2009

Business Process Assessment and Evaluation in Public Administrations using Activity Based Costing

Follow this and additional works at: http://aisel.aisnet.org/amcis2009

Business Process Assessment and Evaluation in Public Administrations using Activity-Based Costing

Jörg Becker
European Research Center for
Information Systems
becker@ercis.uni-muenster.de

Philipp Bergener
European Research Center for
Information Systems
Bergener@ercis.uni-muenster.de

Michael Räckers
European Research Center for
Information Systems
raeckers@ercis.uni-muenster.de

ABSTRACT

Public administrations in Germany currently face challenges of cost reduction and modernization. Furthermore, Pan-European directives foster process harmonization and introduction of IT-supported and optimized processes. Hereby activity-based costing can be a useful instrument for process assessment and evaluation. Especially through the introduction of New Public Management and double-entry accounting Public Administrations in Germany now get the opportunity to use cost-centered accounting mechanisms to assess process performance and evaluate their activities in a holistic concept. Process Modeling can be a useful instrument to help the public administrations to structure their activities and capture information about them and thereby create a basis for activity-based costing. Therefore, the aim of this article is combining the domain specific process modeling method PICTURE and concept of activity-based costing for supporting Public Administrations in process assessment and evaluation.

Keywords

E-Government, Domain Specific Process Modeling Activity-Based Costing, Business Process Assessment.

INTRODUCTION

Public administrations currently face great challenges. On the one hand the demands on public administrations rise. The quality of services has to increase, the service delivery has to be accelerated and made transparent to the customer (Janssen 2005). At the same time the pressure for reducing the costs for daily work grows. Against the background of declining tax revenues, cities and municipalities in Europe in particular have to deal with improving and redesigning their work routines (Becker, Niehaves, Algermissen, Delfmann, and Falk 2004; Gronlund 2002). Therefore, the support of the business process through IT like specialized procedures and cross-section technologies like workflow management systems plays a crucial role. However, this also represents a further cost factor.

Through New Public Management (NPM) new possibilities of cost control for public administrations arise. With NPM the way of accounting in German public administrations changes from the classical fiscal accounting to double-entry accounting as known from the private sector (Hood 1995). Based on this new accounting approach, administrations have the possibility to introduce an almost complete resource usage concept (Jackson and Lapsley 2003). Elements like target agreements concerning products and a contract management with the employees are essential constituents of this reformation.

Activity-based costing is a useful instrument for public administrations. Public administrations, as an overhead intensive service sector, are suited particularly well in this case. NPM offers relevant data basis for activity-based costing. It allows for assessing administration processes from a cost perspective in different overhead areas (Brown, Myring, and Gard 1999; Jackson and Lapsley 2003). The obtained cost rates can be used for cost control as well as for comparing administrations and for comparing as-is and to-be costs.

Process models are an appropriate measure for supporting activity-based costing. The process models are used for transparency issues concerning the knowledge of activity flows and for documenting the often implicit process knowledge of the employess. Thus, process modeling provides a qualitative description of activities, providing in depth-understanding and thereby a starting point for the quantitative analysis with activity-based costing (Tornberg, Jämsen, and Parakno 2002). With business process modeling public administrations face specific challenges because their highly diversified product portfolio

often contains more than 1,000 processes (Algermissen, Delfmann, and Niehaves 2005). Using generic modeling languages like event-driven process chains (Scheer 2000) or BPMN (Object Management Group 2008) often turns out to be very difficult due to the large amount of processes (Becker, Algermissen, and Falk 2007). The modeling method PICTURE, which has exclusively been developed for the needs of public administrations, has proved to be adequate for this field of application. It has been used for modeling and analyzing by now more than 1,000 processes in public administrations successfully (Pfeiffer 2008).

The contribution of this article is the combination of the domain-specific modeling method PICTURE and the concept of activity-based costing. This integration enables public administrations to model their processes fast and easily, to asses them from a cost perspective and based on this to carry out a process assessment and evaluation of reorganization activities.

In the following chapter explains the basic concepts of activity-based costing and its applicability to public administrations. Afterwards the PICTURE method is presented as a modeling method especially developed for public administrations. In the fourth chapter both concepts are compared, their connection is set up and illustrated using an example. This article concludes with a summary and an outlook to future research areas.

