OUTLINE OF A GENERIC E-GOVERNMENT ARCHITECTURE FOR POLITICAL ADMINISTRATIONS – BASED ON THE POLICY CYCLE CONCEPT

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Abstract. *The following article provides a generic outline of a business and application architecture for political administrations. Therefore, the focus was laid on the derivation of processes and their IT support based on the policy cycle concept. The derivation of various (modular) process areas allows for the discussion of generic (modular) application support in order to achieve the modular structure of e-government architectures for political administrations, as opposed to architectures for performance management of administrations. In addition, issues and further to-be-addressed spheres of interest in the field of architecture management in the political administration area will be specified.*

1 Introduction

1.1 Motivation and Problem Statement of the Article

First of all, one may wonder what kind of enterprise architecture for political administrations based on the process model for public administrations [13] should look like. It is very likely that architectures for political administrations on the federal level are more dominant than on the municipality or local government level. However, the mechanisms among administrations, executive, legislature, stakeholders as well as voters on all three levels, federal, (member) state, community/municipality, can be considered similar, even if not to the same extent developed from an institutional point of view. From this perspective, it may seem obvious to consider an independent generic architecture model for political administrations which involves the above-mentioned participants. A connection to a performance management architecture seems to be evident, e.g. for data exchange.
Thus, making the architectural concept in conjunction with the policy cycle a subject is new as well as addressing the generic enterprise architecture topic in administrations. Little literature is available. In practice only few convincing solutions for the to-be-addressed issues have been visualised or realised. Except for the policy cycle concept[1] - which is considered to be controversial due to its practicability - no empirically verified concept of political administrations exists that could serve as a basis for the specification of architectures. In addition, the stakeholder concept (participants of the political process) needs to be considered for the distinction of political processes of an administration in terms of cooperation. Currently, only few aspects of the policy cycle are being discussed via certain keywords in e-government: e-

[1] Compared to the policy cycle concept of many other authors [6] as well as more current aspects of the concept [3], [7].

participation, e-voting, e-citizenship, etc. All these concepts are to be properly distinguished from performance management through an appropriate architecture discourse and must be put in a binding framework.[2] Thus, the understanding of the political process, its participants and involved institutions as well as the dependencies among the system elements is in the centre of the requirement analysis for an enterprise architecture of political administrations. The following essential and influencing parameters regarding the creation of architectures for political administrations must be considered: The political process as a whole doesn't have a clearly defined owner. The different phases of the policy cycle are rather owned by various, changing participants; therefore, it will be difficult to determine an "owner of the architecture". The political process is coined through a kind of "free floating" or power play of different interests or interest groups and aggregation and specification steps in various stages. This impedes the clear assignment of responsibility for the process or parts of it. The same applies to possible application responsibilities; core administration applications supporting the political process excluded. The political process must allow different stakeholders to be equally dominant in the various areas. Thus, the entire architecture-addressing infrastructure must not necessarily be provided by federal government. Instead different infrastructures are possible and even more reasonable; however, it should be possible to link those in an intelligent way (focus on interoperability in stakeholder networks and the availability of a loose connection of collaborative networks). A first conclusion is as follows: The architectural concept should be open similar to the organisational setting and allow for ad-hoc interoperability. Enterprise architecture for a political administration can also be looked at with regard to the four views or levels of the TOGAF framework of the Open Group [14]: business architecture, application architecture, system architecture and the all three levels overlapping data architecture.
The question of modularizing the diverse process, data, and application as well as system areas is in the centre of the four TOGAF architecture domains in order to overcome intricacy issues. The question is also whether modularization should be primarily based on domains. This can be realized in compliance with the different business, activity, process or application areas of the political administration.

