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Enterprise Architecture Descriptions for Enhancing Local Government Transformation and Coherency Management

Case study

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***Abstract*—Local governments cover multiple service sectors and are typically organized into diversified, deeply hierarchical organizations. Public services offered are tangible, mostly non-IT-critical, and heavily dependent on human resources. Information management is mainly manual in strategy and management processes. In this case study of a large Finnish local government organization, enterprise architecture (EA) is proposed as a tool for improving the coherency of the local government and its alignment to IT and other resources. We ask, what kind of EA descriptions local government agencies need for coherency management, and how to organize them. We apply action design research principles at the Kouvola City concern by adapting the Finnish Government EA Grid there. The business architecture is unfolded to evaluate the target state for a planned change. The results give new insights into transformation of the local government towards new public management related operation models, government-IT alignment, and further development of EA description tools and repositories for public administration use.**

Keywords - enterprise architecture; business architecture; public administration; local government; change and coherency management; business IT alignment

I. INTRODUCTION

Local government is being strongly re-organized, e.g., by fusions and privatization (cf. [12]). Effectiveness and efficiency have become crucial, whence e-government has been set as a critical success factor. Effective changes, however, would presume design activities, e.g., analysis of customer needs, planning service and government structures, human resources, information systems, and costs. All these aspects depend on each other. Designing the target state of a government should be seamlessly supported by blueprinting methods, which can be facilitated by enterprise architecture.

Enterprise architecture (EA) is a systematic, common tool for public administration design [14][15]. EA has proven its power in IT organizations as a tool for strategic IT management [37], where a shift from information systems planning [72] to enterprise architecture planning [62] can be seen. Doucet, Gotze et al. [14][15] state that the purpose of EA reaches beyond business IT alignment into change and general management, which are especially necessary in complex organizations like local government. In addition to being blueprint, EA can be seen as common language, and common decision [61] that enhance consistency, coordination and coherence in an organization [51][14][15].

This study focuses on a Finnish city, Kouvola [11] with ca. 6500 employees and 90 000 citizens, formed by a merger of 6 former local municipalities. We ask what kind of EA descriptions a local government needs for coherency management, and how to organize them for that purpose. Our objective here is to outline some EA models and descriptions in an EA framework to support coherency management in the multi-domain local government.

This study forms a continuation with previous studies concerning Finnish Government EA grid adaptation: A government EA (GEA) method was engineered for Finnish public administration [40]. The method engineering work was reported shedding light on the general GEA method requirements [25]. Secondly, the special method requirements of business architecture development in PA were reported [65]. A special GEA grid adaptation model (Geagam) was constructed [68][69] to support all kinds of PA organizations in the adoption of the GEA framework (GEA grid). This was later adopted and elaborated at the Kouvola City concern for the local government [70]. Here we wish to further refine the Kouvola Geagam.

Our case study is based on action research design principles, adapting the Finnish Government EA Grid at Kouvola. The results are based on the GEA work at Kouvola city from the latter half of 2009 to the end of 2010, on the refinements and recommendations of the Finnish GEA method for Finnish local governments by Ministry of Finance [29], as well as on the latest EA literature, e.g., [1][3][16][26][56][14][15].

In the following we first discuss EA frameworks and their use for different purposes, especially in PA. In Chapter 3 we present the case as a part of Finnish GEA development. Chapter 4 describes the research setting and method. In Chapter 5 the Kouvola GEA grid adaptation model is presented. Chapters 6 and 7 discuss and summarize the results.

II. RELATED WORK

Enterprise architecture (EA) has emerged in response to perceived need for more overview of and control with growing systems complexity in large enterprises. The first EA frameworks [17][73] and methodologies [62] were elicited from IS development needs. Later, the focus shifted to information management in federated organizations. Development of EA frameworks was boosted by government initiatives: The US Federal EA [9][10] triggered by legislation in the mid-90s was a milestone followed by GEA work in several countries [35]. The Open Group TOGAF [47] comprises an EA body of knowledge, sourcing especially the large base of governmental EA but also consulting methods. Mature EA methodologies in large organizations cover the ICT planning, management and development.

As the EA is inherently intended for managing complexity, there is a need to structure the whole to confined focus areas, in order to enable separate concerns for efficient decision making on the one hand, and on the other hand, as importantly, to establish the dependencies of the matters and issues in different dimensions. This is essential for collaboration and coordination of ICT management and planning [50][51]. In a meta-level analysis of the existing frameworks and consulting methodologies, a consensus on four EA dimensions has been established: business architecture, information architecture, systems architecture and technology architecture [23].

A study of practical EA work [22][51] reveals that within these dimensions, models and descriptions of EA three levels of abstractions are found: the levels of (1) an enterprise, (2) its domains and (3) subsequently, information systems [23]. The levels reflect three meta-levels of decision making in organizational hierarchies [23] in line with organizational studies, e.g. [13]. EA planning process flows from the strategic enterprise level towards concrete domain and systems levels [49].

