Management Structure Based Government Enterprise Architecture Framework Adaption in Situ

Meri Valtonen

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Meri Katariina Valtonen [1]

[1] University of Jyväskylä, Jyväskylä, Finland
mi.katariina.valtonen@jyu.fi

Abstract. The fragmentation of the public sector makes it difficult to manage strategically and architecturally as a whole. Enterprise Architecture (EA) is considered as an improvement to that. Architectural modeling and visualization of the general management strategy plans along with parallel database development in a local government forms the primary data in the longitudinal case study using Action Design Research Method. To find a proper organizational fit for the EA framework in public sector, we reflect on how the current state architectural descriptions got organized in situ in a deep corporate hierarchy, and what were the emerging management needs in re-organizing the content of the descriptions. We suggest the EA framework in public sector as a strategic corporate management tool. As for the current state EA descriptions, we propose implementing the framework not as a static, but as a dynamic data model of the current management structures.

Keywords: Government enterprise architecture - Framework adaption - Strategy architecture - Action Design Research

1   Introduction

Public sector changes are trending toward privatizations, cost savings, e-government, and private sector management practices [1]. Today's challenges like mergers, corporate governance, and new business models are due [2]. Public sector is formed of organizations of high complexity. When silo-thinking among public organizations is added [3], consequences follow, e.g., e-government efforts end up sparsely structured and basing on ad hoc cooperation [4].

Enterprise architecture (EA) emerges as a promising tool for change and coherency management in public sector [5-7]. We refer to the public sector use of the EA tool as *Government Enterprise Architecture, GEA* [5]. EA is defined as 'analysis and documentation of an enterprise in its current and future states from an integrated strategy, business, and technology perspective' [8]. It provides people at all organizational levels a meaningful frame that allows understanding of the enterprise [9]. Any conscious change of a complex entity requires descriptions as a starting point to shed light on its components and their relationships [10]. The description models for architecting an enterprise are typically organized in an *EA framework*, e.g., in

[10,11]. *EA method* comprises the EA framework, models, developing process and roles, etc. [12]. The present study focuses on the EA framework adaption in situ.

An organization who starts using the EA tool usually adopts a particular EA framework, either an existing or a customized one [13]. No method is suitable as such but rather needs adaption to the situational need [14]. *Method adaption* means customization of a method for a certain use, e.g., for an industry, organization or a project [15]. To select an EA method for the customization is not straightforward [16] due to the difference in approaches, scope and purpose [17], see different approaches e.g., in [18-20]. Some organizations adapt a known framework, whereas others develop their own, possibly based on others [6]. In public sector, all these approaches seem to be used [21]. A framework is not necessary, since EA is adopted without a framework, too [6]. Some approaches are even listed as 'ontology frameworks' in [22], not displaying the categories of EA models but rather focusing on the relationships of the EA descriptions and their contents, e.g., in [23,24].

Assuming that no GEA framework is fit to adopt as such in the complex public sector, we are concerned, how to adapt GEA framework for the current state descriptions in a public corporation. Coherency of an organization means that the parts of it have logical, orderly and consistent relations to the whole [7]. We assume that the up-to-date current state GEA descriptions could support achieving the coherency of the public organization. We aim at the adaption principles of the GEA framework for the current state GEA management. This is done by analyzing, how the current state architectural descriptions got organized in a deep corporate hierarchy, and what management requirements emerged in re-organizing the content of the descriptions. Architectural modeling and visualization of the strategic plans along with the parallel database development yield the primary data of the study. The report is part of a longitudinal case study in Finnish local government using *action design research*, ADR [25] from 2008 to 2015. It presents the reflection and learning of the ADR cycles in the city. The case study composes an abductive evaluation of former findings in Finnish state government [26]. Previously resulted propositions are reconsidered based on the artifact building and organizational intervention.

