A Web Based Platform for the Design of Administrational Reference Process Models

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Abstract. Public administrations are increasingly confronted with a modernization and service gap. Within the scope of eGovernment initiatives in the last few years, administrations try to overcome this gap by reorganizing and automating their business processes. In order to increase the quality of operations and processes, reference process models can be used as a valuable design support. Reference process models show a high level of reusability and thus allow for an extensive exploitation of synergy potentials as well as a reduction of redundancies. For the design of reference process models public administrations need to identify the best practice or common practice within the regarded domain. In order to support the identification of best practice or common practice a communication platform is needed that contains process descriptions of the specific administrations that can be provided by the administrations themselves. The aim of our paper is to propose a conceptual framework of such a web based platform as well as application scenarios in the German public administration domain.

1 Knowledge Deficits in Municipalities as a Driver for Reference Process Models in eGovernment

Public administrations are increasingly confronted with a modernization and service gap which results from a rising task load at simultaneous decreasing liquid funds [1]. E. g., extra tasks arise from accepting competencies from higher administration instances, increasing requirements from citizens and organizations as well as the handling of more complex administration-specific information systems.

Administration performance downgrades due to a continuing bad economic situation, decreasing tax gains, increasing encumbrance and problematic demographical development. In order to close the modernization and service gap, municipalities start to take part in a national and international competition and adopt business management concepts (New Public Management) [8]. On the technical layer, public administrations try to increase efficiency as well as "citizen-friendliness" by applying innovative technologies. In order to handle the resulting complexity many municipalities join regional software choice and user groups. Nevertheless, the

economic situation of the public administrations is keeping on getting worse. One cause are knowledge deficits on supra-municipal, intra-municipal and inter-municipal layer.

1.1   Supra-municipal Knowledge Deficits

Public administrations are not aware of the requirements they have to fulfill in terms of future establishments and laws. They do not know which responsibilities or even new freedoms for process execution they will face, and how organizational and technical requirements can be realized in an efficient way [2], [3]. From the legislator's point of view, the effectiveness of laws and establishments cannot be controlled adequately. Moreover, it is difficult to quickly put innovations across to the concerned municipalities.

1.2   Inter-municipal Knowledge Deficits

Many municipalities "re-invent the wheel", because they do not possess the knowledge how other municipalities solve similar problems or have already solved problems respectively [12]. Furthermore, there is no awareness of existing problems because information of structure and process quality is missing and optimization potentials are remaining unrevealed. Municipality comparison communities seem to provide a solution of these problems. These are so far based on business ratios and hence provide indications, who is doing something better, but do not show why and under which conditions (comparison of symptoms, not of causes). Specific characteristics of municipalities are not taken into account. For the same reason, the creation of regional software choice and user groups is not always reasonable. The basis of these communities should not be spatial nearness, but rather similar structures and processes.

1.3   Intra-municipal Knowledge Deficits

In terms of organizational design, a structured and transparent preparation of relevant information about administrational processes is missing. Besides a user group-adequate visualization of processes and their interdependencies, organizational units within and between public administrations as well as performance ratios belong to this information. In fact, performance ratios are used in product catalogues. Because the ratio instances do not provide inferences of their cause in the business processes, they can not always be used to generate action recommendations for the organizational design. Knowledge is rarely provided in a transparent and structured form in order to support employees in the execution of operational routine processes. At the same time, employees do not possess the knowledge about the placement of their own tasks in an overall business process, as well as legal interdependencies and process and organizational relationships.

In terms of application design, CIOs are confronted with a complex market of domain-specific applications, server technologies and standards. Many CIOs are overstrained with the choice of new software and the adoption of new technologies.

They shy at radical changes, because they do not want to commit without the required knowledge.

A compensation of the mentioned knowledge deficits promises a high improvement potential of municipality process performance [10]. In order to provide the required knowledge, an adequate knowledge base is needed. A great knowledge base for public administrations is their own business processes, or the business processes of many public administrations respectively [6]. Especially by learning from other public administrations that might perform the "best practice processes" in the public domain, the above mentioned modernization and service gaps and the resulting deficits can be overcome. In this paper, we propose a conceptual framework of a web based platform which will be able to support the identification of best practice processes in the public administration domain. For this purpose, the platform is designed to host process descriptions of the specific administrations that can be provided, viewed and compared by the administrations themselves.

2 Structure of a Knowledge Base for Reference Process Models

The framework which delivers the structure for the knowledge bases is divided in 4 different layers [7]. Within each layer the level of refinement raises (see Fig.1).