Besides managing technology and systems architectures, EA has gained momentum as a business development tool. From business-IT alignment, the EA methodologies are evolving to strategic management approaches with a business–led approach, and further, to coherency management [14][15]. Doucet, Gotze et al. [14][15] separate three purposes of EA: the alignment of business and IT to produce a *foundation architecture*, the systematic planning and management of change to produce an *extended architecture*, and the coherency management to produce an *embedded architecture*. As regards the production of EA descriptions is embedded in governance practices to 'leverage on what you already do or produce' [15]. Coherency refers to a logical, orderly, and consistent relation of parts to the whole [15]. At its best, EA is used for all three purposes whether in a complex enterprise or at a public administration [15]. Modeling has the ability to enforce innovation, quality improvement, new designs, and strategic change decisions e.g., in [4]. The models used to convey EA information are an essential means of collaboration between the different stakeholders in the organization.

EA methods are typically adapted from well-known frameworks, or defined locally both in private [59][60] and public sector [7][8]. Local government covers multiple service sectors [48] and is typically organized in diversified, deeply hierarchical organizations [27]. The services offered are tangible, mostly non-IT critical, and heavily dependent on human resources. Information management is often manual in strategy and management processes [67]. Effects of a strategic change decision are analyzed largely in terms of costs and human resources, not always of IS architecture [26]. PA as a context thus sets specific requirements and constraints on the EA method [27]. An EA framework is in a key position there, having the capability to structure the EA descriptions and to guide the EA planning process [51].

PA in Finland [71], as well as in other Western countries [20][6], has been shifting from a hierarchical structure towards a matrix and process organization. Traditional PA organizations thus become involved, in describing their processes [20]. The shift towards new public management (NPM) [12][32] presumes better performance management [6], as well as better management of operations models (cf. [54]). Privatization and adopting purchaser–provider models bring forth the evident change of the operations logic and governance processes. Purchasing and arranging of services presume different perspectives of the administration, e.g., managing supply chains from various providers to customers. This poses special challenges for cross-organizational and cross-sectoral process management and planning [67].

In our study, we wish to present a case study of a local government, where the EA work towards embedded architecture is to promote the local government capability to encounter these administration challenges in the long run. The case depicts an on-going attempt in adopting EA for a local government coherency management purpose, the latter being a rather new concept in EA literature (cf. [14]).

III. CASE KOUVOLA AS PART OF THE NATIONAL EA

The Finnish Government has proposed to Parliament the so called information management law in late 2010, to enforce interoperability and compatibility of information systems in the public sector [38][39]. The control over the State's information systems architecture is to be shifted to the Ministry of Finance [18]. Local government in Finland, however, is based on municipal self-government, and has been independent concerning the organization of information management and e-government [38][39]. Ministry of Finance guides the co-operation by a national networked organization to promote the compliance to standards and administrative principles of the public sector information management [28]. This poses challenges to the coherency of the local government enterprise architectures. The law, however, will presume enterprise architecture modeling efforts by public organizations including municipalities [38][39]. Municipalities in Finland are also currently planning the centralization of their information management on a voluntary basis, in order to be able to face the challenges of the future law, and to ensure the coherency of their target state systems architectures.

Finnish Government has engineered several design tools for GEA since 2006, including a method for GEA planning and development, *GEA method* [40] and *GEA governance model* [41]. The tools were originally built for the State Administration, but [40] have recently been refined into a national standard for Finnish municipalities [29]. This standard remains still rather general as to the adaptation and adoption guidelines for a diversified multi-domain organization. It considers the architecture as a hierarchy of architectures needed for designing and modeling of a local government at different decision making levels [68][69].

Kouvola is a new city with ca. 6000 employees and 90 000 citizens, resulting from the merger of six local municipalities in 2009 [11]. The organization structure has been under continuous change. First, there were four branches of administration along with central administration. Each branch was further divided into a service provider organization, and a purchaser, the latter being responsible for the arrangement of the services. Management by supremacy was replaced by contract management [70]. Second, from the beginning of 2011, the four branches were united in two: 1) the town development, incl. city planning, infrastructure and branch of industry, and 2) wealth, incl. public health care, a local hospital, social services, education, and nurseries. The former is a genuine purchaser, since all the providers of the branch have an entrepreneurial form. The latter, to some extent, goes back to management by supremacy, since most producers are part of the city government. Due to continuous changes, also in future, the GEA tools have to be flexible.

Kouvola has been one of the forerunners among the Finnish municipalities in GEA adoption. National GEA tools have been adapted, and some architectural descriptions adopted. The GEA grid was first adapted for the embedded architecture, in order to describe and put together the entirety of the government [70]. Since then many kinds of descriptions have been piloted and some of them have been taken into use. Next, we shall describe more carefully the GEA work in the city of Kouvola.