ACTIVITY-BASED COSTING IN PUBLIC ADMINISTRATIONS

The central idea of activity-based costing is to change the way how overhead costs are broken down on outputs like products or services. Instead of distributing the overhead as a fixed percentage of direct costs, activity-based costing assigns costs according to the resources used for producing the outputs. The resource consumption by the outputs is measured through their usage of certain activities or processes. Activities are tasks performed by an organization's employees which consume resources. In turn the activities are needed to create the outputs. The frequency of execution for an activity is determined by the cost driver, an "event associated with an activity that results in the consumption of […] resources" (Babad and Balachandran 1993). To calculate the activity cost driver rate – the cost rate for a single execution of an activity – the total costs for caused by the activity are divided by the cost driver. The total costs of an activity result from the share of the activity to the overall capacity of the resource. Sometimes, the factor allocation resources costs to activities are called resource drivers (Cokins, Stratton, and J. 1993; Gupta and Galloway 2003).

Due to these properties activity-based costing is especially suitable for application areas with a high overhead fraction. That is mainly the case in personnel intensive areas like the service sector. In service companies basically all benefit processes can be included in the activity-based costing. Activity-based costing is therefore a well suited and useful costing instrument for the service sector (Ruhl and Hartman 1998). Public administrations mainly provide services, too. Therefore, personnel costs often are the dominating cost factor in this sector. At the same time, departments often offer multiple services at once in an administration and often several derparments are involved in providing a service. Activity-based costing can help to allocate this large amount of overhead costs to the services of the public administrations than simple measures like the number of employees of a organizational unit or their share of budget (Brown et al. 1999).

The execution of activity-based costing requires identification, structuring and recording of the relevant activities or processes. A method that has turned out to be very useful for recording, documenting and also analyzing processes is process modeling (Green and Rosemann 2000; Shanks, Tansley, and Weber 2003). That is why it is not surprising that also in literature respective approaches to integrate the two instruments have been discussed (Tatsiopoulos and Panayioto 2000; Tornberg et al. 2002). However, a more detailed examination of the conceptual fit between different approaches is still missing.

PICTURE METHOD

PICTURE is a domain specific modeling method (Guizzardi, Pires, and Sinderen 2002; Luoma, Kelly, and Tolvanen 2004; van Deursen, Klint, and Visser 2000) which has been developed specifically for public administrations. The target when developing the PICTURE method was on the one hand to represent preferably the complete process landscape of an administration with justifiable effort and on the other hand to create process models which can be used for further semi-automatic analysis. For a more profound introduction to PICTURE cf (Becker, Bergener, Kleist, Pfeiffer, and Räckers 2008; Becker, Pfeiffer, and Räckers 2007). Like many other modeling approaches PICTURE differentiates several views on the modeling object for reducing complexity when modeling. PICTURE distinguishes four views:

Process View

The process view describes the operational structure of the administration in the form of single activities and the hence evolving processes. At the same time the process view integrates all other views by recording "who" carries out single activities, "with what" they are carried out and "what" is edited respectively produced. The central element of the PICTURE

