Management of Process Knowledge in Public Administrations

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Abstract

Public administrations are facing an intense reorganization pressure. As a basis for their reorganization decisions they need transparency about their process landscape. To achieve this, the implicit process knowledge within the administration has to be explicated. In the City of Münster this issue has been addressed with the project PICTURE@MS. In this project the PICTURE-method and its corresponding web-based tool for coarse granular modelling of the whole process landscape in public administrations was applied. Result of the project was a complete documentation of the process landscape of seven involved departments which has been made accessible via the web-based PICTURE-tool on the intranet of the public administration.

Keywords: *E-Government, Process-oriented Knowledge Management, Public Administration, Business Process Modelling*

1 Knowledge Management – Challenges for Public Administrations

Nowadays public administrations are facing several challenges. The political consolidation process within the European Union strongly affects the public sector. The harmonisation of member state laws exerts a significant influence on the organisational structures of public administrations. For municipal administrations this means that more tasks are delegated from the federal and state governments. At the same time the services level demand from citizens and companies is increasing while tax revenues are shrinking. To cope with this situation public administrations are forced to rethink their resource allocation and to reduce costs.

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However, the space for necessary adjustments is limited as the major part of administrational task is mandatory for legal or political reasons. Therefore modernisation projects are mainly focused on reorganisation potential within the administrations' services [4, 11] and their underlying process [8]. But this service portfolio is much diversified. Municipal processes include more than 1,000 interconnected and interdependent services and underlying processes for citizens, companies, and other administrational parties [1]. As public administrations are large organisations, the knowledge about those processes is often decentralized and not sufficiently documented. To make the right reorganisation decisions it is, however, necessary to expatiate, consolidate and manage this knowledge. Therefore, it is an important goal of reorganisations projects in public administrations to create organisation and process transparency. This means for a public administration to be aware of the activities and the organizational units involved in their processes. This knowledge can be used to get a general idea of the process landscape and to further analyse the structure of the organization. Explicit knowledge about the processes can also support new employees within their workflows by guiding them trough the activities and describing the required resources.

In this paper the PICTURE-method is presented which allows for capturing the process knowledge [13] of an organisation. Based on the project PICTURE@MS it is shown how a public administration can addresses the current challenges by applying the PICTURE-method. The goal of this project has been to explicate and document process knowledge of seven departments and to identify reorganisation potential such as support of certain processes with ICT.

The remainder of this paper proceeds as follows. Firstly, based on the specific characteristics of the public sector in the context of knowledge management, requirements for a domain-specific [5, 14] process modelling method are defined. Subsequently, the PICTURE-method is described as a core contribution, which efficiently captures the process knowledge and landscape of public administrations. Afterwards, it is shown how the PICTURE-method has been applied in the City of Münster. Different approaches to capture the processes are presented as well as possible ways to structure the process and thereby provide easy access to them. Then, based on the experiences made in these projects, the degree of performance regarding to the requirements defined in this paper is explained and limitations are shown. The paper closes with a summary of the results and an identification of further research.

2 Requirements for a Process Knowledge Management Approach

Conceptual modelling has proven to be an efficient way to expatiate and document implicit process knowledge. It can also serve as basis for process improvements and further analysis. Based on the characteristics of the public sector and the goal of capturing the whole process knowledge of the public administration with an adequate effort, the following requirements were derived:

Simple representation of the process landscape: Establishing transparency by capturing the process knowledge of the administration to get an overview over its actions requires a complete recording of all processes. To model the whole process landscape of a public administration with acceptable efforts a simple language is required. The modeller must understand all constructs of the language. Furthermore, the syntactical rules of a modelling language must also be easily comprehensible. In order to achieve this requirement, the modelling language should exhibit a minimal set of constructs [9]. Constructs which are not required, unnecessarily increase the complexity of a modelling language. A less complex, domain specific language is easier to learn and thus, allows for more efficient modelling as all constructs are pre-defined with meanings of the application domain. Simultaneously, however, the domain specific modelling language has to be powerful enough to gather all relevant aspects of the processes.

Creation of maintainable process models: If the process models should continuously be used as documentation and basis for further process improvement, it is an important requirement that the models are always up-to-date. To accomplish this, the maintenance of the models has to be achievable with minimal efforts. As the modelling of processes is not the main business of officials in a public administration the models should be less complex and easy to grasp. This enables domain experts to apply the method, at least partially, on their own without the aid of a modelling expert. The capability to modify a model without a modelling expert promotes the regular incorporation of the changes in the organisation into the process models.