The GEA tools were first used to support the general management in everyday work as embedded architecture [14][15] and as the traditional foundation architecture [14][15] in IT management. In Finland, EA is wished to be a tool for the general and operative managers as well as in IT management [38]. In Kouvola we have approached this goal by enhancing the foundation architecture and the embedded architecture concurrently: 1) in general management, by proceeding with the strategy and process descriptions, and 2) in the IT team with the government change management and IT alignment goal [54]. This parallel and iterative, 'bit and pieces' approach is a way to introduce a completely new subject to leaders in order to bring in coherency management, where foundation, extended and embedded architectures might be efficiently exploited as multiple modes of EA [15]. Next we describe the efforts done in both general management and in the IT team for GEA implementation.

Main descriptions adopted in general management have been 1) strategy, 2) service, and 3) process blueprints. In late 2009 and early 2010, the town strategy was implemented by depicting the strategies of the various organizational actors as roadmaps. The blueprints across the organizational agencies formed the strategy architecture of the city. Service architecture was described in 2009 and 2010 by service contracts between the purchasers and the providers. The service groups were described for all the services of the city. Process architecture has been described for different purposes, e.g., for productization and to establish new organizational structures. A description tool for process and strategy descriptions has been introduced, process description notations standardized, and main users of the tool educated to act as process consultants.

In Kouvola, CIO leads the IT team of four IT coordinators. The team is responsible for systems specifications, coordination of the IT investments, IT architecture, interoperability, information security etc. The IT team is interested in the foundation architecture descriptions for alignment of government with IT, assuring IS support in any change situation of the organization and supporting strategic service innovations and e-government. The IT team launched several EA initiatives in 2009 and 2010, such as 1) EA capability fostering, 2) GEA governance model development, and 3) SOA platform development. GEA capabilities have been added by educating the IT team on EA theories, national GEA tools and Archimate descriptions. The first version of the GEA governance model was adapted for local government IT use in early 2010, especially for the management of systems and technology architectures. According to the model, the IT team acts in the role of IS/T architect. Governance process yields annual IS roadmaps aligned with implementation resources and ensures coherent IS and IT architectures with locally and nationally interoperable systems. The GEA evaluation of any project against IT criteria has also been embedded in the project portfolio management process recently engineered for the city, e.g., from [41]. The systems solutions are to be estimated in terms of scalability. To enhance the further development and implementation of government IT alignment and e-government, the requirements of Kouvola's technical e-government platform were specified with the GEA method, and implemented with SOA principles and technologies.

IV. Research method

Our research forms a constructive case study [31] applying principles and practices of action design research (ADR) [57]. ARD is a new approach, combining two commonly used scientific rigors, action research [52] and design research [21]. Action research (AR) 'is an interactive inquiry process that balances problem solving actions implemented in a collaborative context with data-driven collaborative analysis […] enabling future predictions about personal and organizational change' ([52] according to Wikipedia). Researchers work as designers and stakeholders with other employees, to propose a new course of action and to help the community improve its work practices [53]. The first two authors have been working at the city of Kouvola, as strategy designer and as chief information officer (CIO), respectively. They have acted as designers and stakeholders

in the organization, responsible for the research setting of the paper and instutionalization of its results.

Both of the methodical rigors are iterative in nature. In design research (DR) the iterations contribute to re-design of technology or an IT artefact [57]. An IT artifact in our case is an EA framework, which is being adapted for a local government [27] for coherency management, through an adaptation model [69]. In AR, the iterations contribute to an organizational intervention [57]. The long-term effect of our artifact is to support the development of a more systematic governance model for the diversified local government in the future. The expected effects are better leadership and organizational consciousness. However, this would presume a far-reaching change process concerning the entire organization culture of the town.

The theoretical aim in DR, is theory abstraction on design principles [57]. Here, we wish to enhance the organizational design and government IT alignment knowledge in PA. In AR, the theory abstraction is done on the effectiveness of change [57]. Knowledge is created through intervention to effect change, and reflecting on this intervention [57]. We urge the utility of systematic EA tools [3] in coherency and change management. So far, we have taken into use descriptions at various organizational levels and functions (cf. Ch.3). The new practices are to, e.g., enforce embedded architecture by facilitating active and participative leadership practices by blueprints. The common interest 'anticipated by the research group' [57] has been the urge to adopt a common GEA framework for the coherency management of the local government, as a means of common understanding, language and blueprint [61], and further, to enhance the interoperability at all levels of the municipality [26]. In this paper, we ask especially, what are the organizational descriptions needed for coherency management at a local government organization.

