Federal Information Management – Context and Effects

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Abstract: In spite of their common legal basis public sector organizations have developed a plethora of diverse forms and service descriptions for similar or even identical citizen services. As a consequence for citizens as well as for businesses it is difficult to understand the wording of forms and the procedures necessary for citizen and business services. Public administration cannot profit from synergy effects which could be gained by a shared effort for developing these information – although a holistic approach for an integrated information management should be the goal of strategy. The aim of this paper is to combine and integrate data and information from the information domains of services, processes and forms from the public sector domain and provide a holistic approach to make them usable for information managers in the field. To this end, we identify the essential relationships and effects of these information domains on the administrative action. We develop a framework based on the information needs outside of the administration (citizens and private sector) and within the administration, which represents content and interaction. We also examine to which extent such a structure can be further defined on a more detailed level and integrated.

1. Introduction

In spite of their common legal basis public sector organizations have developed a plethora of diverse forms and service descriptions for similar or even identical citizen and business services. As a consequence for citizens as well as for businesses it is difficult to understand the wording of forms and the procedures necessary for citizen and business services. Besides public administration cannot profit from synergy effects which could be gained by a shared effort for developing and maintaining these information.

If the information on citizen and business services needs to be updated as a consequence of changes in the legal basis the quality of the information provided is often heterogeneous in terms of completeness and usability caused by scarce personal resources. This is especially critical for public administrations since that information has to be usable and reliable for citizens and for businesses. In order to meet this challenge several initiatives are aiming to conceptualize specific (public sector) information domains and provide standards concerning structure and content [AWL13], [Bm11], [Le05]. Yet, the federal structure of the organizational units concerned with developing and maintaining citizen service information is still a barrier for leveraging synergy effects by concentrating that effort.

In order to provide the basis for improving the quality of citizen service information as well as the effectiveness of the provisioning process itself common information quality standards and organizational structures for information editing are necessary and from strategic importance for the public sector. Thus harmonization of and shared organizational structures for providing citizen service information are the key elements of the solution proposed in our paper.

There are three major information elements describing a citizen (or business) service: (1) The textual description of the services including the respective legal basis, the responsible part of the public administration and documents needed for processing the service. (2) The corresponding form(s) usually delivers information for the public administration or more general the receiver. Forms can be input documents or output documents. An example for the former one are application forms. Examples for the latter one are notices or output documents of other services such as passports. Forms trigger the (3) process of generating the service. Service descriptions, forms and processes represent individual information domains, which serve different information needs. The different requirements in the three information domains can be attributed to different conditions in the administrations. Different goals also affect information needs and their granularity.

Thus, information about and around services and processes in the public sector can only be harmonized by means of an overarching architecture for a federal information management (FIM) between the federal level, the federal state level and the municipal level. Additionally, the definition of editorial processes plays a central role in order to ensure the quality and availability of relevant information as well as the harmonization of the structural basis for deployment and retrieval of information. The three major information domains of public administration need to be merged and linked in a holistic approach by mapping contexts and their provision of information management services. The corresponding approaches in Switzerland are equally transferable to Germany [Le05], [DJS10], [Wi11], [Sc09], [LSS10].

The focus of the research presented in this article is the representation of the interaction of these three information domains in a holistic FIM. The aim of this paper is therefore to show how the approach of a FIM links the different information needs and can effectively provide adequate information.

In order to leverage synergy effects and enforce the harmonized use of service information, it is suitable to impose or recommend standards [Di08], which have been elaborated top-down across the different administrative levels and to define quasi-standards on the implementation level.

From a methodological perspective, this research focuses on the design science principle. Based on a problem statement and the investigation of the related work, requirements can be defined and can be used as a basis for the development of a concept to support and address this gap. The construction of such a concept is followed by an epistemological aspect, namely the evaluation of the developed concept. Although we will focus on the construction and development of a concept to solve the problem and only partly will look on the evaluation in this article, this research is based on the paradigm of design science, which has recently been predominantly discussed based on Hevner et al.[He04], [Pe07].