1.2 Objectives

Based on the above descriptions, the present article pursues the objectives below: specification of the policy cycle concept and dissociation of its (modular) domains and process characteristics; outline of the distinction of different stakeholder groups and their involvement and participation in the fields of communication, collaboration and documentation in the various process areas of the policy cycle; systematic derivation and specification of modular e-government architectures for political administrations in consideration of the mentioned TOGAF architecture levels; due to lack of space without system and data architectures; evaluation of the structuring principle of the domains on the application and business architecture level, and, last but not least support of empiric research based on a to-be-proposed "architecture prototype" which can be empirically validated.[3]

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[2] However, interfaces do exist between performance management and political administration, e.g., in the data area. (Electronic) elections and votes require citizen data which are managed and maintained by performance management. Thus, the architectures of both administration areas are explicitly linked with one another.

[3] The following questions must be asked: To what extent does the deployment of architectures for political administrations in the context of federation, cantons/federal states and municipalities differ and to what extent is it equally developed? In how far may different argumentations be required? Which clarifications regarding the structure model of the political administration (architecture) and its specification are to be looked at separately?

1.3 Systematic Approach

The aspects below are significant for the systematic approach of this article: Systematic derivation of business and application architectures based on proper theoretical considerations and developments as well as concepts taken from literature; derivation of a modularisation concept considering the experiences made in the private industry; Derivation of generic frameworks for business, application (and system) architectures of various process areas for political administrations; Development of guidelines for further empiric research for the specification of architectures for the political administrations of Germany, Austria and Switzerland, and based on literature, a "building proposal" for an architecture for political administrations is made.

2 Stakeholder Models in E-Government

For a better understanding of the approach, the stakeholder concept must be examined. The stakeholder model for the federal government can be made of the components as displayed in figure 1.

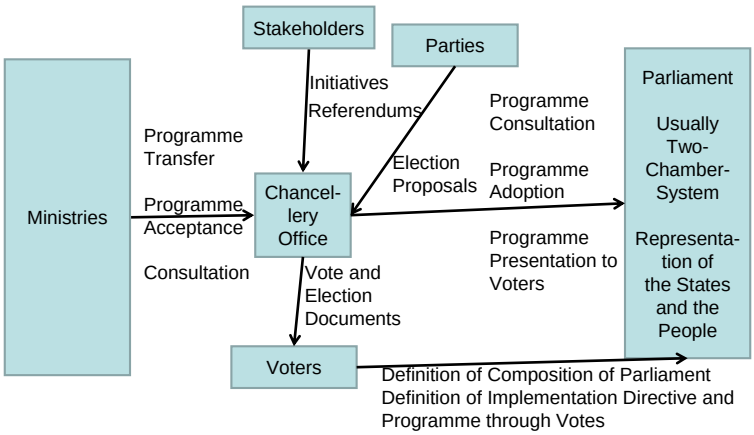

Fig. 1. Possible links between state-run institutions and stakeholders.

Stakeholders serve as participants of the opinion-forming process which is eventually a political process. On the contrary, by institutions state-run institutions are meant which hold certain recipient roles in the political opinion-forming process and discourse [8]: Ministers as law enforcement officers lead the area of stakeholders from within the administration; the administration itself is a traditional state-run institution; others: chief officers as employees of an administration, civil servants (of political administrations and operation level architecture) as well as experts from within the administration; experts from outside the administration; the press; parties, associations and unions can have various directly linked roles in the political administration area as well as stakeholders and/or lobbyists; chambers and services of parliament as traditional state-run institutions; chancelleries or departments as information brokers/hubs (distribution and collection) among parliament, ministries, collection points for referendum petitions as well as votes and elections; Citizens, enterprises, entrepreneurs or clients of an administration in general; Parliamentarians as representatives of the people. The participants and their interaction allow for the derivation of activities which guide the creation of the e-government architecture. The relationship among the different stakeholders can be displayed using few examples as shown in figure 1. A written consolidation is not possible due to lack of space. For the course of this article, it is essential to consider the fact that stakeholder and expert groups differ depending on the field of policy and probably also policy program which is discussed in a field of policy. Thereby, different communication, collaboration and internal processes for the various participants can evolve. This again affects the enterprise architecture of the corresponding area of the policy cycle. It is not the objective of

the present paper to look at a specific architecture of a specific field of policy or policy-making body but to provide a generic approach across all fields of policy and to discuss policy-cycle-phase-specific differences.