The research is based on earlier and on-going national GEA efforts. The first version of the Finnish GEA method [40] composed of a large conceptual framework, a general-level process model, a set of description models with templates, and normative instructions for how to apply the framework. It was adapted in pilot projects in State Treasury and Road Administration [69][58]. A general Finnish 'Government enterprise architecture grid adaptation model' (Geagam, [69]) was created as the first guideline for applying the GEA grid to the Finnish public organizations. It included preliminary guidelines for adaptors and adopters [68][69]. The Geagam instructed to recognize the fit between the description levels of a government and the heterogeneous needs of the different administrative roles.

Geagam has consequently been applied at the city of Kouvola in 2009 [70]. The description levels and viewpoints for the new organization were considered with some exemplary descriptions populating the grid. In the current study, we analyze more specifically the description roles and responsibilities of the different types of the organizational actors and the viewpoints for coherency management. The descriptions and models are identified and situated into the set of grids, based on the work done at the city of Kouvola (described in Ch.3), the latest Finnish GEA work [29], and EA literature [1][3][16][26][56][14][15]. Concerning Finnish GEA work, we take into account the set of GEA descriptions included in [29]. Kouvola Geagam is being built iteratively, the second version of which is presented here.

The results reported here have been mainly produced in June and July 2010, by the first two authors. We had ten workshops approximately two and a half hours for each, for the redesign of the framework, and for the depicting the dependencies of the descriptions situated in the grid. The latter illustration will be introduced in our future publication. When populating the grids with the descriptions, we asked ourselves, what descriptions are already in usage, in test use or are still needed. Further, we asked which viewpoint each blueprint is representative of, and at which organization type and decision level the responsibility for the modeling and maintenance of the blueprints exist. We also refined the order, contents and naming of viewpoints and whether they are still appropriate [70]. The choices were made based on our common understanding on Kouvola local government, and the GEA efforts and the needs acknowledged there. In every workshop we produced several iterations of the presented results. Memoranda of the discussions included the used references, comments, and conclusions of the workshops. The role of the first two co-authors was also to reflect on the GEA requirements and constraints of Kouvola context with the background knowledge of EA and ISP literature. The results are described in the next chapter.

The results have been evaluated in a half day workshop with the four IT architects of the town. The evaluation session was organized as a semi-structured group interview by the first two co-authors, emphasizing the utility, content and presentation of the framework. The comments were documented as a memorandum by the first author. The evaluation of the previous version [70] has been made in group interviews of leaders, and in queries concerning the strategy architecture management. The details of these evaluations are to be published later, but have already been taken into account here. In ADR, the phenomenon of interest does not remain static through the research process [57]. Since the Kouvola grid adaptation model was created, a new organization structure emerged in 2011. The reported adaptation model at hand is evaluated against the new organizational structure in use from 2011.

V. GEA GRID ADAPTATION AT KOUVOLA CITY

Here we present the GEA grid adaptation model, called Kouvola Geagam, for the local government at the City of Kouvola, and show how this model is used to organize a large variety of models and descriptions for governance. The model is aimed to support more systematic, transparent and participative management practices and to enhance the coherency management of the city [15]. The goals of the Geagam are as follows: It should 1) provide a common frame of reference for thinking [51], 2) show the necessity of blueprinting of different organizational aspects of a municipality, 3) facilitate the EA work of IT architects, e.g., [16][37], and 4) offer support for all function leaders.

The Kouvola Geagam (Figure 1) is composed of three grids which represent the roles of different organizational

actors in the city: a strategic grid for the city concern and two operational grids, one for provider and another for purchaser organizations. The thin arrows signify the positioning of the operational grids below the strategic grid of the concern, due to constraints set by central management and city council on the other organizations. Service agreements between the organization types are depicted by thicker arrows. The number of the description levels in each grid varies according to the decision making levels of the organization types. These levels in the strategic grid are the Council and town board, and the Central administration. In the purchaser organizations they are the Board and sector administration, and Purchase management for each service area. In the provider organizations, there are three levels: Board and service sector management, Service area, and Service unit.

The other dimension of the grids is defined by six viewpoints: Operational Environment, Service & Customer, Information & Data, Personnel, Systems and Technology, and Finance. Operational Environment reflects the external boundary conditions and strategies how to react to these. Service & Customer (S & C) relates to the services provided to customers. Information & Data (I & D) refers to all the data and information collected, processed, stored, and disseminated by the local government. Personnel concerns employees, their capabilities, locations and roles etc. Systems and Technology (S & T) stand for information systems and technology architectures. The viewpoint of Finance is for financial and cost information.

Since we are focusing here on the providers serving town customers, the grid for support function providers in [70] has been omitted here. Centralized support functions, such as rental management, core IT services, and financial services serve the organization of the town. Functional leaders in the central management typically design the organizational service needs in co-operation with other organizational stakeholders, and sign agreements for these support services. For example, CIO buys IS and IT services, and the head of the FSM unit buys financial services. Most centralized providers could utilize the operational grid for providers with slight adaptations.