Layer 1 contains a functional-contextual framework which serves as an entry point in the total model and allows the navigation within the knowledge-base. For the presentation of a large number of model based knowledge on a high level of abstraction a structure according to management processes, core processes and support processes has proven valid. The elements of the framework link certain functions according to their contextual dependencies and can be compared to organisational units like departments.

On layer 2 the different functions are decomposed and hierarchically structured (e.g. by the use of function decomposition diagrams). The elements on layer 2 refer to certain services how they can be found for example in municipal product catalogues [9].

On layer 3 the processes are examined which underlie the different services. The complete process is presented as a combination of different process modules (e.g. by the use of value chain diagrams). In cooperation with a set of innovative municipalities these modules can be identified, consolidated and saved in the knowledge base in different variations. Application domain specific modules belong (e.g. for the evaluation of building applications) to the process modules as well as domain spanning process modules (e.g. payment applications, signature applications etc.).

On layer 4 different specifications or variations of the process modules are provided which fit the application context best (e. g. manual or electronic archiving process). In order to create the process modules a certain modelling language has to be selected. There are various and diverse model types for modelling (business) processes. Petri-nets [4] and event-driven process chains (EPC) [11] are amongst the
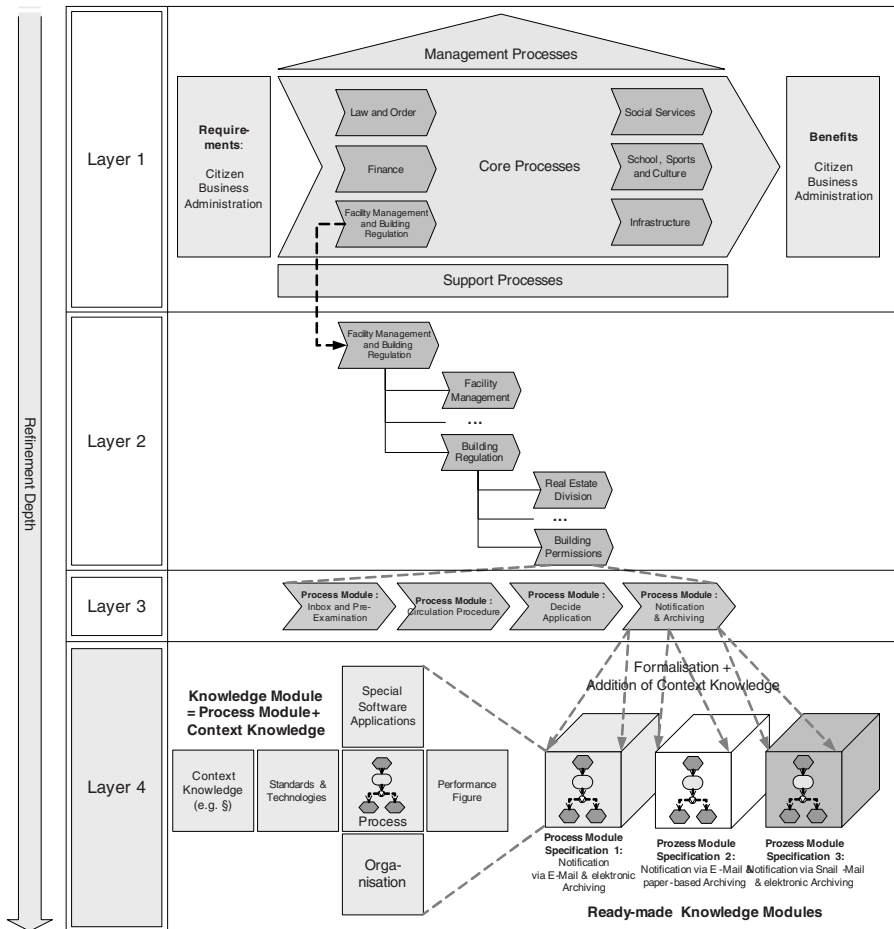
Fig. 1. Structure of a Knowledge Base for Reference Process Models

best known. Application aims, such as simulation and workflow management, require model types which produce detailed, precise, formally itemised models. This excludes, for example, the use of added-value chain diagrams. Application objectives such as process-oriented reorganisation require less formal models. The most important requirements of a modelling method in the given context are summarised below:

- Simple principle, clear presentation
- Comparability between various models
- Presentation of information systems
- Presentation of organisation units and places
- Presentation of information flow

Based on these requirements, the Event-driven Process Chain (EPC) is selected as a method, because of its high degree of clarity, and its potential for integrated evaluation. Moreover the process modules have be easy understandable for a range of individuals with heterogeneous backgrounds (e.g. mayor, or information technology officer).

As smallest elements in the framework certain types of additional information are linked to the process modules and hence increase the knowledge about the process.

The process modules become knowledge modules which contain organisational as well as technical information.