3 Positioning of the Political Administration Process Architecture in the Context of an Administration Process Framework

First, political administration processes must be positioned in a larger context. We differentiate between five generic types of administrative processes: political processes, operational processes (including front- and back office processes; daily contact to customers), management processes, support processes, and inter-governmental (inter-agency; inter-organizational) processes.

Further, the above explanations also raise a couple of questions: Which modularization criteria do exist from the perspective of the management of e-government business (process) architectures? To what extent can these modularization criteria be further developed with regard to the application architectures and the resulting data and system architectures on the level of hardware, software, and network architecture [10: page 77]? How can architectural structuring criteria be mapped in compliance with the mentioned modularization criteria according to [4]? [16] specified a process pattern for e-government which can be used as a model for the creation of appropriate business process or architecture modules. However, it must be considered that the modules can be defined from different perspectives.

A possible solution to cope with architectural intricacy is the mentioned modularization of architectures or parts of it, e.g. of the mentioned business, application, data and system architectures. These or the to-be-created modules possess certain characteristics which can be referred to as follows by [1] based on [4]: abstraction from the implementation (in terms of IT systems because all the following criteria were defined from the perspective of software engineering), encapsulation in terms of hiding internal modes of operation, exchangeability, reusability, temporal validity, orthogonality – in terms of not affecting one another, mutual exclusivity, exhaustiveness – in terms of isolation, universality, interoperability, well-defined and minimal interfaces, generic as well as hierarchic structures if applicable.

Based on the here-defined criteria of modularization and based on [16], the attempt is to bundle processes and to unit these bundles via domains or modules. In table 1 in the left column, e-government process areas are modularized in a first step. In a second step, further process categories are distinguished in the right column. The overall amount of process modules as well as the actual sub process modules in table 1 must be further specified. This is done in table 2 regarding the following criteria: participants, objectives, input-output relations, clients, degree of structuring and standardization, IT support options, development opportunities (with regard to various administration departments); intricacy of processes, etc. The addressed process categories never emerge exclusively or separately but always in a federal-government-specific or organization-specific mixture.

Table 1. E-government process areas and appropriate modularization.

E-government processes according to [16] (supersets)	**Possible process module developments (according to [16])**					
Strategic political administration management processes	Policy cycle planning	Management of organizational aspects in the policy cycle	Management of personnel aspects in the policy cycle	Management of leadership of policy cycle processes as far as possible	Management of control of policy cycle processes	---
Policy cycle processes (of political administrations)	Policy initiation	Policy estimation	Policy selection	Policy implementation	Policy evaluation	Policy termination

Table 2. Characterisation of process supersets.

	Strategic political administration management processes	**Policy cycle processes (of political administrations)**
Participants	Top-ranking officials of political administrations	Policy cycle stakeholders and policy field audience
Objectives	Objectives of policy programmes (impact and outcome)	Increase of impact and outcome
Input-output relations	Reason for policy programme; successfully realised policy programme	Input for initialisation of policy programmes, achievement of objectives in terms of the outcome across all policy programmes of a period of time
Clients	Audience of the field of policy and the policy programme	Audience of the fields of policy
Degree of structuring	Medium	Mixed
IT support options	Low; usually information evaluation systems (data-warehouse based)	Mixed; support through collaborative information systems (web 2.0; social software)
Degree of standardisation	Low	Mixed
Process characterisation (regarding various fields of policy)	Indicator-oriented; information compression and review; usually deterministic	Very different, insecure, stochastic
Process intricacy	High	High