Web-based representation of the product catalogue: In order to be useful for the public administration the captured information should be easily accessible. That is to say the process knowledge should be available at all workplaces in the administration. This can be realized with a web-based solution within the intranet of the administration. For the modelling method this implies the requirement, that the models can be created, accessed and maintained with a web-based tool.

Creation of comparable process models: The inherent structural analogies within and between public administrations offer high potential for reorganisation projects. Therefore, it is not sufficient to analyse the process models of an organisation independently from each other. Rather, it is essential to identify similar or deviating structures in models [6]. Thus, the models must be syntactically and semantically comparable. However, if two models are compared, type conflicts, naming conflicts and structural conflicts can arise [2, 7]. *Type conflicts* occur whenever the same fact of an application domain is represented by using different constructs of a modelling language. *Naming conflicts* emerge due to the use of synonym and homonym terms in conceptual models. *Structural conflicts* result from a description of reality at diverse levels of abstraction (abstraction conflict) or whenever domain terms are modelled differently detailed (conflict of detail) [6]. Therefore, in order to identify common patterns and weaknesses which occur in multiple processes it is necessary to address these conflicts to make the models syntactically and semantically comparable. To get comparable process models in this way the degree of freedom for the modellers has to be limited. The modelling language itself should ensure that the same issue in two different cases and considered from two different persons is modelled the same way [3]. Enabling the comparison of process models admits the identification of reorganisation potential by considering the entire process landscape.

Based on these requirements, the PICUTRE-method was developed as a domain-specific approach to expatiate and present the process knowledge of a public administration.

3 Documenting the Process Knowledge with the PICTURE-Approach

3.1 Description of the PICTURE-Approach

The PICTUE-method consists of three steps. Besides the *modelling method*, which is subject of this paper, there is a *method for customisation* of the modelling method and *analysis method.*

The *PICTURE-modelling method* focuses on a strong involvement of the officials of an administration in the modelling project. There are certain questions for example about the execution of processes and the frequency of certain tasks that can only be answered by a responsible official or his supervisor. Due to the fact that, in order to represent the entire process landscape, many officials must participate, the collection of the processes by a central modelling team is very time consuming. It is a main contribution of the PICTURE-approach to enable modelling in a distributed

manner. Furthermore, the collection of the process models must be performed in a coarse granular form to reduce time and efforts for modelling. PICTURE has been designed as a simple and intuitive modelling method focusing on officials in public administrations. The mechanisms of the PICTURE-approach allow for independent and local modelling activities and are described in the following:

Process Building Blocks: The basic constructs of the PICTURE modelling language are domain specific *process building blocks* (cf. Table 1). A process building block represents a certain set of activities within an administrational process. Examples for those building blocks are "Incoming Document" (Figure 1) or "Enter Data into IT".

Process Building Block	Definition of the Process Building Block
Incoming Document	A document which arrives from an internal or external source.
Create Document	A new document is generated.
Scan	Information are digitalised
Consultation	A citizen is consulted by an official.
Enter Data into IT	Facts or documents are manually entered into an IT system.
Forward Document	A document is internally forwarded.

Table 1: Examples for process building blocks.

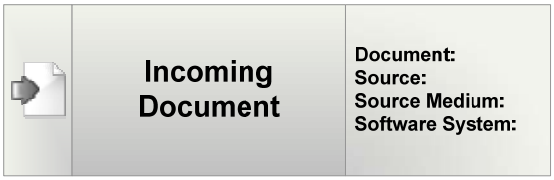

Figure 1: The process building block "*Incoming Document.*

Process building blocks have been specifically developed for public administrations and apply the vocabulary of this domain. As they are domain specific the meaning of a process building block is characterized by a corresponding domain statement. Thus, the process building blocks dispose of a fixed, informally defined, domain specific semantics.

In PICTURE process building blocks are the only way to describe processes. Processes are represented as a sequential flow of building blocks. The use of process building blocks restricts the degrees of freedom of the modeller and simultaneously promotes the construction of structurally comparable models. Since only process building blocks can be used, the type of each model element is not just syntactically but also semantically fixed. Problems like *naming conflicts* in a

model comparison are avoided because the name of a process building block is predefined by the language designer rather than being specified the modeller.