The results suggest the current state GEA framework as a dynamic data model of the management structures of the adopting corporation. The limitations, as to generalizability of the results are due to one case organization and one architectural viewpoint. As a longitudinal study with several artifact iterations and levels of data collection, we wish to present preliminary suggestions for the current state GEA framework adaption. Related literature is described in Ch. 2, the case organization in Ch. 3, the propositions for the evaluation and the research methodology, in Ch. 4., along with the strategy architecture development. Ch. 5 describes findings, Ch. 6 discusses the implications and limitations, and Ch. 7 concludes.

2   Related works: Enterprise Architecture Frameworks

Enterprise Architecture, EA, as the analysis and documentation of the enterprise [8], is dependent on the architectural representations, i.e., *EA descriptions,* that display the enterprise structures and functions in the current or target state as pictures, diagrams,

lists, etc., [11,27]. Each type of EA description - *EA model* - is preferably based on a commonly agreed modeling notation and practice. EA models are traditionally enlisted in an EA framework, e.g., [8,11,28]. A framework signifies a skeletal structure, a frame containing something, or a set of frames [29]. We denote *EA framework* as a container of EA models and connected information, typically including classifications. In 'traditional EA approach' [30] EA frameworks are typically 2- or 3-dimensional matrices or cubes, e.g., in [10,31] or [8,28,32]. We use the term *EA grid* synonymous to EA framework, and *GEA grid* to governmental one.

The dimensions of the EA grid vary in the suggested frameworks and other comprehensive works [11,28,32,33]. There seems not to be a general opinion on how many dimensions the EA grid should include and what these dimensions should signify. Convergence seems clear of the dimension called *EA layers* [34] or *EA viewpoints* [35]. We use these terms synonymously. EA models are typically categorized in the EA layers of Business, Information, Systems, and Technology Architectures, (BA, IA, SA, TA), e.g., in [11,31]. Simon et el. [34] have categorized a vast amount of EA studies based on their focus on one or more of the four aforementioned layers. These four EA layers seem to be identifiable in most EA grids one way or another. In some frameworks, strategy descriptions are included in the BA layer [11], some grids explicate *Strategy* as a separate layer [8,28,33], and some call it *Business motivation,* including the strategy concepts such as mission, vision, goals and objectives [36]. When any of these layers is documented in an organization, it may alone produce a set of co-dependent descriptions. For example, the *strategy architecture* in a hierarchical organization comprises institutionalized strategy goals as hierarchies of descriptions [33]. That is as laborious job per se to produce [37].

Beyond the EA layers, suggestions of the following dimensions vary. Typical options for the second and third dimensions are the organization structure or lines of business [8], the abstractions level of the models [8,38] or the system life-cycle [32]. By using the word *EA grid dimension* it is emphasized here that the conception of the EA framework dimensions is not settled. In addition to the aforementioned 2-3 dimensions as 'x-, y-, and z-axes', we shall suggest that there might be more dimensions for the current state GEA management in situ.

Many authors signify the EA evolvement for new purposes [6,17,39]. In [6], EA is seen as an advanced development tool for information systems engineering from 80's, an enhanced information management tool by 2000, and a promising future tool for strategic business management by 2020. It is titled as a tool for solving business questions as 'only abstract representation of the entire enterprise' [39]. Lapalme [17] shares EA evolvement in three purposes 1. the business-IT alignment, 2. the organizational integration for enterprise coherency, and 3. the adaptive co-evolution of the organization with its environment. The EA grid scope seem to appear in different variations differentiated by the EA purpose. In [17], for enterprise IT architecting, e.g. [40], for enterprise integration, e.g., [19], and for co-evolution [20]. In the last example [20], the EA grid's scope may evolve when the EA maturity of the deploying organization grows. Hoogervorst and Dietz [41] emphasize the importance of identifying the future system that is to be architected, and then defining the EA grid accordingly. However, achieving the coherent fit of the EA grid with the future system to be architected is seen meager by them [41]. Beyond the aforementioned traditional grids, there are other types of frameworks which are not literally

frameworks in the sense of a 2- to 3-dimensional grid [22]. Instead of an explicitly defined grid, they offer EA principles, modeling rules and standardizations, e.g., [23,24]. When standardized diagrams become 'data with well-defined structures and meanings' and represent the facts and concepts behind the picture [24], the descriptions form more structural dataset than traditional figures, enabling searches and reconstructions, e.g., in [24,42].