method and thus also of the process view are the process building blocks. Each process building block represents a typical activity in the sequence of work of public administrations. This strictly defined language construct facilitates modeling because it refers to the known vocabulary of the domain. An overview of the building blocks is presented in Figure 1.
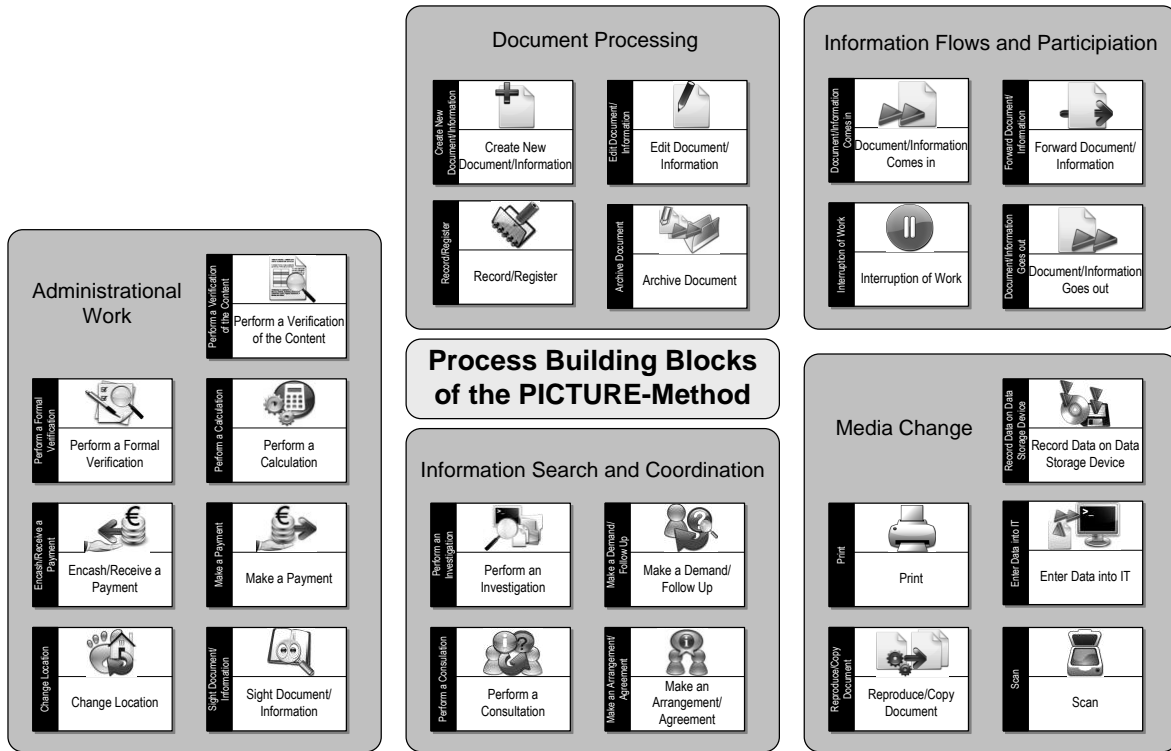

Figure 1. PICTURE Process Building Blocks

For describing the details of an activity execution more closely and for recording properties which are necessary for subsequent evaluations the PICTURE building blocks are specified in more detail by attributes. For example, for the building block *Document/Information Comes in* attributes like *Input Channels*, *Received Document* or *Used Information Systems* and the *Sending Organizational Unit* are recorded. The attribute *Input Channels* is an example for an attribute which requires multiple entries which have to be weighted. In PICTURE this is presented by a percentage distribution. Another important attribute also with regard to supporting activity-based costing is the *required processing time* which can be found in many building blocks like e.g. *Enter data into IT*.

At the next structural level building blocks are composed to sub processes. Thereby a sub process is understood as a sequence of activities (process building blocks) which are carried out within one organization unit by one administrative employee and which contribute to the performance of a task of the complete process. Sub processes contain attributes, too. Here it is for instance recorded how often the sub process is carried out per year (*number of cases*) and who is responsible for its execution.

Within sub processes the modeling of process building blocks is done strictly sequential. This is due to the reason that one sub process only comprises those activities which one single administrative employee carries out. Therefore, it is assumed that he can only do one task at a time. Furthermore, it is possible that for one sub process several alternative operational variants exist, e.g. due to a decision (acceptance respectively rejection). For representing such a situation PICTURE offers two different constructs. One the one hand, attributes can be used, like the above described attribute *Input Channels*, where different cases can be represented by entering percentages. On the other hand, it is possible to define sub process variants. Such a sub process variant describes the alternative execution of the sub process from start to finish.

Sub processes are composed to processes. A process is characterised by providing exactly one benefit for the customers of an administration. Examples for such processes are *Moving an identity card* or *Extending the parking permit*. In the simplest

case a process consists of exactly one sub process; processes passing through several organisation units consist of more than one sub process.

Besides the differentiation regarding the refinement of the modelling levels to processes, sub processes, variants and finally process building blocks, aggregating processes to products is also possible by combining processes to groups or superior groups. These groups represent products, product groups etc. The procedure leads to a hierarchy of services which opens out into a comprehensive product catalogue. For example, the processes for applying for, extending and giving notice of the loss of a passport can be combined into the group *passport affairs*. A potential superior group for processes concerning identity cards would be "pass documents".