Based on a requirements engineering and formulation of a problem statement, we finally collected four questions that are guiding us through the design science process: (1) Which information do the public sector authorities, the citizens and the businesses require? (2) Which relationships and dependencies exist between the different components of information? (3) How can such a structure be gradually refined and integrated within each other? (4) What are, based on this concept, the benefits for the public administrations, citizens and businesses?

To answer these questions, this paper is structured as follows: In chapter 2 related work is discussed. In chapter 3 we present the overall framework of FIM and its components, based on our problem statement and open questions and the aspects we could conclude from the related work. Chapter 4 describes which standardized information (in which information domains) is provided and which relationships exist between the various domains of information, whereas chapter 5 summarizes the effects (and benefits) such integrated approach has. Finally, in chapter 6 we discuss the limitations and findings of our research and give an outlook on future work.

2. Literature Review

The interaction of information or data and business processes is the subject of an extensive research tradition. In IS research in the field of *Business Process Modeling* [Me95] or *Reference Modeling* [Sc98] many scientists examined how the flow of business processes and the required information and data can adequately be represented and designed.

These research efforts concerning (business) process modeling resulted in various concepts and modeling techniques to represent processes and information objects and to map them to each other [Sc91], [DP97]. Many of these modeling techniques allow representing different views to differentiate between the specific information needs of different user roles. A better understanding of this specific information needs leads to an improved *information logistics* [Di08].

The concept of information logistics is often discussed in the field of Master Data Management [SGZ12]. It includes components and processes for distribution and replication of master data elements. For the concept of FIM the challenge is to make the master information available in a central repository and in case of updates or corrections to ensure the distribution of the updated version of the master information. Master information is centrally prepared, but may be adjusted as needed for a particular application. Organizational measures such as version control must be taken to identify master data and their possible adjustment. At the same time, the knowledge about the multiple use of master information can support the standardization of data definitions and thus improve the efficiency of information processing. In particular, the design of high quality process structures requires the optimization across all information objects and their standardization [BH06], [RS97]. Therefore, this standardization should be promoted [BK04]. However, only those processes and systems should be centralized which fulfill the same tasks on the same execution level. The underlying IT support needs binding and uniform exchange formats, data structures and interfaces [KW05].

Reference Modeling provides a concept for this project, which structurally supports harmonization and interoperability by showing general examples of entire industries and requirements for data models, process models, organizational models and other models [RS97], [BS96]. The goal of these reference models is to meet the various requirements of different stakeholders and harmonize and integrate all these information requirements into one model.

The findings from Business Process Modeling can be transferred to the field of public administration. In both fields the process-oriented view becomes more important than the function-oriented view. Carrier of information objects such as forms or notices can be assigned to a particular administration process by merging the process view and the object view [BAF07].

3. Description of the Information Domains

The main principle of a federal information management is to harmonize and integrate the three information domains services, forms and processes into one entity (Figure 1). The different requirements in the three information domains can be attributed to different preconditions in the administrations. In order to take into account the different levels of details of the information needs, the FIM information domains also have to work in an integrated way even if not every information domain is available in the same level of detail.

From a citizen and business perspective the following requirements towards a FIM concept can be formulated: Citizens and especially businesses corresponding with different public administrations at different sites need unambiguous and reliable information on citizen or business services. Ideally that information on a specific service should not differ depending on the municipality or federal state it is requested from. In addition both citizens and business could benefit from the reuse of information: Information on name and address of a citizen or a business is requested at the beginning

of nearly all forms of public administration. If that and other frequently used information was put in a standardized form and structure citizens and even more so businesses could reuse that information in diverse administration contexts.

From a public administration perspective the reuse and especially the interoperability of information is an important requirement. Interoperability refers to sharing information within subject domains like public safety across federal levels as well as to sharing information across subject domains like urban development and transportation planning. In order to improve effectiveness and flexibility in the provision of online citizen services public administrations especially on the municipal level should be able to use pools of shared information on services, forms and processes which can be adapted to local requirements. Changes in the legal basis of citizen services result in high efforts to adjust service descriptions and forms or even processes. These efforts could be reduced if that information and the necessary updates – as a reference basis – were provided centrally. Many forms like the individual ID card are used in the course of diverse administration services. Systematic links between forms, services and respective processes can help to standardize interfaces and improve interoperability.