4 Derivation of an E-Gov-Business Architecture for Political Administrations

4.1 Introduction

In figure 2, in the framework of the by-[16]-suggested reference process model for public administrations on the level of political processes, the prevailing policy cycle model is recommended as the basis for the structuring of architecture and business processes. Since there are currently no other reference models for this field available, it seems appropriate to use this model for the mapping of processes in order to make policy. It can also be used to first analyze business processes and in how far those are covered in terms of applications. Based on that, a proposal for the implementation of a business and application architecture can be made. The proposed architecture should be as generic as possible to ensure that various administration units and employees on a super ordinate level are involved. However, it must be emphasized that the proportion of political processes differs depending on the level of government (federation, cantons, and municipalities in Switzerland). Considering the entire administration volume, the share of each level decreases from the federation to the municipality level. In return, the proportion of operation level architecture (and also of support process areas and architectures) increases. This affects the definition, specification as well as generalizability of the here-made comments.

4.2 Policy Cycle Model as Basis for Architecture Discussions

The policy cycle as a basic element for the course of this article and creation of an appropriate IT architecture will be looked at in more detail below. The focus is being laid on the following aspects. The policy cycle consists of the process phases: policy initiation or problem perception, policy estimation or policy or policy program formulation, policy selection or decision, policy implementation or realization of the policy program, policy evaluation as well as, last but not least, policy termination. Each phase of the political administration process has different inputs and outputs but also various sub-tasks and participants. Different objectives may be defined for each phase and one may wonder in how far the administration, federal government, actually is the process owner in corresponding networks. The various inputs, outputs and tasks must be looked at separately for each process phase, its participants and resulting documents. Based on the process analysis, information system support in terms of a comprehensive architecture management must be decided on to support the whole range of political processes.

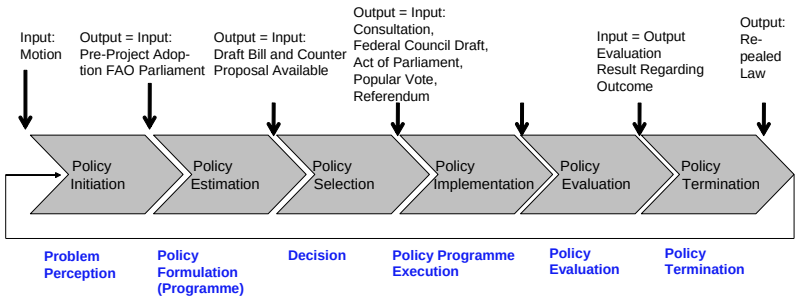

Fig. 2. Political processes based on the policy cycle.

In table 3 below, processes of the policy cycle are distinguished based on the graphic representation in figure 2 considering the following characteristics: input, throughput, output as well as an example for each phase from Switzerland.

Table 3. Distinction of the processes of the policy cycle.

Process area policy cycle	Input	Throughput	Output	Swiss legislation example
Initiation	Making of motion	Discussion of motion in parliament	Adoption as pre-project of the department	Motion parliament, popular or canton initiative
Estimation	Initiation of pre-project of department	Set-up of departmental pre-project or creation of expert draft	Available bill or draft as well as counter proposal	Pre-project of department, expert draft, counter proposal
Selection	Bill or draft as well as counter proposal	Creation and consultation of, for example, draft laws of the federal council, creation of draft laws of parliament, etc., draft law definition for votes	Created demand for consultation, created federal council draft law, created parliament draft law, initiated popular vote, referendum	Consultation, federal council draft law, parliament draft law, popular vote, referendum
Implemen-tation	Adopted law or adopted ordinance	Enactment processes, enforcement processes	Law or ordinance implementation completed	Enactment, enforcement
Evaluation	Evaluation task and research questions as well as evaluation design	Evaluation processes	Evaluation outcome	Verification of the effect of the law by internal and external bodies
Termination	Decision regarding the termination of the policy programme	Termination processes	Terminated policy programme with potential motivation to re-start the policy programme	

First, process thoughts are specified based on figure 2 and table 3. Next, derivations for the IT support of political administration processes are discussed (compare table 4). Thus, the interaction of the various participants of the policy cycle processes can also be regarded as an intricate process which is shaped by different collaboration and communication networks and interested parties and which isn't necessarily controlled by the administration. Among those participants are political administration bodies, operational administration (e.g. as the implementing body or data supplier), (chambers of) parliament, coordination bodies for administration bodies, parliament, government agencies, cabinet, stakeholders (e.g. federal or state chancelleries), etc. as displayed in figure 1.