Organisation View

In the organisation view the organisational structure of the administration is represented in a hierarchical composition of the different organisational units and positions. The organisation units are the basic elements of the organisation view. The organisational units are responsible for the execution of process aspects within the processes. That is why in PICTURE sub processes are assigned to organisational units.

Besides the organisational units, positions and administrative employees are also to be maintained in this view. This is of special importance regarding the determination of personnel costs. Different position types and according properties like cost rates and capacities are specified for the positions.. This allows for recording the relevant costs for employees as they are assigned during the modelling with PICTURE to the respective position. This is relevant for a subsequent automated analysis. Besides the mere storage of cost rates it is also important to state here to which process building block attributes these cost rates will be assigned (i. e. specifiying the resource drivers for the cost reates). In the field of personnel cost this are mainly time attributes like processing time.

Business Object View

The business object view contains information concerning the necessary input (e.g. applications) and the corresponding produced output or possible intermediate products (e.g. statements or notifications) of an administrative process. Here, all services including internal support processes for customer related services which can provide an assessable input or output are important because cost can and should be assigned to all these elements. It does not matter from a modelling perspective whether the input was created within the administration or whether it was given from the outside. An internal input has to be the output of another sector and thus can be quantified. This can be internal order documents or information. An external input normally does not cause costs until it arrives. These costs are measured and operationalized via the process view.

Resource View

The resource view shows which work equipment is needed for providing an administrative service. That is, for example, software applications like MS Office or specialised procedures as well as hardware (printer, scanner) or judicial information like laws. The resource view contains element types for representing these non-organisational work supporters as well as *sources* and *targets* of the business objects. In their roles as work supporters resources can be compared to the already mentioned element types of the organisation view. In their roles as *sources* or *targets* of business objects they determine where business objects – especially documents and information – come from and where they are stored like e.g. in specialised procedures. In the context of activity-based costing the resource modelling serves for adding these cost types like printing or archiving costs to the activities in which they are used. Thus, a product-centred addition of the respective costs will be possible if the required cost rates are stored with the resources in the PICTURE method. Thereby the corresponding attributes from the method have to be assigned to the resources like e.g. the attribute "printed pages" to a printer.

INTEGRATION OF ACTIVITY-BASED COSTING AND PICTURE

Comparison of Method Elements

To integrate activity-based costing and the PICTURE method, the different constructs of both instruments have to be compared and assigned to each other.

Activity-based costing is applied to allocate costs to outputs. In general these could be for example products or services. In the context of public administrations as a information processing organisation, the suitable output are the administration's services as they do normally not produce material goods. This corresponds to the concept of a product in PICTURE.

PICTURE uses different levels to structure the activities needed to deliver a service. The top level - the processes - encapsulates all activities needed to deliver a process while a sub-process depicts activities within a certain organizational

unit. Process building blocks finally are the atomic level to describe activities in PICTURE. In contrast, activity-based costing does only have the concept of activities which are not further structured. The examples in the literature show activities on a quite high level of abstraction like "process orders"(Anderson and Kaplan 2003) or "disbursing Materials" (Cooper and Kaplan 1998). These examples seem to be similar to a sub-process in PICTURE, as activities in activity-based costing are used to distribute resources costs which are normally associated with single organisational units. However, the concepts of processes and process building blocks can be easily integrated in activity-based costing. Processes allow for an accumulation of the cost of several activities conducted while delivering a service, while the detailed level of process building can help to break down activities further and therefore makes it easier to capture the resources used by an activity through the attributes of the building blocks.

Activity-Based Costing	PICTURE
output	product
primary process	process
sub-process	sub-process
activity	process building block
	building block attribute
cost driver	business object
ressource	ressource
	position

Table 1. Comparison of Elements of Activity-Based-Costing/PICTURE

Cost drivers in activity-based costing denote the determining factors (e.g. amount of building applications) that are responsible for the execution frequency of a main process. Such inputs or outputs can be represented in PICTURE by means of the processed object view. The respective amount of process and sub-process executions per year is recorded in form of an attribute on the process level and sub-process level, respectively.

The resources, respectively the resource consumptions, determine which costs are produced by activities. The most important resource in this context is the labour utilisation. The resource labour is modelled with the aid of the organisation view. In this view it is possible to deposit the payment and the (annual) labour time of a certain position. On the basis of these data the minute-by-minute wage rate can be calculated. The other resources are recorded in the resource model. The allocation of resources to activities happens by annotating the resources to the according building block.