The overall concept of FIM consists of different concepts which have to be conceptualized and specified in an integrated manner. In doing so, the **FIM Logic** forms the core concept for harmonization. This logic specifies the FIM information domains, their linkage and rules to define the interaction among the FIM further modules of the overall architecture. The **FIM Tools** consist of concepts, methods and standards used to create, maintain and use FIM content. So the FIM tools will include methods for business process modelling, such as BPMN, and also will specify the mechanisms and rules to create service descriptions and reference forms for FIM. The **FIM Building Set** comprises all structural elements needed to create FIM content – by using the FIM Tools. The building set consists for example of wiki modules, form fields, process elements as well as linkage rules. The FIM Building Set provides the basic FIM content ready to be combined in as many ways as possible and as easily as possible reusable. For example, the FIM modular component “forms” consists of LeiKa[1] modules, form fields, form field groups and rules.

For the FIM component "forms" that are, for example, the modular elements of fields, field groups and rules. Further, an unlimited number of fields and field groups can be included in the master form.

Content for the **FIM Library** can be created by means of the elements of the FIM Building Set and by using the methodologies and principles included in the FIM Tools. These are for instance reference forms, which consist of form fields, form field groups and linking rules based on federal law or federal state law. The **FIM Editorial Concept** consists of editorial processes and defines user roles for FIM, which elements have to be maintained and can be used and how to manage the creation, maintenance, access or the quality assurance.

[1] LeiKa = Leistungskatalog

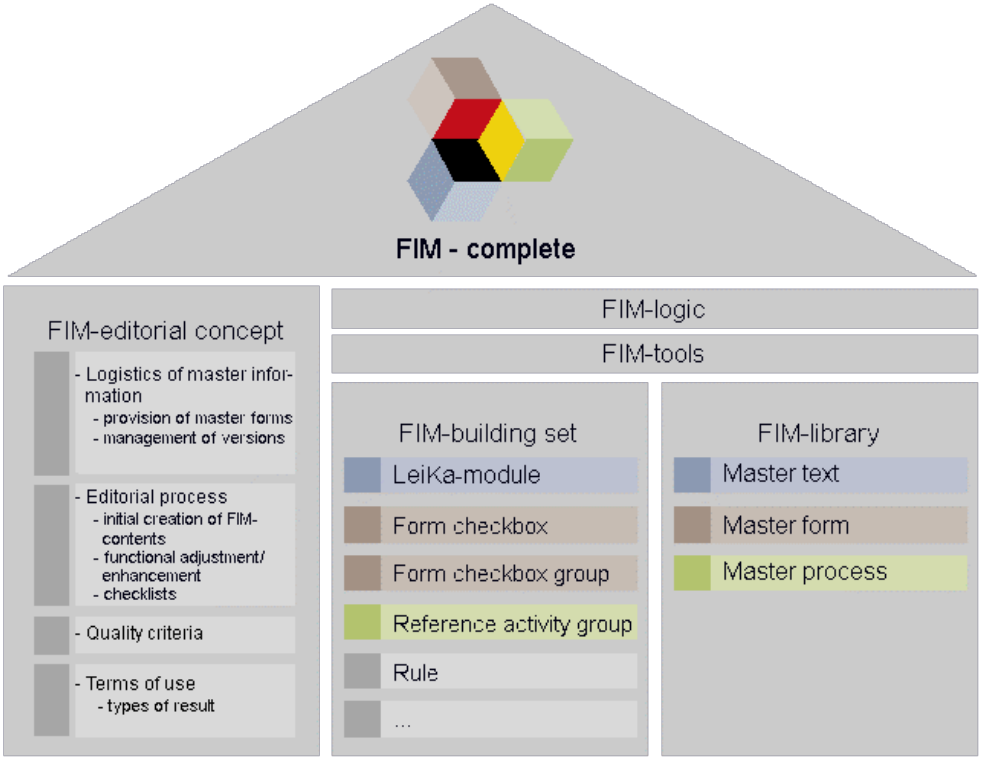

Figure 1: FIM House

4. Interaction of the modular components

One of the major goals of FIM is to not only provide information but also to link this information across the three information domains. The level of detail of these linkages will be continuously refined in three stages during the implementation of the concept in practice. When doing this, the three information domains will mellow in different pace. It is essential that in every stage the interplay of the information domains is possible even if they are not on the same level of detail.