Table 4. Distinction of policy cycle processes and possible IT support.

Phase designation	Core activities	Possible IT support
Policy initiation	The focus regarding communication and collaboration between stakeholders and administrations; integrated business administration and document management, for example for processing queries to parliament, etc.	Through communication and collaboration systems, electronic business administration and document management systems (GEVER), administration applications as well as CRM and policy-making-body-specific applications.
Policy estimation	Expert work and comprehensive communication of the expert work, programme draft, law and ordinance texts, etc., possibly also campaign preparatory work regarding referendum and initiative management	Through GEVER and CRM systems with campaign planning functionality, Office environment, expert systems and database access, etc.

Phase designation	**Core activities**	**Possible IT support**
Policy selection	Comprehensive communication during consultations and consideration of consultation results in parliamentary work, campaigns regarding referendum and initiative management, initiative and referendum votes; preparation of implementations, etc.	Through communication and collaboration platforms; GEVER systems, administration applications, CRM and campaign planning systems; deployment of simulation or "model building" tools, depending on the policy-making body
Policy implementation	Policy implementation on the operatrion level architecture and adjustment of IT support, if necessary, according to amendments pursuant to process adjustments in operation level. If possible, the deployment of IT must allow for structured evaluations on the spot, provided the policy-making body approves.	Through specific administration applications, preparation of data warehouses, performance management of high-performance administrations
Policy evaluation	Sharing of information from various IT systems of operation level architecture but also of systems in the justice area which similarly represent some kind of operation level in jurisdiction. Communication of results for the alignment of policy, the policy programme, if necessary, etc.	Through business intelligence based on data warehouses, integration of specific administration applications of the operation level architecture of high-performance administrations.
Between **policy implementation** and **policy evaluation** the following applies	○ The policy programme moves on to the implementation (operation level) phase in between. ○ Thus, the policy programme is implemented on an operation level (focus: operation level architecture): implementation of laws, ordinances, adjustments or new definition of operational administration based on the programme. ○ If possible, a special focus should be laid on the IT support because data for the evaluation of the programme can be easily generated through appropriate IT implementations; however, this is seldom the case and depends on the policy-making body (also compare figure 5).	

Figure 3 also shows how diverse the mentioned relationships between operational administration and political administration are. This diversity can include: data supply by the operational administration units and applications for evaluations or votes and elections, measures for the implementation of policies in operational administration, etc.

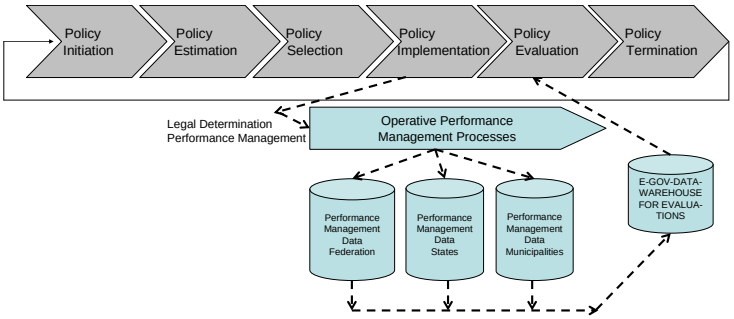

Fig. 3. A model displaying the relations between stakeholders and policy cycle processes as well as data aggregation putting operational administration in charge.

For the performance management to be able to supply data for the evaluation of policies in the political administration process, the policy program must be planed, phrased, decided, etc. with as much detail as possible regarding the information technology support and its realization. Based on that, information systems can be specifically built, which, in turn, allow for measuring the success of policies and, thus, for drawing information-based conclusions regarding the effect of policies on the audience. This task is facilitated when, for example, a reduction of carbon dioxide emissions is measured using scientific methods and due to certain policy programs. Social behavior, that is supposed to change through a policy program, is harder to measure (e.g., AIDS prevention).

