying the construction project. The plan approval agency collects and stores the incoming statements as a basis for subsequent negotiations on project modifications. The collection and documentation of the involved organization's declarations represent one of the module's outputs and serves as input for the following module "handle objections and statements".

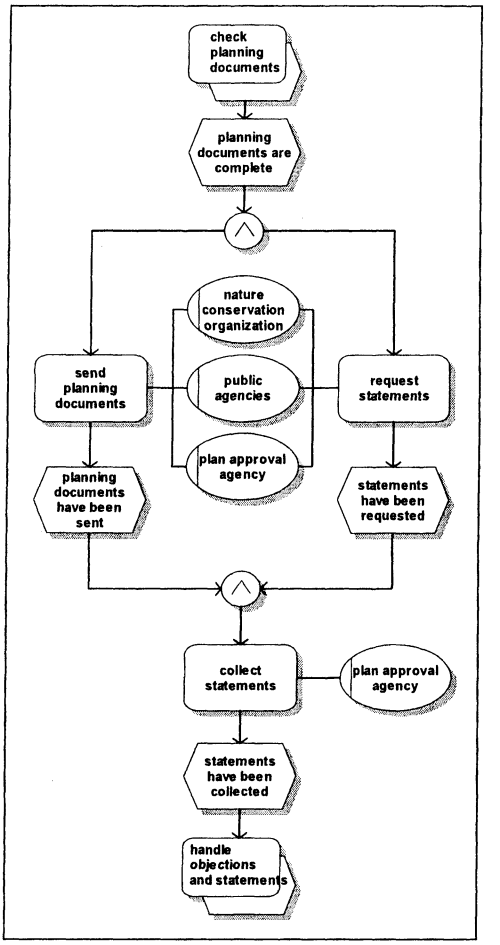



*Figure 4.* Process module "Gather statements"

For the identification of performance indicators and measures, the monitoring of process quality, process costs and the cycle time were named as the partner administration's target dimensions. In order to operationalize them for the entire process, the CAF-result dimensions and their accompanying criteria provided an initial point. The usage of the European concept covers the requirement of common validity for the process model-related performance indicators. Table 1 demonstrates the selected aspects and their assignment to the target dimensions.

In the next step, the evaluation criteria were operationalized for the various process modules in order to enable concrete measurement and performance evaluation. Hereby, the performance indicators of the IKO Net, covering the areas of "environmental conservation" and "construction planning",

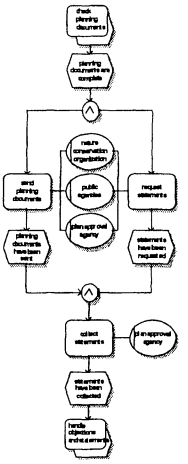
provided precious input. Table 2 shows the measures and their operational definitions. According to the principle of output orientation, the indicators are tied to the process module's results. The displayed output measures characterize the process output "sent planning documents".

*Table 1.* Evaluation criteria

| Rating Category | Evaluation Criteria | Addressed Targets |
|---|---|---|
| Output related Results | Cost effectiveness | Process costs |
| | Efficiency· | Cycle time |
| | Involvement of the internal stakeholders | Process quality |
| | Ability to satisfy the stakeholder's requirements | Process quality<br>Process costs |
| | Budget fulfillment· | Process costs, quality |
| | Fulfillment of financial targets | Process quality |
| | Ability to satisfy the stakeholder's financial requirements· | Process costs |
| | Effective use of resources | |
| Customer/Citizen Results | Number of complaints | Process costs, quality |
| | Cycle time of the complaint processing | Cycle time |
| | Involvement of Stakeholders | Cycle time |
| | Received and documented proposals | Process quality |
| | Customer Relationship Management | Process quality |
| | Number of returned files containing defects | Process costs, quality |
| Workforce Results | Number of sick leaves | Cycle Time |
| | Fluctuation rate | Process quality |
| | Productivity | Cycle time<br>Process costs |
| Society Results | Consideration of environmental aspects in decision processes | Process quality |

Beyond those shown, a set of performance indicators and measurement specifications was developed for each of the process modules. The link to the relevant CAF "Result" dimensions and the corresponding evaluation criteria ensured the completeness of the measurement scenarios. The experience gained has shown, that the consideration of process structures on a high level is sufficient and ensures concentration on crucial indicators. Additionally, the definition of measurement scenarios per process module ensures the ability of the staff responsible to monitor "their" process modules. The accumulation of the collected data leads to the performance evaluation of the overall process "Plan Approval Procedure". Based on the specifics defined within the measurement scenario, those in charge within the PAs can select and customize measurement specifics. The setup of a process performance measurement is facilitated and time and cost advantages are realized.

*Table 2.* Output measures process module "Gather statements"

| *Process module* | *Output* | *Performance indicator* | *Explication* | *Unit* |
|---|---|---|---|---|
|  | *Output 3.2: Sent planning documents* | 3.2.1 Total of sendouts | Number of planning documents sent to the recipients | pcs. |
| | | 3.2.2 Number of defective units | Number of documents that contain a defect: formal defects as e.g. missing recipients; content related defects as e.g. missing documents | pcs. |
| | | 3.2.3 Average cycle time | Period between the reception of the planning documents and their sendout compared to the total of sendouts | dys. |
| | | 3.2.4 Number of corrections | Number of process cycles (re-work) that have to be performed to eliminate defects | pcs. |
| | | 3.2.5 Average correction time | Period between the approval of a defect and its elimination compared to the number of defective units | dys. /unit |
| | | 3.2.6 Percentage of rework related costs | Process cost for reworks including staff and other resource cost compared to the total costs | % |
| | | 3.2.7 Total process costs per unit | Costs per sent document | € |
| | | 3.2.8 Percentage of efforts | Plan approval agency's efforts caused by the sendout compared to the total efforts | % |