While making plans and decisions from a certain viewpoint, signified by the column, by a government unit, signified by the row, each number in the corresponding cell signifies the models and descriptions at hand. Models (e.g. strategy roadmaps) are depicted at all relevant decision making levels. The content, however, is specific to different roles and service domains. Table 1 lists the models and documents with the identifying numbers, categorized in the six viewpoints. In the following, we describe them in more detail.

The models and descriptions in Operational Environment relate to the local government dependencies. Finnish local government operations are dependent on a multitude of laws [18], decrees, standards, external organizations, actors and stakeholders as well as external, national or geographical reference strategies and architectures (models 1-3). Strategic choices [43] are formed typically through the analysis of the strengths and weaknesses of the current state, and the threats and opportunities of the future state of the organization (SWOT analysis [30], models 4). Strategic actions and goals are planned and modeled as roadmaps (models 5). Centralized strategy modeling notations and tools yield the so called Kouvola's strategy architecture with comparable descriptions among different organizations. Strategic choices and goals constrain and direct also the architectural principles and the strategic business requirements (models 6-7). In order to evolve towards coherency management, (1-5) are to guide the design of other viewpoints, e.g., service design [4], systems planning and acquisition, human resource (HR) design, cost analysis and budgeting.

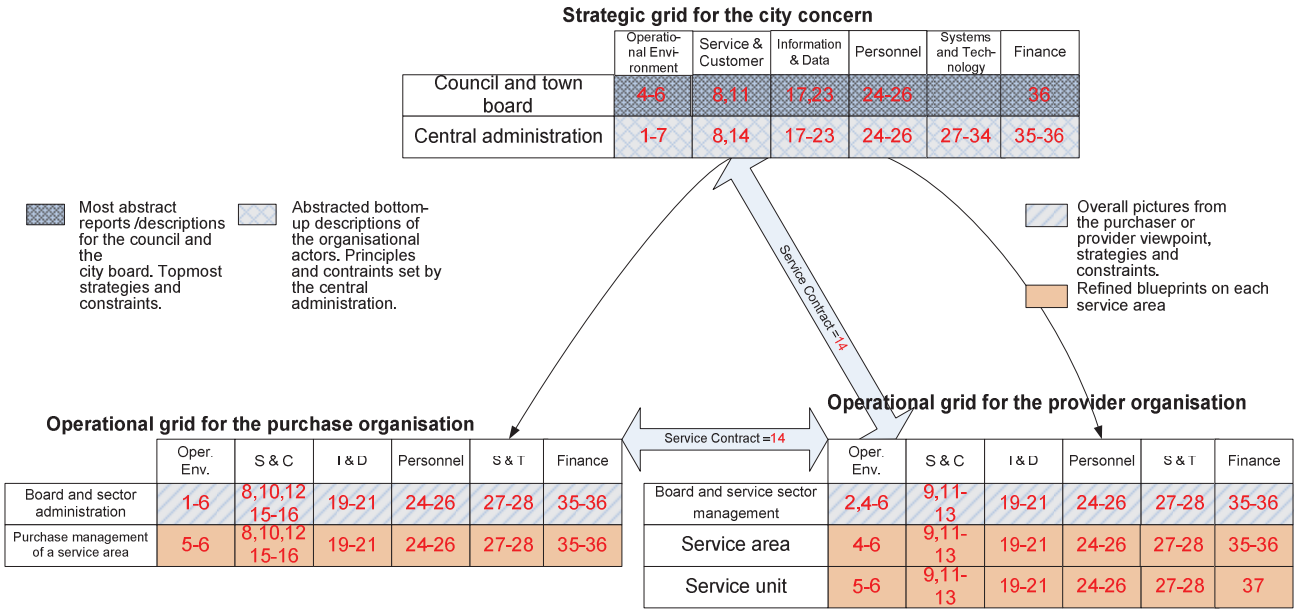

Figure 1. Kouvola Geagam.