Table 1 summarizes the above mentioned considerations in tabular form.

Activity-Based Costing in PICTURE – an Example

To conduct activity-based costing in PICTURE the relevant services and activities have to be identified in accordance to the activity-based costing approach. For this purpose the definition of a process in PICTURE, which is geared to the external services of the public administration, can provide assistance. In the presented example this is the process "Modification of an income tax card" which in turn consists of the sub process "Modificate income tax card".

The identified processes have to be modelled subsequently with the PICTURE method. Thereby the attributes which are relevant for the activity-based costing, especially the used resources and the personnel in charge, have to be recorded. The sub process "Modify income tax card" is depicted in Figure 2.
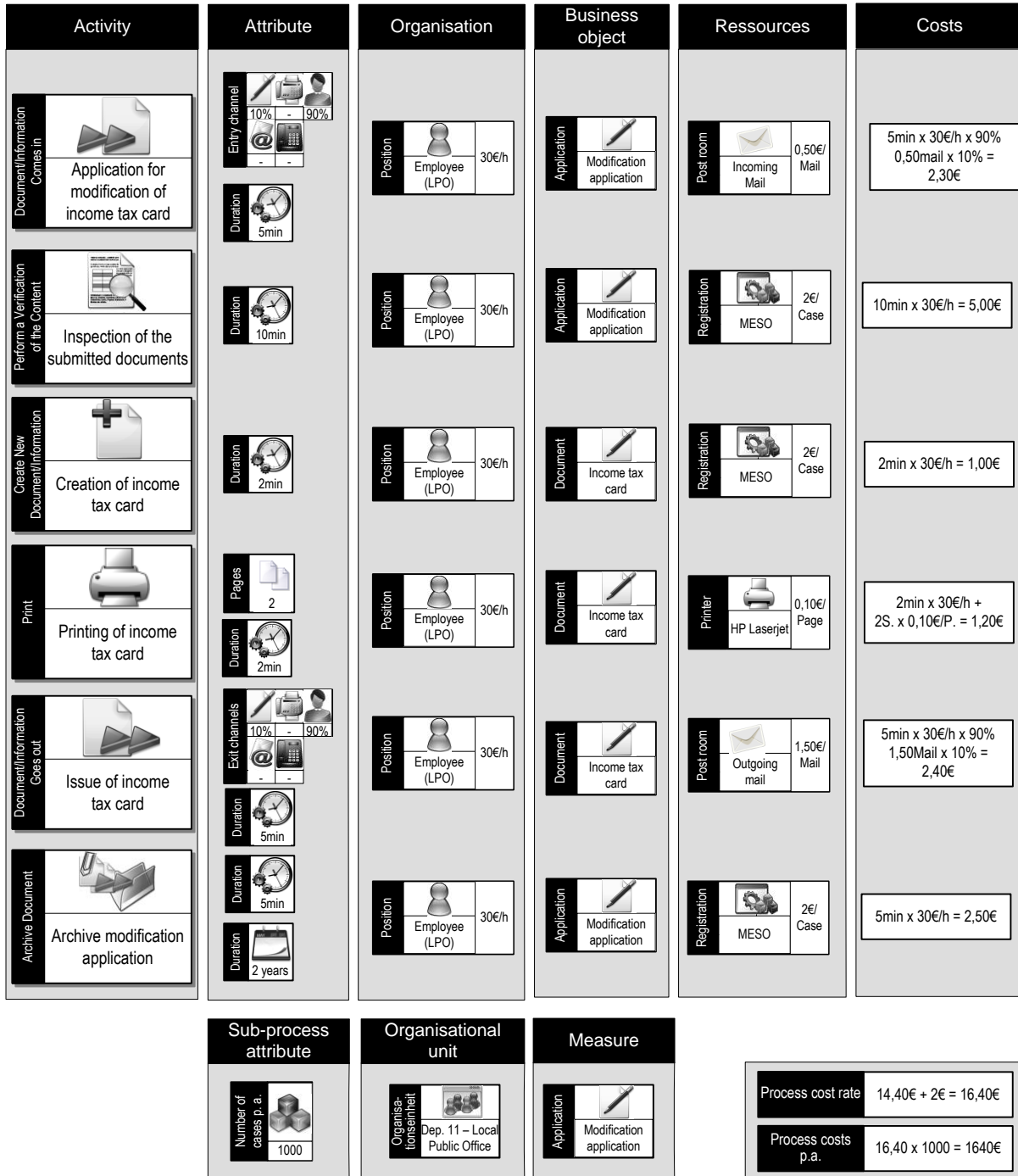
Figure 2. Exemplary process "Modifyincome tax card"