Attributes: With building blocks the sequential order within administrational processes can be specified. Additional facts about the processes can be collected with the help of *attributes* assigned to the process building blocks. These attributes specify, according to the required information, the properties of the corresponding building blocks in detail. For example possible attributes for the process building block “Enter Data into IT” are “Source”, “Source Medium“ or “Processing Time” (cf. Table 2). Altogether, PICTURE contains nearly 50 different attributes. Attributes provide the core information for a subsequent process analysis, in which, according to the predetermined goals, corresponding weaknesses and potentials are detected.

Attribute	Definition of the Attribute
Document	The name of the document which is moved or processed. For example an application form or an official notification.
Source	Source of a document or information, e g. a person, organisational unit or organisation.
Source Medium	The medium in which a document or information arrives. For example telephone, fax, mail or e-mail.
Processing Time	Time in minutes it takes to complete a certain activity.
Software System	The name of the software system which is involved in this activity.

Table 2: Examples for attributes including their definitions.

Sub-Processes: In PICTURE a process can consist of several *sub-processes* (cf. Figure 2 b)). A sub-process is a process section being carried out by a responsible official or a position within a single organisational unit. Sub-processes are sequentially connected and can be linked together to visualise a whole process. The majority of the modelling activities take place on the sub-process level. As processes can span over multiple organisational units the differentiation between processes and sub-processes makes it possible to delegate modelling tasks to the responsible official who enacts the activities. Within the scope of the sub-process the responsible official can collect all relevant information and represent them in the form of process building blocks and attributes. For example, the process “Towing a motor vehicle” in a public administration can have the sub processes “Execution of towing”, “Creation of towing file”, and “Opposition proceedings”. However, some processes contain only one sub-process (cf. Figure 2 a)). An example is the process “Notification on fees for a motor vehicle”.

Sub-Process Variants: The modelling with the PICTURE-language is strictly sequential. PICTURE offers no language constructs to represent forks in the course of process building blocks. It is also not possible to model iterations. The reason for this is to simplify the modelling process for domain experts, as they perform their tasks in a sequential manner. To describe technically important ramifications in the process flow, PICTURE offers two possibilities: On the one hand attributes can be used to specify different cases with percentage values. For example an incoming document can arrive in 50% of the cases through the communication medium mail, in 30% per email, and in 20% per fax. On the other hand it is possible to specify process variants (Figure 2 c)). A *process variant* defines an alternative sequence within a sub-process. Process variants contain in comparison with the original sub-process many common process building blocks. However, some of the process building blocks have been modified, new ones have been added and some have been removed. The frequency of a process variant can be weighted by percentage values.