Information for Organisational Design

- the organisation units and positions (department clerk or chief)
- the necessary contextual knowledge for the process execution (e.g. organisation rules or law regulations)
- performance figures for a whole process or certain parts of a process allowing a comparison or evaluation (e. g. execution or transport time, number of cases etc.)

Information for Application Design

- the necessary software components to support the process (e.g. Software for building applications)
- standards and interface technologies for application design (e.g. the OSCI protocol family in Germany)

The knowledge base is provided through a web-based knowledge management platform (ProKMuni-Platform) and can be accessed from the connected municipalities.

3 The Application of a Knowledge Base for Reference Process Models – The Web-Based ProKMuni-Platform

The possibilities of the knowledge base are made applicable by means of a web-based knowledge management platform [5], called ProKMuni-Platform (process oriented knowledge management for municipalities) (see Fig. 2). We aim at the following application scenario:

A municipality can use multimedia based manipulation tools in order to construct their as-is processes (e.g. a specific building application procedure) based on ready-made knowledge modules. Furthermore they can perform certain adaptation procedures to enhance the reproduction quality (e.g. by changing the sequence of the process modules).When implementing the tools is has to be made sure that on the one hand the functionality is powerful enough to describe the problem area adequately. On the other hand the modelling tools have to be easy and intuitive enough to allow a

high number of users and get their acceptance. The modelling of the processes can for example be done with graphical drag and drop-techniques (like the web based ARIS Easy-Design) or interactive surveys.
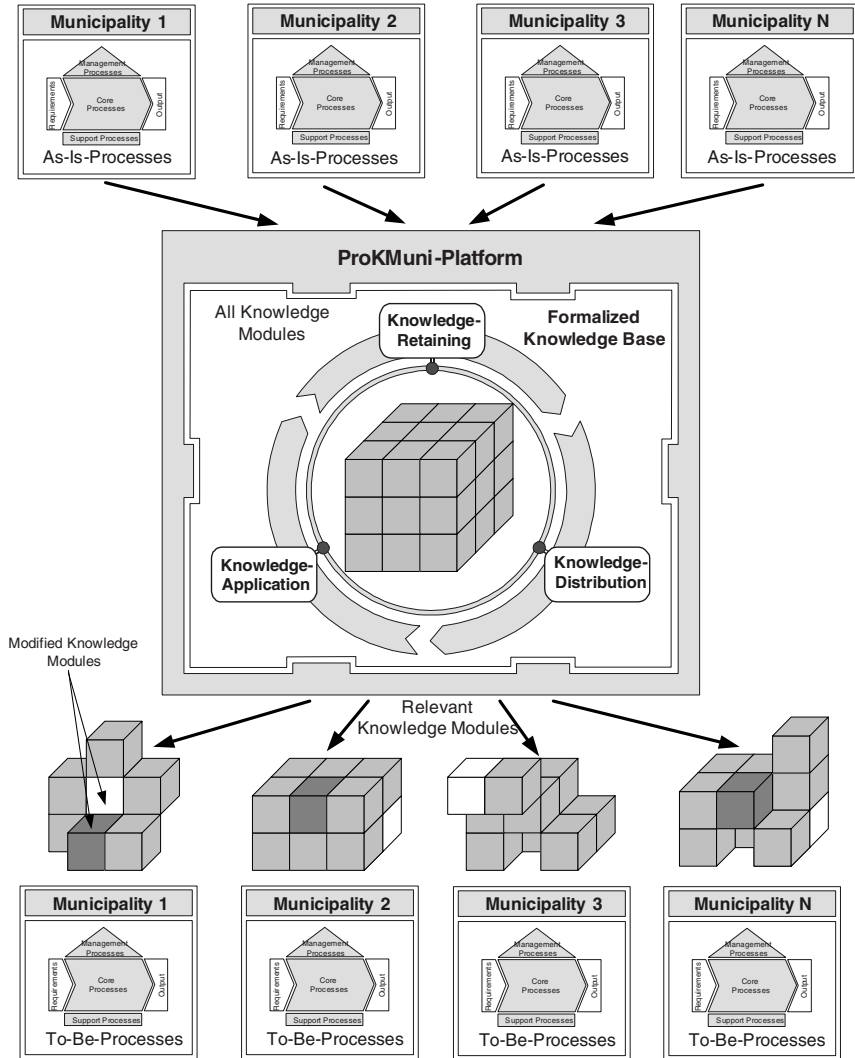

Fig. 2. The Application of the ProKMuni-Platform

The as-is-processes are the base for a knowledge management on different levels:

3.1   Intra-municipal Knowledge Management

With the web based reconstruction of processes using knowledge modules municipalities create a systematic and structured description. At the same time the municipalities acquire the relevant contextual knowledge which is encapsulated within the knowledge modules and can use it during the process execution (e.g. laws and regulations). According to different user groups different views on the process models can be provided (e.g. a compact view for the mayor with focus on core processes and a detailed more technically focused view for the chief of the IT-department).