The respective partial cost rate can be calculated if the corresponding cost information is deposited in the organisation model and in the resource model. In the example of Figure 2 the deposited cost rate of an employee of the Local Public Office amounts to 30€ per hour. The second activity, the inspection of the submitted documents, therefore results in labour costs of 5.00€. The first activity incorporates also the attribute values of the input channel to the calculation. The labour costs only occur if the application is submitted in person by a citizen. In case of a postal submission, the deposited cost rate for the used resource *post room - incoming mail* comes into operation. Hence, PICTURE does not only allow the ascertainment of costs for the resource labour, but also for arbitrary other resources. Another example is provided by the fourth activity and the

annotated resource *Printer*. The costs can be calculated on the basis of the amount of printed pages (resource driver) and the stored cost rate.

The cost rate for the sub process can be calculated on the basis of the cost rates of the single activities. The costs incurred by the use of the software Meso form a special case in the presented example. Here, a cost rate per (sub) process execution is calculated, which is consequently incorporated in addition to the activity cost rates into the sub process cost rate. The product of this rate and the respective resource cost driver, in this case the amount of modification applications, results in the annual sub process costs. The sub process cost rates can be further aggregated to main process costs.

CONCLUSION AND OUTLOOK

Public administrations in Germany face far reaching internal reforms. The introduction of New Public Management, the pressure arising in the course of modernisation to design workflows more efficiently and more transparently and to provide the services more customer-oriented and conveniently results in a multiplicity of projects and efforts geared towards change. Activity-based costing can help to assess and evaluate the performance of newly created and reorganized processes. Furthermore, intra- and inter-municipal benchmarking can be applied and a comparison of as-is and to-be processes is possible. Process modelling has proven itself to be a useful tool to generate the data pool needed for activity-based costing. Particularly the application of modelling approach that is especially tailored to a certain domain leads to a quicker and easier acquisition and analysis of information. The possibility to capture processes and process-related information in a efficient way is especially important for the application of activity-based costing as the main criticism on this instrument are the enormous costs for interviewing and surveying people to gather the relevant information {Anderson, 2003 #64}.

The present article underlines how the domain-oriented modelling approach PICTURE and the concept of activity-based costing can be combined to support public administrations. The example shows that the information gained during the phase of modelling suffice to make consolidated statements about the process costs accounting for personnel costs as well as other types of resource consumption. Thus, it enables decision makers in deciding e.g. on IT-investments or organisational changes. Based on that, further research activities should particularly concentrate on the development of a procedure model that standardizes the application of activity-based costing in the area of public administrations and on the empirical evaluation of activity-based costing with the use of the PICTURE method.