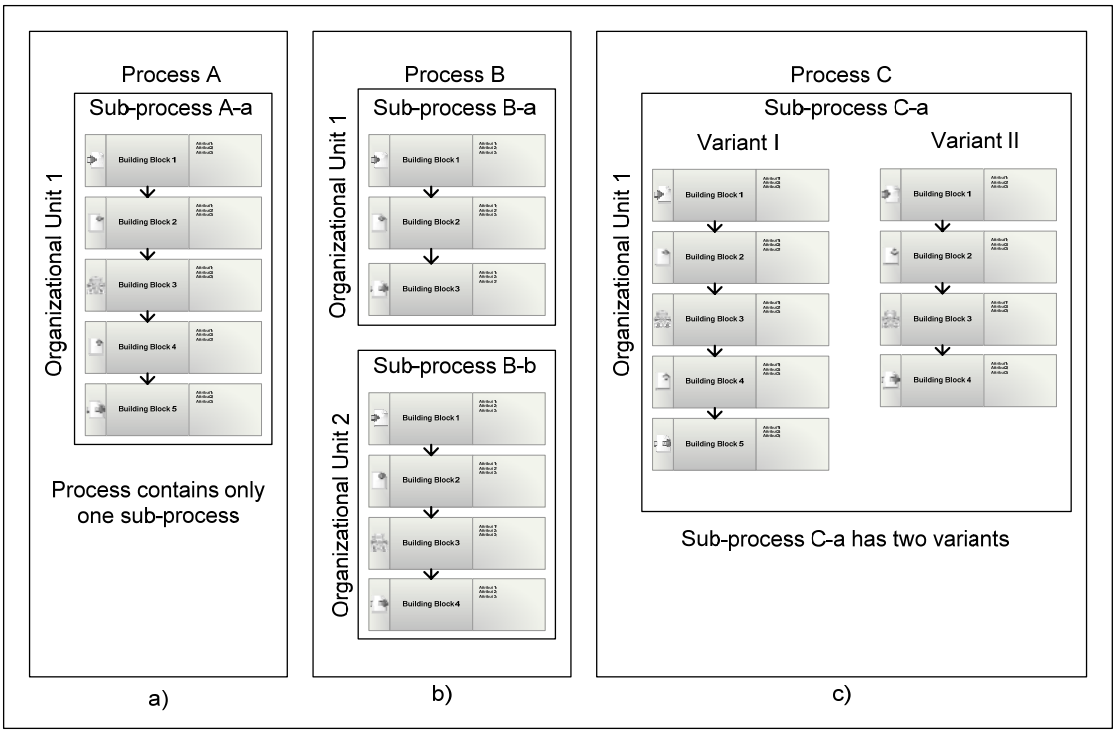

Figure 2: Processes, Sub-processes, and process variants.

Within the PICTURE-method, a process can be catalogued by different criteria. Apparent structuring characteristics are the administrations' organization structure or a product catalogue but other criteria like the differentiation between binding and voluntary tasks of a public administration are also possible.

3.2 Documentation of Process Knowledge in the City of Münster

The City of Münster has about 280,000 inhabitants and an administration with roughly 4,000 officials. With the project PICTURE@MS the City of Münster aimed at the objective of creating more transparency about its process landscape by capturing the process knowledge from seven different departments. This knowledge should be used both as process documentation for example for new employees and as basis for reorganisation projects such as introducing infrastructure ICT technologies.

Before the start of the modelling phase the processes of interest were deducted from a product catalogue, which has already existed in the administration. During the project a total of 51 interviews were conducted with officials from the seven different departments of the administration of the City of Münster. A project manager, five sub-project managers and 12 team members were involved in this project. Based on the interviews 172 processes were identified and documented. These processes have been collected in two different ways, paper- and tool-based. Thirty-eight processes were acquired in the traditional form, first on paper and later modelled with the PICTURE-tool. Of the remaining 134 processes 105 were modelled directly during the interviews together with domain experts. The remaining 29 processes were modelled by the officials of a department themselves after a training by team members. A team member was available as contact person for possible questions and to monitor the modelling process. To acquire a process on paper took about two-and-a-half person hours. About one person hour was necessary to document the process on paper and one additional person hour to feed the process into the PICTURE-tool. Another 30 person minutes were required to prepare the interviews and to ask for feedback. By using the PICTURE-tool directly a process could be finished in one-and-a-half person hour. Even though it took somewhat longer than documenting on paper, the time for the transfer in the tool and later rework could be saved.

The modelled processes are available to the employees via the intranet of Münster’s administration. To facilitate convenient locating of the processes they were structured two in different ways. Firstly, the organizational structure of the administrations was modelled within the PICTURE-tool and sub-processes were assigned the responsible organisational units (cf. Figure 3). Secondly, the existing

product catalogue was also implemented in the PICTUE-tool and processes were attached to their corresponding products.