In the first stage, the modular elements are mostly isolated from each other (Figure 2). Forms and processes are black boxes for each other. Only the services are standardized which allows an explicit matching of "Forms" and "Processes" within the area of service descriptions. The element "Services" (LeiKa) includes the description module "Necessary Documents" and "Forms" which lists all documents and forms. The description of services for the application for issuing a weapon, for instance, includes in the first stage a reference to all necessary documents (application form, etc.) in form of an ID form instead of text.

Similarly, the service specification contains a reference to the corresponding process by means of a process ID. Further, the process references the respective service by means of the LeiKa ID.

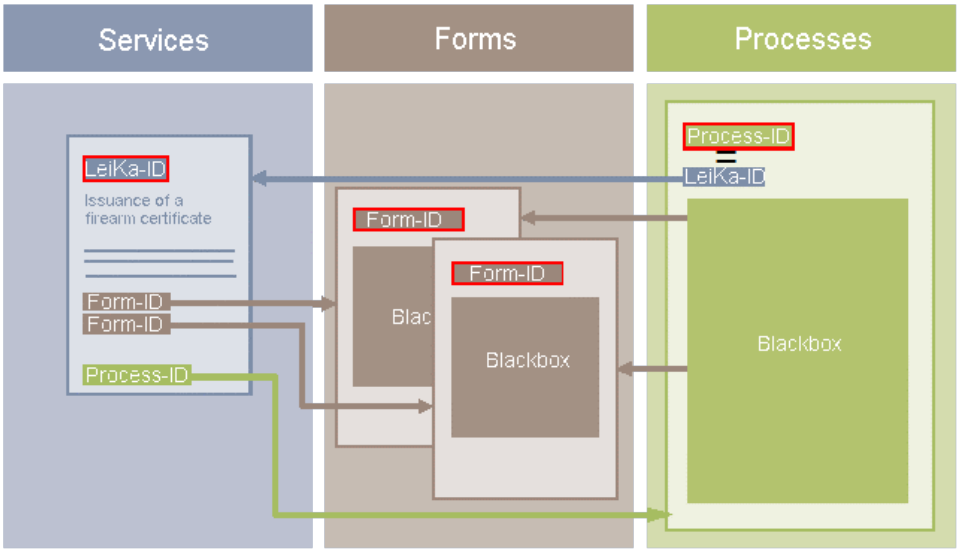

Figure 2: Interaction of the FIM modular elements during the first stage

In the second stage, the details of the black boxes are shown and the linkages between the components are specified in more detail (field group IDs, activity IDs; Figure 3).