There is a challenge in the EA literature for more case studies to bridge the theoretical foundations and practical work [30,34]. A mature theory to tie-in the variety of EA frameworks is called for [8]. There is 'no generally accepted theory, recommendations or standard of the EA framework, even though such one is included in numerous EA works of governmental institutions, standards bodies, academia, and practitioners' [34]. Partly this may be, because the EA concept has evolved in purpose and scope. However, this raises up the question, whether the EA framework as the classification of the EA models has anything to do with the practical EA description in situ. In the case study, we are drilling in the development of the current state GEA descriptions for the strategy architecture. Certain organizational classifications for the current state GEA description contents arise, and propound to reformulate the GEA grid adaption propositions.

3   The Case Organization

The study connects to GEA adoption in Finnish public sector, where state government and local government co-exist [43]. *State government* comprises 12 ministries that draft legislation and steer their branches with the help of around fifty specialized central agencies. The regional and local state services are governed by approx. two hundred regional state agencies. *Local government* consists of circa 300 municipalities. Municipalities are self-governing units by Constitution, with the right to tax the residents. The services are further dispersed locally in the town areas. State and local government develop the public services together. Similar organizational trends can be perceived in both, e.g., corporatizations.

The case organization in the study is a municipality corporation in Finland, the city of Kouvola. The city was formed in 2009 in a merger of six municipalities and three municipal joint organizations. By 2015, the city had more than 90,000 citizens on the area of 3,000 km^2, 6,500 city employees, and annual expenditure of 0.5G€. The provided services were education from nursery to secondary school, health care up to a district hospital, business support services for entrepreneurs and farmers, social and legal services of citizens, water supply and sewerage, as well as the planning, building and maintenance of land, city infrastructure and town buildings. This resulted in deep hierarchies in *administrative organization* with multiple *organizational actors* such as the sectoral domains, central management (CM), and in-house enterprises. CM tasks were shared to corporate executives (CxO) and their units. The *political organization* comprised city council, board and 19 sub-boards in 2009. Since beginning, the new city was in continuous change. After starting as a 'purchaser-provider organization' in 2009, it was changed gradually to process organization. Some management levels appeared purely administrative due to vast service catalogues, service groupings, as

well as both geographical and governmental oversight tasks. Accordincly, the administrative levels were diminished. Gradual outsourcing of prominent business areas was apparent as they were exposed to market competition. These drivers resulted in three major organizational changes in 2011, 2013, and 2015.

4 Application of the Action Design Research

Finland has been launching GEA since 2006, and after that it has established its role by Information Management Act 2011. The effort has yielded a common GEA method [38], where the GEA grid forms a central part, cf. [16,26,44].