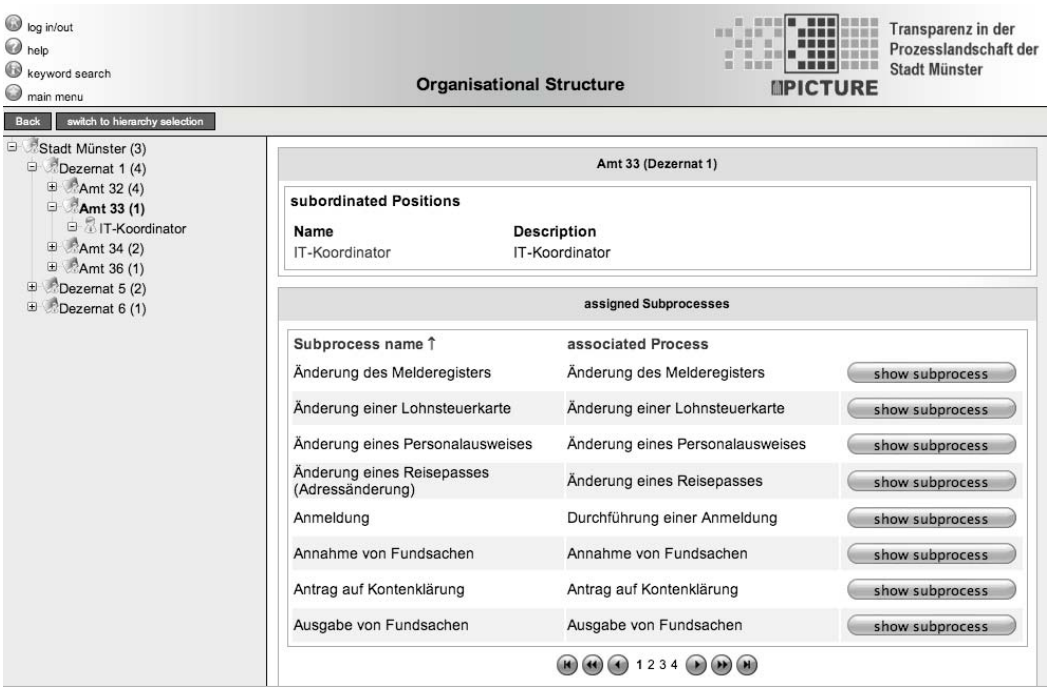

Figure 3: Sub-processes categorised by organization.

The City of Münster uses the processes as documentation and as basis for reorganization measure, especially for ICT investments. Furthermore, it is planned to use PICTURE to capture the process knowledge of the remaining departments which have not been analyzed with PICTURE yet. It is strived for having the process knowledge of the whole administration available within the PICTURE-tool.

4 Discussion of the PICTURE-Approach

In the following the PICTURE-approach is evaluated on the basis of the previously formulated requirements for a modelling approach in the context of knowledge management.

Simple representation of the process landscape: Within the administration, the reactions to the method were very positive. The abstraction level of the process building blocks proved to be suitable. The predominant majority of the officials were able to formulate their process knowledge with the aid of the process of building block-vocabulary. In the course of the project it became clear that the activities of certain departments can be modelled better than others. Especially processes that are structured and form-driven could adequately be described. In order to be able to represent

less structured processes and processes without documents, additional process building blocks were added on the basis of the findings from the interviews. Even the elimination of process branching due to the constant sequential representation of the processes, was unanimously accepted by the officials and regarded as a meaningful simplification. A comparative survey with the EPC-based [12] project Regio@KomM [1] showed that process modelling with the PICTURE-method saves up to 50% of modelling effort. In the Regio@KomM it took about six person hours to acquire a process with EPC in contrast to the PICTURE@MS project it took two-and-a-half person hours. Though PICTURE-processes are not as detailed as EPC models, officials found them suitable to capture and present their process knowledge.

Creation of maintainable process models: The PICTURE-method supports the creation of maintainable models. Due to the use of process building blocks, no detail information about the processes is recorded. Hence, structural variations could be observed less frequently compared to classic process modelling methods. Nevertheless, necessary changes to the models can be carried out by those responsible for a process. Compared to classic modelling approaches, these lower maintenance expenses, associated with easy access to the models, strongly motivate users to keep models up-to-date.

Web-based representation of the product catalogue: The process models were captured by using the web-based PICTURE-tool. They can be located conveniently using the organisational structure of the city or the product catalogue. Therefore, the processes are easily accessible for the public administration and can be used as documentation of the process knowledge and as basis for further analysis.

Creation of comparable process models: Through the use of same process building blocks in different process models, the comparability of the models is promoted. The process building blocks limit the degrees of freedom with the modelling. These building blocks ensure that the model element type is determined by the application domain semantics as well as the name of an element. This leads to the fact that problems such as name or type conflicts within a model comparison are avoided [10]. Structural similarities in administrative processes can be identified in such a way. The processes found in the two administrations were modelled by multi-person modelling teams and were, in the end, nevertheless easily comparable. For a uniform presentation of the processes only minimum revisions had to be made.

According to these results the PICTURE-methods proved to be an adequate approach to capture the process knowledge within a public administration. PICTURE is also suited to manage this knowledge and to make it available within the public administration.

5 Conclusions and further remarks

Public administrations are facing an intense reorganisation pressure. To achieve transparency about the process landscape is an important first step in the reorganisation process. It can serve as foundation of the process analysis and is the basis for subsequent reorganisation measures. The City of Münster has addressed the problem of transparency with the project PICTURE@MS. In context of this project the PICTURE-method has proven to be an adequate approach to capture the process knowledge of a public administration and to make this knowledge available to the members of this organisation.

Based on the results of the evaluation of the PICTURE-approach analysable process models can be deduced as research objective for the near future. Of particular interest is the question what reorganisation measures fit to certain weaknesses in the process landscape. It must be defined how weaknesses can be identified and how the reorganisation potential of certain organisational or technical measures can be assessed (e.g. the potential of merging to departments or introducing a workflow management system). For that purposes it has to be resolved which information has to be captured by the PICTURE-method and how according analysis algorithms could look like.

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