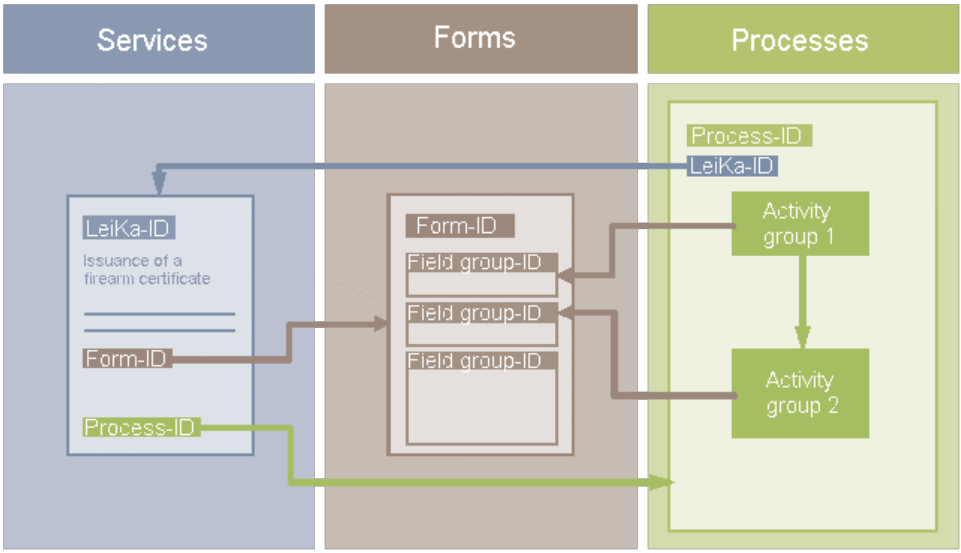

Figure 3: Interaction of the FIM elements in the second stage

In this stage, the recurring combinations of field groups (e.g., the address, consisting of name, street, postal code and city) and activities (e.g., the processing of incoming mail,

consisting of opening, scanning, detecting the metadata, and forwarding to the person in charge) have to be associated with the service description. At the same time, it is a requirement in the process view that the form fields needed for specific activity bundles can clearly be identified. This means that for the processing of incoming mail the field group IDs and their corresponding field groups are stored in the metadata of an activity bundle.

In the third stage, the linkages between the components are also specified in the field level wherever necessary and appropriate (Figure 4). Across all stages of development the linkages between processes, services and LeiKa IDs are stored in the Process Characteristics.

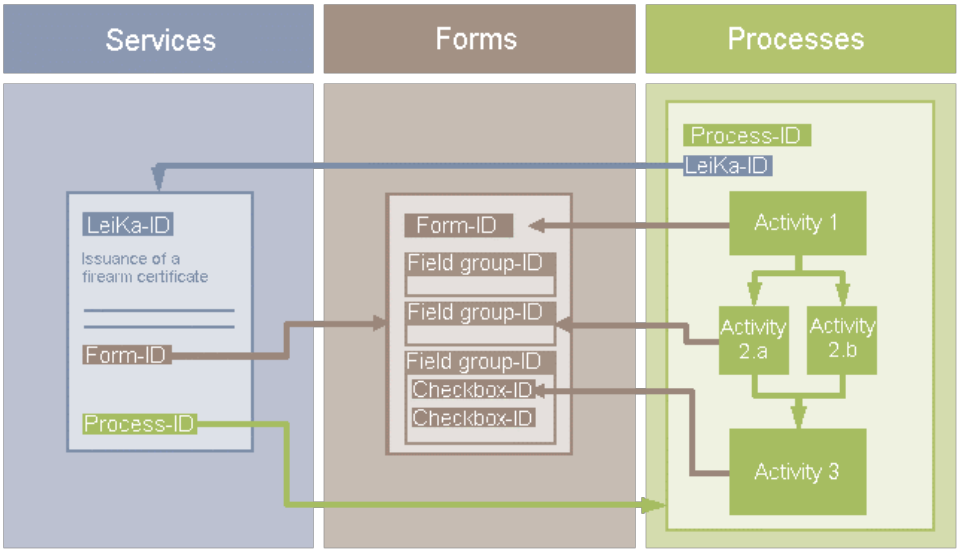

Figure 4: Interaction of the FIM elements in the third stage

For the implementation of this concept, a data model was developed, which reflects the described relationships between the FIM components and represents the core of the FIM logic. Using the data model (i.e., FIM Meta Model), one can link the single service descriptions and their corresponding forms and documents as well as the corresponding process. On a more detailed level, each activity bundle respectively specific activities of a process will be matched to the corresponding form field groups and form fields. One example is the matching of a responsible person to the last name and address of an applicant. The matching is realized by means of IDs, which are stored in the metadata of the FIM components.

The meta model matches one service to one or more forms and documents.

The term **Object Document** designates administration external documents such as blueprints or pictures. They are also used as an information carrier in the context of administrative services.

The matching between service and form or document is realized by means of the IDs: the LeiKa ID, form ID and document ID[2]. Similarly, a service or the respective forms and documents are matched to the corresponding process by means the process ID. The relationships shown below apply to both the main level of information as well as the instantiations at the execution level.

The data model has continuously been refined according to the three stages of development. In the third stage, the relationships between the elements are described (form field and activity (= process step), cf. Figure 5). In a specific form, the content of form field and form field groups can be linked, which are described by rules (e.g. field selection rules, linkage rules, plausibility and consistency rules, structural rules, building regulations or subject-specific rules).