TABLE I. GEA DESCRIPTIONS POPULATING KOUVOLA GEAGAM (* = IN USE / TEST USE)

Operational Environment	Service & Customer	Information & Data	Personnel	Systems & Technology	Finance
1 Laws, decrees and (national) standards 2 Organisational actors and stakeholders 3 Reference architecture and strategies 4 SWOT factors/trends * 5 Strategy goals and roadmaps * 6 Business requirements * 7 Architectural principles *	8 Government operations model * 9 Business model * 10 Client segmentation and structure 11 Service map and catalogue * 12 Process map and descriptions * 13 Services vs. production processes * 14 Service contract * 15 Customer needs analysis * 16 Client or Life even process vs. used services mapping *	17 Strategic and management processes map and descriptions * 18 Information flow * 19 Processes – information 20 Organisational actors - information 21 Information portfolio and information structures 22 Logical information assets 23 Semantic concepts * (definitions and bywords)	24 Organisation diagram * 25 Job descriptions * 26 Processes – Job descriptions' roles *	27 Systems – information – 28 Process-systems – 29 Systems requirements * 30 System services specification 31 Constrains 32 IS portfolio and IS map * 33 Data dictionary 34 Logical systems	35 Cost-benefit analysis 36 Budget * 37 Costing model *

The goals and availability of the provided services are planned by the purchaser. The purchaser has to plan, what services and of what quality level, are provided for the customers of the local government. It also has to control the quality and fulfillment of 'ipso jure' requirements. The purchaser should be interested in customer needs, experience [4], feed-back, and seamless cross-organizational client and life-event processes [67], in order to invest in the services consequently, and produce the seamless client experience. The strategic arrangement of the services is also planned by the purchaser. Government operations model depicts the chosen providers and services thereof, preferably against the life event process of a customer. The provider would depict the business goals for effective, innovative and transparent provision, the due provider processes and the information capital formed in them. Service experience of the clients [4] should interest them for quality assurance. In Kouvola, the largest service area has ca. 2000 employees in ca. one hundred schools and kindergartens. The client is met in these locations where the execution of the services takes place, and the client information is created. Service & Customer viewpoint is thus populated with government operations model (8) and customer needs analyses (15) for purchasers. Business models (9), service maps and catalogues (11), services–processes matrix serve the providers. Client segmentation and structures (10), service contracts (14), and process descriptions (12) are for the both. Concerning process descriptions, the purchaser and provider roles differ with the contents of the descriptions: The purchaser, as a policy-maker and responsible for the availability and arrangement of the services, should rather focus on life-event processes (ref) versus services to-be-purchased (16), whereas the service provider might to wish associate its service map with its provision processes (13), the so called 'coal face processes'[46].

Information & Data viewpoint refers to the information and data architecture [3][23]. Beyond the client processes, identifying and modeling of the abstract management and strategy processes [46] has been lacking in PA in Finland [67]. Management and strategy processes (17) were therefore clearly separated from the client and provision processes, and considered parallel with information flow descriptions (18), and thus situated in the I & D viewpoint. By this separation, we wish to emphasis the urgent need of the development and automation of the governance processes and practices, currently lacking enough resources to evolve. Nursing or teaching, e.g., cannot be highly automated. Only the information flow automation can help to get rid of the unnecessary and overlapping governance work to integrate governance processes among functional management processes. Other descriptions in this viewpoint are more traditional (19-22). Logical information assets (23) range from Excel-sheets to databases and data warehouses [42].

The Personnel viewpoint involves employee information, the locations and capabilities thereof, as well as roles (24-26). The Systems & Technology viewpoint refers rather traditionally [47][23] to the information systems and technology architectures from the ICT management viewpoint (27-34). For example, the systems are analyzed against their information or processes. The Finance viewpoint collects the financial and cost information produced in the organization, whether annual (such as budgets) or costing models (35-37).

The order and titles of the description viewpoints have been refined slightly from the previous Geagam version [70] in order to better support the design process in various organizational change situations [15]. The goal of the changes may focus on aligning resources, whether human, systems or rooms.

The description levels serve different roles of the organizational decision levels. Top management, council and board members wish to have summaries of the current states and goals of the branches and service areas. Central management is the most responsible for producing such analytic *bottom-up descriptions*. At the moment, these kinds of descriptions are either manual or lacking. Secondly, the central management is presumed to produce the vertical management practices transparently, and to provide functional policies to follow. This yields management and strategic processes (13) as well as functional management strategies and goals (5) at the central management. Some descriptions form *top-down hierarchies* providing a kind of boundary conditions to other organizations for alignment, such as top decisions, strategies, goals, and principles.

However, an iteration should be applied both in top-down and bottom-up descriptions. The dependencies between the descriptions of different viewpoints [1][16] follow the principles in EAP processes [62][50]. In our research workshops in summer 2010, beyond the hereby reported Geagam framework, we concurrently built a layered meta-model depicting the descriptions as entities with their relations (in the style of [1][16]). How all the different descriptions in Kouvola relate to each other will be reported in our next publication.

In the Finnish local government, systems are seldom designed and built by the government itself. Instead, solutions are bought from private markets [39]. The IT team is basically responsible for systems requirements and acquisition in co-operation with the branches. The systems description level, typically at the bottom of hierarchical EA grids [23], is left out in our construct so far. Also most technology architecture descriptions, such as technical services, hardware architecture, network diagram, deployment diagram, integration map, technology components catalogue [29] are left out in the current version of the grid. IT services (cf. ITIL [45]) are outsourced at Kouvola to be provided by a centralized IT support function that became a town-owned corporation in 2011. This IT service provider manages the IT services delivery and the company business, owning the technology architecture descriptions of the town. However, to maintain S & T architectures, the IT team needs descriptions provided by IS providers, as well as by the corporate IT. The descriptions presumed by IS providers could be situated in Kouvola Geagam S & T viewpoint at the relevant description levels.