4.3 Requirements of Business and Application Architectures for Political Administrations

The following sections are an attempt to describe the various requirements of business and application architectures for political administrations.

Actually appropriate and detailed network analyses would be required but this is an attempt to create a generic requirement profile. In addition, applications can be assigned to support those process requirements. The value of the deployment of an integrated information system and a generic management of political administration processes is crucial. The interaction of stakeholder groups and institutions of the political system, that are affected by the processes in various phases and different network configurations, requires for example: communication functionality via various communication media and various contact points; collaboration functionality allowing experts, parliamentarians, employees of an administration, etc. to work together; documentation system functionalities; contact and campaign management functionnalities as well as customer or citizen relationship management (CRM or CiRM) logic [15], e.g. for consultations, votes and elections, etc.; knowledge retrieval functionality for experts who create draft laws for various policy-making bodies and explore or try to discover interdependencies, etc.
These functionality requirements also allow for the derivation of the most important architecture domains, which are in the centre of an architecture for political administrations. The functionalities must be available for use in an open (external) or closed way (internal, e.g. administration, stakeholders, etc.). Political administrations work independently from the rest of the administration for the most part; however, interfaces to other process areas exist which must be considered when building the architecture. This includes the access to citizen data for the addresses of voters but also access to data of operational administration units and applications for evaluating policy programs, etc. Based on these requirements, information systems can be derived which cover the needs appropriately: communication applications; collaboration applications; documentation applications for political administration processes (in German-speaking countries known as DMS (document management system), GEVER (electronic business administration), ELAK (electronic file system) or DOMEA systems); applications with contact and campaign management functionalities (CiRM or CRM functionality and logic; CiRM meaning citizen relationship management and CRM customer relationship management); applications with knowledge management functionality. CRM logic to support operational administration in the front office and processes is different: due to the law of large numbers economies of scale are achieved in contact and communication management. In political administrations, it's communication types that remind rather of so-called public relations in the private industry instead of 1:1 communications as in operation administration. Thus, here, integrated communication via electronic means has a different meaning than on the operational level of the administration. However, integrated electronic communication scenarios must also be considered by the political area due to an increasingly electronically supported environment. Participants can be the mentioned stakeholders of the political process. In the policy cycle program area, the focus is laid on the communication within the administration but also among the various participants and stakeholders of the political process who define and determine a policy program. For this purpose, integrated communication and collaboration structures can be used to facilitate communication among the various participants.

4.4 Specification of a Component-Based Architecture for Political Administrations

Based on the here-outlined requirements regarding the architecture of political administrations, the following process modules (including according information system support) - in terms of added value - can be named: communication module including appropriate platforms (phone, e-mail, web, face-to-face), collaboration module including appropriate platforms (e.g. project-oriented collaboration allowing various experts or stakeholders to work together to support the creation of policy programmes) as well as a lean CRM logic (platform) for intelligent personnel management in administrations and for other stakeholders, GEVER (electronic business management) or business administration module with appropriate

information system support (for the documentation of the creation, implementation, and evaluation of the policy program), operation-level-specific modules and applications of the various administration departments, information systems of all kind as the basis for the creation and specification as well as implementation of policy programs in political administrations.

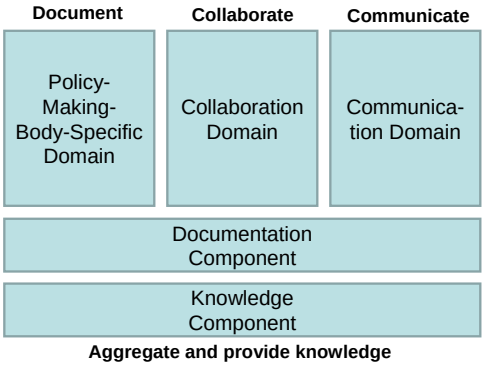

Fig. 4. Possible process and application component architecture to support the policy cycle.