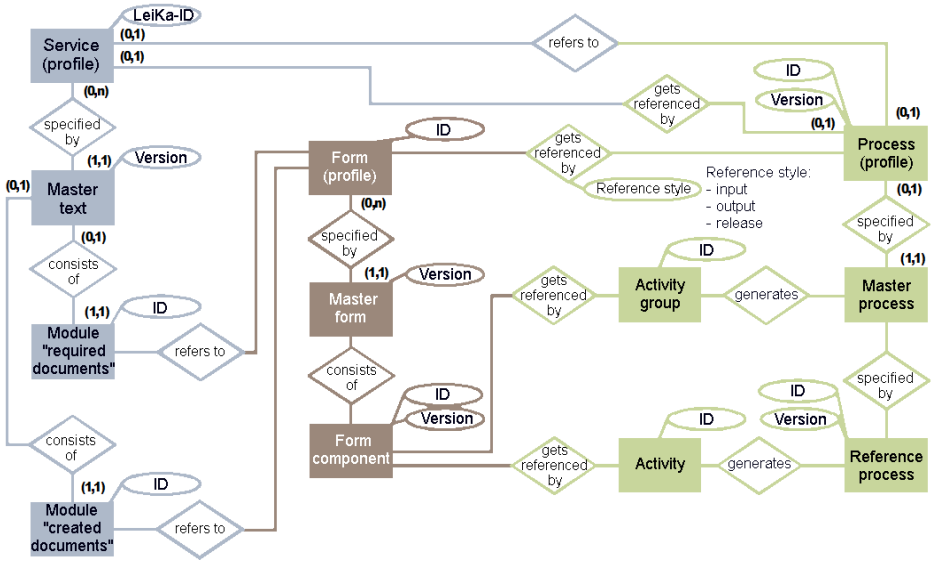

Figure 5: FIM data model in the third stage

Several activities form an activity bundle. Form fields and activities are identified by and associated with IDs. Similar to the matching between activity bundles and form field groups, the matching between activities and form fields take place in the context of a specific form.

5. Effects of a Federal Information Management

Based on the data model and concept presented several effects on the enhancement of a federal information management can be identified and described. These effects are not only based on the structural framework presented above. When digging into more detail and also thinking about harmonization on the content within this structure we will come

[2] For clarity, the illustration of the object document is omitted in the graphical representation.

up with useful and measureable effects for a holistic federal information management. The result of the integrated view is a comprehensive connecting and harmonized interaction of the three information domains. These effects are summarized in Figure 6, we will explain in more detail:

Coming from the beginning, the starting point is the provision of services of the public administration (including administrative services): outside the administration for citizens and companies, as well as within the administration to support or accompany services. The information needs now can structurally be documented with the concept of service descriptions. The service descriptions consist of different modules which form the master text and provide the citizen or enterprises as well as the officials within the public administrations guidelines and support in what the service is about, who is responsible, which information is to be handed in, what are the possible results and further more. Two of the modules from the service descriptions support especially the interplay with further information domains: required and created documents. With this, a link to the domain of forms is structurally given. Furthermore, this structure guides the creation of service descriptions and fosters the user of the concept to document comparable information in a comparable way – and integrate the links to the further information domains in a structured, harmonized way.

An application form or a comparable form usually delivers information for the public administration – or more general the receiver – and triggers further activities. The forms mainly are a structured list of fields and groups of fields, which describe the information the applicant has to hand in for a certain service request. Additionally, the forms also cover further forms in a wider sense like certificates or other documents, which the applicants have to hand in. Thirdly, the domain of forms describe the output information, which is given back to the applicant. These forms or documents like official notifications of verdicts are the results of the process of generating services. The winning effect of this structure is given when it is used to create a set of harmonized and reusable form fields and form field groups. Such set of elements will support the creation of harmonized master forms in which same information is requested with same elements and same concepts.