REFERENCES

1. Algermissen, L., Delfmann, P., and Niehaves, B. (2005) Experiences in Process-Oriented Reorganisation through Reference Modelling in Public Administrations - the Case Study Regio@Komm, *Proceedings of the 13th European Conference on Information Systems (ECIS 2005)*, Regensburg.
2. Anderson, S.R., and Kaplan, R.S. (2003) Time-Driven Activity-Based Costing, *Harvard Business Review*, 82, 11.
3. Babad, Y.M., and Balachandran, B.V. (1993) Cost Driver Optimization in Activity-Based Costing., *The Accounting Review*, 68, 563-564.
4. Becker, J., Algermissen, L., and Falk, T. (2007) Prozessorientierte Verwaltungsmodernisierung - Prozessmanagement Im Zeitalter Von E-Government Und New Public Management, Springer, Berlin, u.a.
5. Becker, J., Bergener, P., Kleist, S., Pfeiffer, D., and Räckers, M. (2008) Model-Based Evaluation of Ict Investments in Public Administrations, *Proceedings of the 14th Americas Conference on Information Systems (AMCIS 2008)*, Toronto, Canada, 1-10.
6. Becker, J., Niehaves, B., Algermissen, L., Delfmann, P., and Falk, T. (2004) Egovernment Success Factors, in Traunmüller, R. (Ed.) *Proceedings of the 3rd International Conference on Electronic Government EGOV 2004*, Zaragoza, Spain, 503-506.
7. Becker, J., Pfeiffer, D., and Räckers, M. (2007) Domain Specific Process Modelling in Public Administrations - the Picture-Approach, *Proceedings of the 6th International EGOV Conference (LNCS 4656)*, Regensburg, 68-79.
8. Brown, R.E., Myring, M.J., and Gard, C.G. (1999) Activity-Based Costing in Government: Possibilities and Pitfalls, *Public Budgeting and Finance*, 19, 2, 3-21.
9. Cokins, G., Stratton, A., and J., H. (1993) An Abc Manager's Primer, Irwin Publishing, Chicago.
10. Cooper, R., and Kaplan, R.S. (1998) Measure Cost Right: Make the Right Decision, *Harvard Business Review*, 66, 96-105.
11. Green, P.F., and Rosemann, M. (2000) Integrated Process Modeling: An Ontological Evaluation, *Information Systems*, 25, 3, 73-87.
12. Gronlund, A. (2002) Electronic Government - Design, Applications and Management, Idea Group Publishing, Hershey et al.

13. Guizzardi, G., Pires, L.F., and Sinderen, M.J.v. (2002) On the Role of Domain Ontologies in the Design of Domain-Specific Visual Modeling Languages, *Proceedings of the 2nd Workshop on Domain-Specific Visual Languages, 17th ACM Conference on Object-Oriented Programming, Systems, Languages and Applications (OOPSLA 2002)*, Seattle.

14. Gupta, M., and Galloway, K. (2003) Activity-Based Costing/Management and Its Implications for Operations Management, *Technovation*, 23, 131-138.

15. Hood, C. (1995) The 'New Public Management' in the 1980s: Variations on a Theme, *Accounting, Organizations and Society*, 20, 2-3, 93-109.

16. Jackson, A., and Lapsley, I. (2003) The Diffusion of Accounting Practices in the New "Managerial" Public Sector, *The International Journal of Public Sector Management*, 16, 5, 359-372.

17. Janssen, M. (2005) Modeling for Accountability: The Case of the Virtual Business Counter, *Proceedings of the 11th Americas Conference on Information Systems (AMCIS 2005)*, Omaha, NE, 2021-2029.

18. Luoma, J., Kelly, S., and Tolvanen, J.-P. (2004) Defining Domain-Specific Modeling Languages - Collected Experiences, in Tolvanen, J.-P., J. Sprinkle and M. Rossi (Eds.) *Proceedings of the 4th Object-Oriented Programming Systems, Languages, and Applications Workshop on Domain-Specific Modeling (OOPSLA 2004)*, Vancouver.

19. Object Management Group (2008) Business Process Modeling Notation, V1.1.

20. Pfeiffer, D. (2008) Semantic Business Process Analysis - Building Block-Based Construction of Automatically Analyzable Business Process Models, Münster.

21. Ruhl, J.M., and Hartman, B.P. (1998) Activity-Based Costing in the Service Sector, *Advances in Management Accounting*, 6, 147-161.

22. Scheer, A.-W. (2000) Aris - Business Process Modeling, Springer Publishing, Heidelberg et al.

23. Shanks, G., Tansley, E., and Weber, R. (2003) Using Ontology to Validate Conceptual Models, *Communications of the ACM*, 46, 10, 85-89.

24. Tatsiopoulos, I.P., and Panayioto, N. (2000) The Integration of Activity Based Costing and Enterprise Modeling for Reengineering Purposes, *International Journal of Production Economics*, 66, 1, 33-44.

25. Tornberg, K., Jämsen, M., and Parakno, J. (2002) Activity-Based Costing and Process Modeling for Cost-Conscious Product Design: A Case Study in a Manufacturing Company, *International Journal of Production Economics*, 79, 1, 75-82.

26. van Deursen, A., Klint, P., and Visser, J. (2000) Domain-Specific Languages: An Annotated Bibliography, *SIGPLAN Notices*, 35, 6, 26-36.