The report presents a reflection and learning phase of the *Action Design Research ADR* [25] as part of a longitudinal case study in City of Kouvola in 2008-2015. The city needed novel management tools in the merger. Case study results from the state government were deployed, i.e., the GEA grid adaption model, *Geagam* [26]. Geagam was subdued to abductive evaluation in the City of Kouvola. *Abductive logic of reasoning* forms a 'process of discovery', where inferences are drawn to the best explanation when the phenomenon under study is investigated with wider sets of data [45]. This is particularly effective for evaluating the findings of new phenomena [45]. The research setting is figured in Fig. 1. With the insight of the CxOs, a city specific GEA grid adaption model was constructed and applied in two ADR research cycles as *Kouvola Geagam*. These *alpha* and *beta versions* included GEA method objectives and inherent adaption principles [46,47]. Kouvola Geagam was included in GEA governance model of the town, and admitted as strategy framework by city board. Propositions under evaluation are explicated in 4.1. The ADR reflection techniques are described in 4.2, and the development of the strategy architecture artifacts in 4.3.
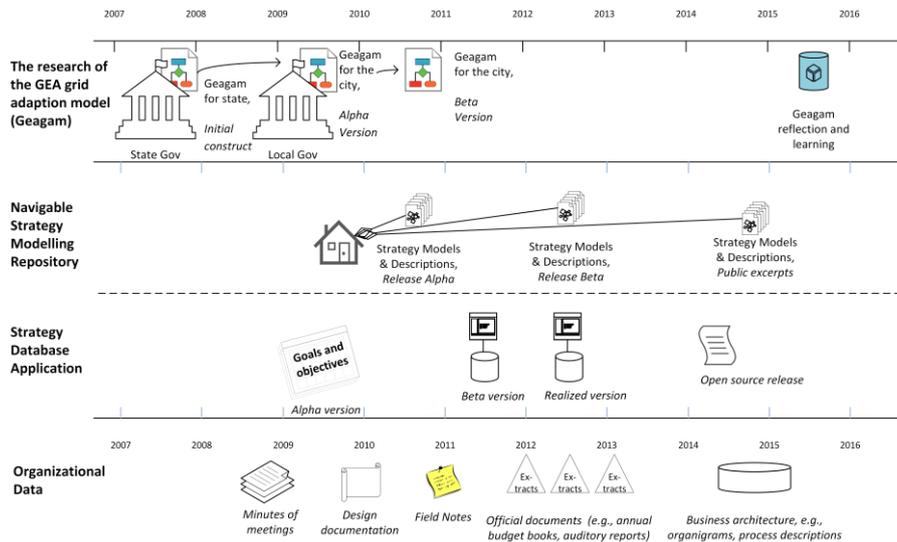

Fig. 1. The research setting for GEA framework adaption

4.1 Geagam Propositions

GEA grid adaption model, *Geagam*, presents of a set of typified EA grids for the public sector organization types in Finland. The model was initially constructed using state government as the unit of analysis [26]. Kouvola Geagam followed presenting the set of GEA grids in the local government context [46,47]. The new context provided new findings of the GEA grid adaption especially for the required EA layers [46,47]. For the ADR learning and reflection phase at hand, the inherent adaption principles in [26,46,47] were subjected to textual analysis to explicate the propositions for evaluation. By excerption and categorizing, the suggested principles in-between the Geagam constructs were triangulated and enforced. For the study, we chose the most significant propositions enforced by the traditional assumptions of the 2- and 3- dimensional EA frameworks. Administrative organization hierarchy was suggested to display as the description levels (rows) of the adopted GEA grids. The political decision levels were mapped to these administrative levels. GEA grid viewpoints as columns of the GEA grids were suggested to cover the concern areas of the CxOs as *expanded EA layers*.

Propositions: GEA descriptions of a complex public corporation are to be organized in static GEA grids with two dimensions, those being
1. the administrative levels as the description levels of the GEA grids, and
2. the central management concern areas as the expanded EA viewpoints of the GEA grids.

4.2 ADR Reflection and Learning by Recursive Artifact Development

As the responsible for the process and strategy architecture modeling of the town and the related artifact development, the author used *Kouvola Geagam* and its inherent principles to realization and maintenance of the strategy architecture for evaluation data. Kouvola Geagam instructed the design and implementation of the navigation structures of a *strategy modeling repository*, and the iterative development of a *strategy database*. The artifacts evolved through development cycles, which were considered as recursive ADR cycles to the GEA grid adaption cycles, Fig. 1. We are not reporting the design principles of these recursive artifacts, analysis focuses to them only in the extent where they reflect on the GEA grid adaption.

Both organizational intervention and utility of the artifacts were pursued in the development as ADR method insists [25]. Artifact development and maintenance produced data, such as requirements, documentation, perceived design principles etc. Organizational intervention was traced to town documentation. Such data sources are summarized as organizational data in Fig. 1 with figurative illustrations. As ADR method suggests [25], the *building* of the artifacts, *intervening* in situ, and *evaluation* of the innovations were interlinked and mutual. Central and sectoral management insights were continuously perceived in regular meetings during the development. CxOs were keen on the applicability of the tools in their management role. The annual city audit process took official stance on the prevailing strategy planning principles. User experiences and feedback were gained from the sectoral management. The author acted as principal designer and researcher in the design of the Kouvola Geagam, and the recursive strategy artifacts.