VI. DISCUSSION

The presented EA framework provides several advantages for the local government transformation and coherency management. At the same time, there remain many kinds of challenges in the adoption of the framework. Here we first end up with some advantages to be gained, as well as perceived challenges for EA in PA use, next give some practical suggestions for GEA deployment implementation in a local government.

A. NPM quests for the efficient coherency management

Enterprises can be seen as service systems [36], as 'value co-production configurations of people, technology, other internal and external service systems, and shared information' [63]. When adopting the definition for public administration, the value looked for has to mean more than currency. The local management brings value in wealth, using common currency for that, as wisely and largely as it can. Therefore, in NPM, a local municipality needs to continuously evaluate the services and the ways of arranging them. When investing in several service providers, there should also be systematic practices to manage the service system thus produced. By Geagam, we wish to offer a systematic tool for coherency management of different organizational actors and roles thereof. Re-organizing of purchasers and providers is a continuous process, which seems to change organizations towards the centralization of the former ones and the de-centralization of the latter ones at Kouvola.

Both in outsourcing and contract management, the information-flow between the stakeholders may halt, if it is not agreed upon in the service contracts. There is a need to define an operations model, with the desired levels of process standardization and integration [54]. This is essential for the set of organizations in a government that are in continuous change concerning enterprise forms, structures and processes. An EA grid as a tool for coherency management can be considered a meta-model of all the descriptive information (descriptions) about production, development, and management. Outsourcing practices, at least at Kouvola, quest for more systematic and thorough practices concerning the integration of the information. There are risks of losing important information in privatizations. We might conclude more generally, that a shared GEA grid among different management and organizational roles, as a means of coherency management, would bring stability and systematicity to public administrations service system re-engineering, through a common meta-level categorization of the enterprise information, models and descriptions. Geagam could act as a check list for the purchaser, in ensuring the coherency of a set of providers concerning transparent information flows, and further, in digitization of the information interfaces between them. If even common description methods were insisted from the chosen providers, that would also enhance comparability.

Evaluation of the target state in and its change effects, has to capture also the dependencies, and consequences to the personnel and the costs, especially where the services are human resource dependent. EA for coherency management could be used to align all kinds of resources with strategic demands, whether human, information systems, rooms or money, by analogy to business IT alignment. In Geagam we have anticipated this kind of use, and do wish to discuss it more widely in the future.

B. Embedding architecture in government practice

At Kouvola we have embedded the depiction of strategic action plans in management tasks at all the organization levels. By embedded architecture, the managers have better capabilities to recognize their own spheres of responsibility, and the relationships with each other (cf. [15]). Process architecture is depicted within the same modeling tool, and saved in the same repository, as strategic plans. EA blueprints from the ICT perspective will be forced by the new information management law. So far they have been facilitated by the IT team and Archimate tools. However, the value of all the descriptions and the information in them, is added only if all this information is used in communication, adding new meanings [66] and enhancing innovation [4]. EA provides a unifying alignment mechanism towards a common vision for the organization [15]. We consider our EA grids as a support for such an alignment mechanism, and a meta-level tool, as they provide a common framework of analysis. By adopting a shared categorization of organizational descriptions, a meta-level organizational

awareness can be enhanced, and is instantiated by descriptions and common description repositories.

Kouvola was merged from smaller municipalities, where almost everybody knew each other, and information management was easier to manage without meta-models. However, since the merger, information about existing information bases has often been lacking. Consciousness, availability, transparency and reusability of information would be the practical benefits from the realization of the Geagam. Blueprinting itself makes things transparent, although often tables, lists and matrices are enough as EA descriptions (cf. in [29][73]). If all managers can access relevant information easily with equal principles, it will make managing a lot more efficient, eliminating also human based 'hair ball' connections [19] in the information flow, and enables more holistic considerations in a specific decision situation.

Challenges in adopting a common framework for common understanding of the shared information are multiple. The idea of embedded EA is rather new and not many practical cases have been presented in the literature (see a collection of EA in its different modes in [14]). The adoption of EA practices by general managers in Kouvola has been slow and tedious, requiring education and change agents. Common learning presumes meta-level capabilities to guide organizational development [66]. Blueprints open up an organizational actor for the others, which can been seen risky by leaders who wish to keep everything in-doors. Lack of trust can thus prevent the adoption and use of modeling tools. Authorization policies should support socio-organizational requirements [55] of the blueprint exploitation, such as suitable access rights and trust, bridging thus the gap between security and usability.