The processes are the activities running within the public administrations taking the input forms and creating the result forms. When transforming the information into results, several process steps will take place. Again, the effect of the concept presented so far will be apparent when defining a common set of activities and activity bundles and have them prepared for reuse for modelling the processes. Then it will help to harmonize the processes, identify same steps in the processes as same or similar and help the users of the concept to prepare usable process descriptions.

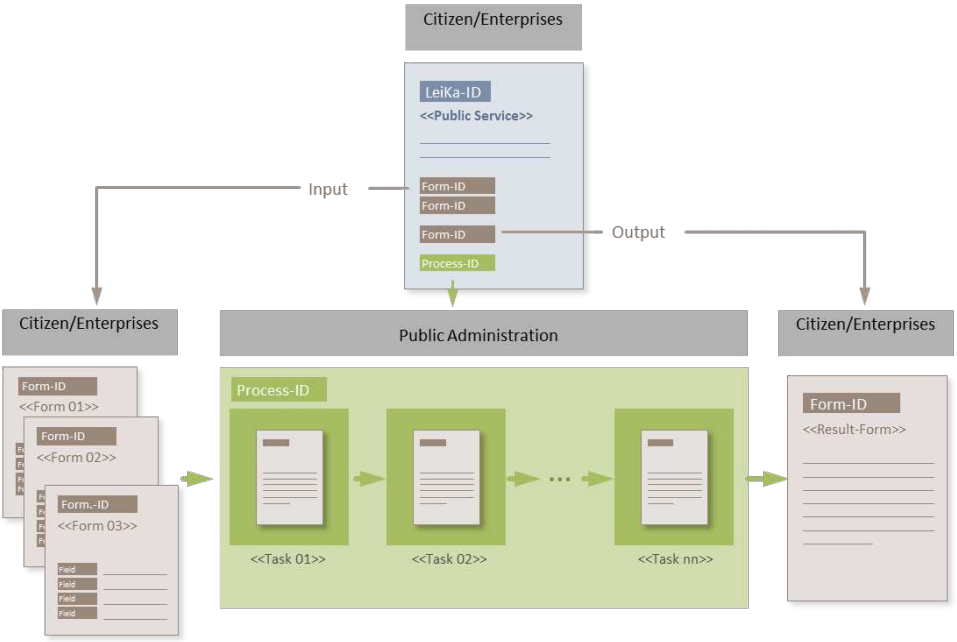

Figure 6: Effects of the integrated view of the information domains

6. Concluding remarks

The aim of this paper is to present the content and especially the relationship between the components of a FIM which contributed to the strategy of an efficient and effective information management for the public sector. Our work was guided by four questions described at the beginning. When analyzing the public sector domain, we identified three information domains relevant for the structuring of the field: service descriptions, business processes and data/information, conceptualized through forms. This contribution shows that the interaction between data or information and business processes is not only relevant for the private sector but also for the public sector [Be12], [Sa11]. While concepts for business process management in the private sector are largely agreed upon, these concepts for public administrations are just about to emerge and not yet tested (Question 1).

We structured the different views identified and developed a concept and data model to describe the relationships and interdependencies of these concepts of information (Question 2). Next, we developed a three step approach of refinement to address the different maturity of the three information domains and the different pace of development of each information domain (Question 3). Although there are appropriate techniques to describe processes and information objects and to associate them to each other [Sc91], their (across federal level and the federal state level) use in the public sector is still in its infancy [Be12]. It is shown that the understanding of the specific

information requirements in certain parts of the process, contributes to improve information logistics.

Finally, we described the effects, this integrated structure will have on the public sector domain (Question 4). Until now, this approach has not been sufficiently anchored in the practice of public administration. Although the potential benefits are recognized, the specifics of the federal administrative organizations inhibit their materialization. Thus, for the better answering of Question 4, intensive evaluation of the concept is a next step in the overall approach and object of further research, which is actually due. However, the multiple use of different types of information on the various administrative levels and in different functional contexts makes the effect of a standardization of data definitions evident. This effect is enhanced when the relationships between the components of a FIM are taken into account. The identified third stage corresponds to the maturity level of the private sector for entire industries [BS96]: universally valid examples are defined, guidelines for data models, process models, organizational models and other models are given.

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