# 4. CONCLUSION

This paper outlined the development of process performance indicators and measurement scenarios which enable the implementation of a Performance Measurement for E-Government processes. Based on approaches developed in the field of NPM, the indicators and their operational definitions have been explicated and linked to process modules which cover the case scenario of German Plan Approval Procedures. At present the project is still in progress and first as-is measurements are realized at the PAs involved in RAFEG in order to achieve a baseline for the actual process performance and to find realistic target values considering the requirements of the stakeholders involved. The data already available, such as total cycle times, is collected and new data, such as the number of defective outputs, is evaluated. In a later phase, the prototypically developed system-components for the execution of the Plan Approval Procedures will be implemented and provide the required data. At this stage, the implementation of the indicators in a professional tool for process performance management providing interfaces to the prototype is intended. The comparison to the actual baseline will show the impact of ICT usage and display the benefits of the E-Government approach within the field of Plan Approval Procedures.

# 5. REFERENCES

[1] Lothar Beyer; Hans Brinckmann: Kommunalverwaltung im Umbruch: Verwaltungsreform im Interesse von Bürgern und Beschäftigten, Bund-Verlag, Cologne, 1990, pp. 14–20.

[2] Deutsches CAF-Zentrum: Common Assessment Framework (CAF) : Ein gemeinsames Europäisches Qualitätsbewertungssystem. German Ministry of internal affaires, Berlin, 2003, p. 6.

[3] Oliver Grieble: Modellgestütztes Dienstleistungsbenchmarking – Methoden, Implementierung, Anwendung, Eul, Lohmar, 2004, p. 24–30.

[4] Ralf Heib: Effiziente Verwaltungsprozesse durch E-Government, in: Scheer et al. (Eds.): Innovation durch Geschäftsprozessmanagement : Jahrbuch Business Process Excellence 2004/2005, Springer, Berlin, 2004, pp. 385–394.

[5] Werner Hoppe; Hans Schlarmann; Reimar Buchner: Rechtsschutz bei der Planung von Straßen und anderen Verkehrsanlagen (3. compl. rev. ed.). Beck, Munich, 2001.

[6] Christian Horak; Franz Schwarenthorer: Die Balanced Scorecard in der öffentlichen Verwaltung, Ministry for public services and sports, Vienna, 2002.

[7] Erika Horn; Thomas Off: eGovernment-Architekturen auf Basis der eLoGo-Referenzmodelle, in: Nierhaus (Ed.): KWI-Projektberichte, Nr. 9, University of Potsdam, Potsdam, 2004, p. 4.

[8] Robert S. Kaplan: City of Charlotte, Harvard Business Review, Boston, 3/1999.

[9] Robert S. Kaplan; David P. Norton: The balanced scorecard – translating strategy into action, Harvard Business School Press, Boston, 1996.
[10] KGSt: Arbeit mit Kennzahlen, Teil 1: Grundlagen, KGSt, Cologne, 2001.
[11] Ralf Klischewski; Klaus Lenk: Understanding and Modelling Flexibility in Administrative Processes, in: Traunmüller; Lenk (Eds.): Electronic Government. Proceedings of the first International Conference, EGOV 2002, Aix-en-Provence, France. Springer, Berlin, 2002, pp. 129–136.
[12] Klaus Lenk: Prozessmodelle für eGovernment, in: Kubicek et al. (Eds.): Innovation@Infrastruktur : Informations- und Dienstleistungsstrukturen der Zukunft. Jahrbuch Telekommunikation und Gesellschaft 2002, Hüthig, Heidelberg, 2002, pp. 199–205.
[13] Udo Rienaß: Die wirkungsorientierte Steuerung im Landeseinwohneramt Berlin – Kennzahlen und Leistungsvergleiche, in: Kuhlmann; Bogumil; Wollmann (Eds.): Leistungsmessung und -vergleich in Politik und Verwaltung : Konzepte und Praxis, VS Verlag für Sozialwissenschaften, Wiesbaden, 2004, pp. 186–203.
[14] Kuno Schedler: eGovernment und neue Servicequalität der Verwaltung? in: Gisler; Spahni (Eds.): eGovernment: Eine Standortbestimmung (2. ed.), Paul Haupt, Berne, 2001, pp. 33–51.
[15] Kuno Schedler; Isabella Proeller: New Public Management (2. ed). Paul Haupt, Berne, 2003, p. 83.
[16] August-Wilhelm Scheer: ARIS – House of Business Engineering, in: Becker; Rosemann; Schütte (Ed.): Referenzmodellierung : State-of-the-Art und Entwicklungsperspektiven, Physica, Heidelberg, 1999, pp. 2–21.
[17] Andreas G. Scherer; Jens-Michael Alt: Strategische Steuerung und Balanced Scorecard. Bundesverwaltungsamt, Berlin, 2002.
[18] Eckhard Schroeter; Hellmut Wollmann: New Public Management, in: Bandemer; Blanke; Wewer (Eds.): Handbuch zur Verwaltungsreform, Leske + Budrich, Opladen, 1998, pp. 59–70.
[19] Oliver Thomas et al.: EPK-Referenzmodelle für Verwaltungsverfahren, in: Nuettgens; Rump (Eds.): EPK 2004 : Geschäftsprozessmanagement mit Ereignisgesteuerten Prozessketten. Gesellschaft für Informatik (GI), Bonn, 2004, pp. 39–54.