C. *Government EA tool development*

As mentioned above, the evaluation group analyzed all the descriptions situated in Geagam. Most descriptions are used by all management roles, independent of their decision making level or organization type. However, some functional management roles are responsible for the development, instruction and maintenance of some descriptions practices, e.g., the IT team for the IS portfolio, and the strategy team for the strategy roadmaps. A shared repository and meta-engineering tool for development of the notations and maintenance of descriptions would stop the central management from parallel development and hinder from the silos of blueprints.

At Kouvola, blueprints had been in use rather little before the merger. They are also quite a new management tool altogether in PA [6][20] presuming abstraction of organizational contents at a higher level. Gaining the benefits from the blueprints is related to the capabilities in utilizing the models. In Finnish governmental organizations, information is mostly retained in traditional data bases, and even in datasheets and word documents (cf. [42]). Producing blueprints has been considered troublesome at Kouvola, even though the available description tools being improved all the time. Tools that can automate visualizations of relational data would enhance blueprinting a lot.

Models and blueprints can be developed independent of a categorizing framework. However, a framework like Geagam, may enhance the innovation and development of the descriptions of dependencies among different viewpoints. In many meta-modeling tools, a change in one blueprint can be automatically replicated into another [65]. The KuntaIT descriptions that were analyzed, included various cross analyses among two of the viewpoints. These were mostly in a matrix format, however. New kinds of dependence descriptions between the EA viewpoints should be added to the embedded architecture description repertoire, and be supported by engineering tools.

D. *Practical suggestions*

We conclude with some practical suggestions for GEA deployment and implementation in a local government:

1) Implement architectural terminology and modeling practices step by step in the organization, e.g. one dimension at a time. In Kouvola, EA maturity was quite low at the time of the merger. Different modeling practices have been deployed and developed separately step by step. Strategy architecture, for instance, has been established separately, as a new concept including strategic action roadmaps. The long term goal is to have common descriptions of all the dimensions of the organization where all architectural dimensions are utilized by the general management. Then it will be easier to develop and present new kinds of description models, even with crossing viewpoints and among different functional management roles. However, in the beginning, the whole framework might be too much for leaders.

2) Proclaim the GEA as library. By modeling and blueprinting, we are adding to a shared information asset. Considering the EA grid as a common information repository scheme might enhance the use of it. The benefits of EA become real only once the descriptions are reusable and reused by individuals other than those who 'authored' them. Awareness of information is important and should be facilitated by efficient communication.

3*) Adapt your EA grid gradually* in analogy to evolving library categorization. The grid is not the first thing to be presented for the end-users of the blueprints at the organization, but the blueprints are. The evaluation group concluded, that the current Kouvola Geagam for coherency management is needed, since the Finnish GEA grid (see in [69][29]) as such does not assume the embedded architecture approach, lacking e.g., the personnel descriptions that have been added in Kouvola Geagam. However, for the implementation of the grid, it is better to proceed 'hands on' and to experience practical success stories through organizational innovations, rather than present many versions of the adaptations of the grid.

VII. CONCLUSIONS

We presented a refined government EA grid adaptation model for Kouvola city (the Kouvola Geagam), populated with a set of enterprise architecture descriptions. The adaptation process of the GEA method is on-going. We presented and reflected on the building of the second version

of the Kouvola Geagam. The model was built using the action design research principles, and was based on the organizational work done at the City of Kouvola, within the process of the Finnish Government Enterprise Architecture (GEA) development, and is based on most recent EA literature. The organizational interventions emerged especially from urging GEA by the strategy management and the information management functions, as well as for process descriptions. The new practices were to enforce an embedded architecture, to leverage on active and participative leadership, and to ensure government-IT alignment, and foster e-government.

In our reflection, we suggest Kouvola Geagam as a useful tool for systematic management of new service operation models emerging in NPM, by noticing the unchangeable description roles represented by our grid types, even in continuous change of the organization structure.

There are still challenges in the adoption and use of the framework. Our subject about the GEA framework is quite theoretical, concerning framing and categorizing descriptions for government embedded enterprise architecture. For us, the GEA framework is a way to create a mental structure for coordination and collaboration. However, it is difficult to evaluate the value and utility of such a mental frame. The focus of the evaluation could be on interventions concerning blueprinting practices, dimensional architectures (business, strategy architecture, information architecture etc.), and the dimensional dependencies (the relations and consistent maintenance of the various artifacts), and organizational awareness and consciousness through the common framework thereafter.

Much is to be done to provide an embedded architecture for general management, including a wider range of models and repositories, easier blueprinting techniques, and elaboration of GEA planning and management processes. The last involves the development of new governance practices capturing all management roles beyond IM.

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