Figure 4 shows the various modules which can be bundled per policy cycle phase instead of working with different layers as displayed in figure 5. The bundling option takes account of the consistent handling of security and compliance aspects. A temporary solution between figure 4 and figure 5 is to implement continuous layers for documentation management, for example. This needs to be considered for the management of security limits between the upper and lower architecture area in figure 5. Figure 5 is an attempt to show a comprehensive architecture for political administrations based on the policy cycle. Various layers can be distinguished: communication, CRM logic, collaboration, GEVER / DOMEA / ELAK, specific applications for political administrations, information, monitoring and expert systems as well as general information systems. In addition, compliance, security and data warehouse systems are required for political administration management.

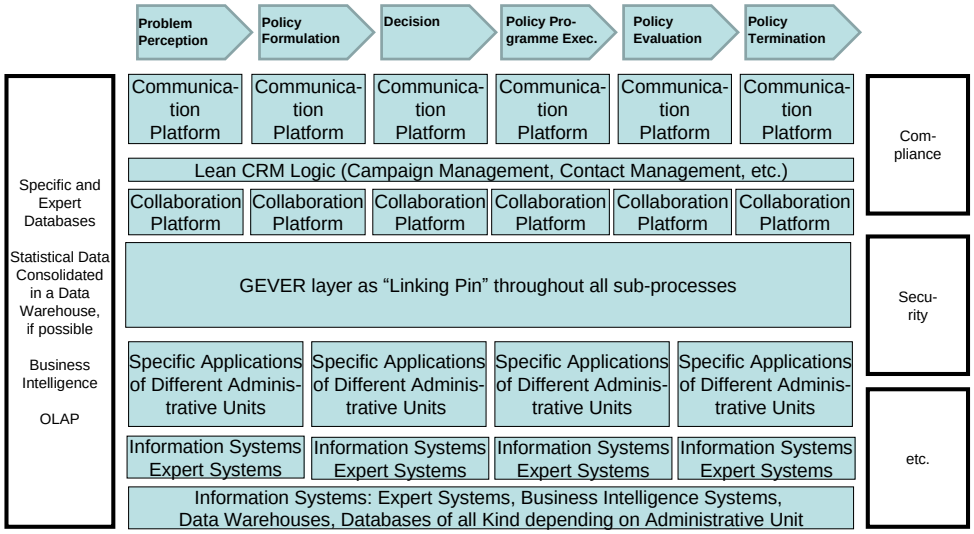

Fig. 5. Possible component architecture for sub-areas of the policy cycle.

The fact that communication, collaboration and specific applications are looked at separately shows that collaboration and communication systems can have different security requirements, which, in turn, results in more or less open and, thus, in more or less integrated information systems. This distinction also reflects and adopts the various configuration requirements of the different phases of the policy cycle as well as the fact that the first phases or processes of the cycle are not necessarily led by the administration but by the stakeholders. Thus,

different requirements regarding the provision and management of exchange or communication platforms must be met. Also, when dealing with personal data in the decision-making process, for example in the event of popular votes or elections, security management draws special attention, which, in return, results in special requirements for CRM, collaboration and communication systems.

5 Conclusion and Outlook

Architecture management in the context of political administration processes was looked at from the perspective of a comprehensive management of administration business architectures. The focus was laid on the derivation of activities in the policy cycle network which served the assignment of supporting system types to the various activities and allows for the creation of modular e-government architectures for political administrations. Also, an attempt is made to illustrate the architecture for political administrations based on the component concept and the very generic framework of the policy cycle. In addition, critical areas and specific areas of architecture management in political administration are specified based on the policy cycle. Eventually, one question that remains is whether the modules should be aligned with the policy cycle and its phases or whether the alignment should be based on the similarities of the applications which are supposed to support political administrations in their core areas.

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