The web-based access to the ProKMuni-platform allows furthermore exporting the process models including the inherent contextual knowledge in a municipal intranet where it can be used as an organisational handbook or as a e-learning-platform for employees. In addition a fast notification time is made possible for changes in different modules (e.g. when laws are modified) according to the push-principle. Eventually one can link the created processes to certain performance figures. These can be aggregated over the 4 layers described above enhancing the ProKMuni-platform with functions of a management information system.

3.2   Inter-municipal Knowledge Management

Further benefits of the ProKMuni-platform can be acquired when different municipalities add performance figures to their own processes and compare them with each other afterwards Process knowledge and supplemented technical and organisational knowledge allow for a precise analysis of the reasons for differences. Action recommendations for the organisational and application design can be derived from best-practice processes. The possibility of a continuous evaluation of their own processes allow for an effective change management and a success control when implementing to-be-processes.

3.3   Supra-municipal Knowledge Management:

As well for municipalities as for institutions on a higher level the ProKMuni-platform allows a comparison and an evaluation of different conditions (e.g. different state laws in federal republics like the US or Germany). As many internal processes are influenced by laws and regulations certain action recommendations for the legislator can be identified. The contextual knowledge encapsulated within the knowledge modules provides hints for improvement potential when examining cause-reaction-chains.

Summarized the ProKMuni-platform can help in answering many questions regarding the organisational or application design which helps to reduce knowledge deficits on an intra-municipal, an inter-municipal and a supra-municipal level (see table 1).

Table 1. Benefits of the ProKMuni-Platform

	Organisational Design	Application Design
Intra-municipal	• How do different processes in a certain administration look like and how do they fit together? • What organisational units are involved in which processes? • What effects had organisational changes on certain assessment figures?	• What software applications support what processes? • How does the actual software architecture look like? • What effects had the introduction of a new software on certain assessment figures?
Inter-municipal	• What municipality has the fastest, qualitatively best or most cost efficient processes? • Are differences caused by the process execution? • Are differences caused by the organisational structure?	• Can differences in success be justified on the software applications? • What software is the best for a certain process? • What standards and technologies have proven best?
Supra-municipal	• What effects have changes in law on the organisation? • Are differences in processes caused by different laws and regulations in certain states?	• What effects do changes in law and regulations have und software applications (e. g. Digital Signature)?

4   The Generation of the Knowledge-Base

The manual creation of an initial knowledge base can be done through the examination of innovative processes in municipalities known to be best practice.

Therefore in a first step the process and contextual knowledge is acquired and consolidated according to the structure of the knowledge base (see figure 1).

The automated addition of new knowledge takes place during the continuous usage of the platform by the participating municipalities.

On the one hand side existing process module specifications can be composed differently and hence create new knowledge through combination which is then added to the knowledge base. On the other hand existing process module specifications can be modified either by manipulating or enhancing the process itself or the contextual knowledge. The modified modules are also added to the knowledge base as a new specification variant.

As municipalities, in contrast to companies, do not compete to each other one can project a wide acceptance for participation throughout the municipalities. That is also the most important reason why this domain is the most suitable for the idea of the platform.

Hence the ProKMuni-platform becomes a learning system which increases in quality and quantity during the duration of usage and therefore makes itself more attractive for new participations through the well known network effect.

When adding all the different modules certain mechanisms to ensure syntactical consistency have to be implemented. In addition the correctness of the knowledge can be supervised by creating an institution which has the certain competencies (e.g. one big municipality is responsible for the building permission procedure).

5   Summary

Reference processes are created, supplemented with organisational and technical information and then stored in a web based knowledge base called ProKMuni as so called knowledge modules.

Using certain modelling methods and tools municipalities are able to model their own as-is-processes in a formal way and compare them to other municipalities in order to identify potential for improvement. Processes which have been evaluated as good many times can hence be considered as best-practice and therefore added to the knowledge base as a new knowledge module.

The platform allows, that innovative organisational and technical knowledge which has been decentrally developed by different municipalities can be centrally presented in a structured manner therefore enabling other municipalities to adapt that knowledge.

Hence a standardisation of administrational processes can be reached on a high level. By disseminating the innovative knowledge which has been stored on the ProKMuni-platform as knowledge modules the previously described knowledge deficits can be significantly reduced. Hence the efficiency of public administrations rises. At the same time the conditions for the economy and hence for more growth and employment are enhanced.

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