We reflected on the Geagam propositions based on the artifact building and organizational intervention in situ. The propositions were submitted to the evaluation by analyzing the *recursive artifacts* as 'wider set of data', as abduction logic presumes [45]. This was done by analyzing, how the current state strategy architecture descriptions got organized in a deep corporate hierarchy during organizational changes, and what were the emerging management needs in re-organizing the content of these descriptions. Based on the analyses, a revised explanation of GEA grid adaption is proposed for current state GEA management.

4.3 Strategy Architecture Development

Next, the strategy artifacts, their premises and development are described along with the data analysis. Town strategy was institutionalized by strategic planning [48], as instantiations of the town strategy goals by each organizational actor and relevant administrative levels. The strategic planning was updated annually as a part of the budgeting process. In 2009, no systematic long term expressions could be perceived in strategic planning. Strategy visualization and modeling were unknown. There was no information systems support for strategic planning beyond text editing. No adequately specific solution was found in the market either. Goal and objectives, as well as follow-up information were given point-like by actors. This yielded unstructured institutionalization and incoherent implementation of the town strategy.

Strategy discourse was facilitated by GEA practices and tools. Strategy modeling practices were developed along the *strategy-modeling repository*. Secondly, the strategy information management was developed as an in-house *strategy database*. The artifacts were introduced to the central and sectoral managers. The first yielded the visualized long term objectives and operations as road maps (Fig. 2), the latter, the structural data for the same (Fig. 3). The development of the strategy artifacts was parallel for practical reasons, carrying a vision of a united system though.
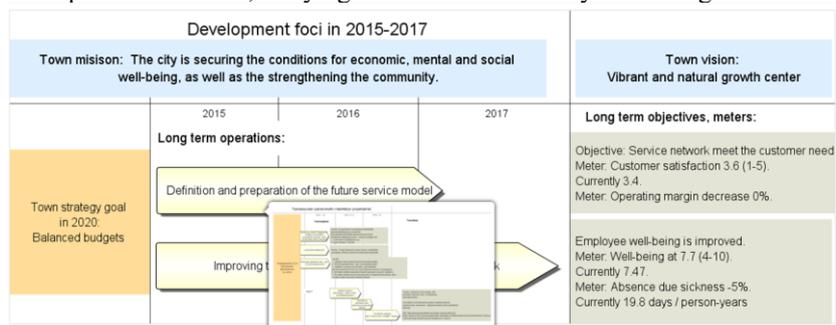

Fig. 2. *Strategy modeling repository*: Road map for mayor, in budget book in 2015

Strategy modeling repository. A process modeling tool was deployed for the strategy modeling in a cyclic manner. The town strategy goals were institutionalized as objectives, measures, and related operations as *strategy road map*, of the description owner, Fig. 2. Optional actions maps were further navigable from this picture, as (not clear) in Fig. 2. By 2015, the repository consisted sets of road maps along administrative hierarchy, yielding 'a hierarchical set of descriptions', as

strategy architecture [33]. The navigation structures of the different repository versions were at the focus of our data analysis, and they were compared to organigrams, process architectures, and suggested GEA grid dimensions.

Strategy database application. The development of the strategy database aimed at automatic visualization of the road maps, cf. Fig.2. By 2014, the development yielded Ratsu Information System as open source publication [49]. The application was iteratively introduced in annual strategic planning process, Fig. 1. It offered a platform to test the strategy information in structural format, facilitating database queries and excerpts to official reports. The resulting database schema reflects the management requirements as emerged during the research period for reporting, filtering, and re-categorizing the description contents. The implemented database schema was analyzed by re-categorizing and generalizing the entities and relationships, to achieve a reconsidered vision of the database at conceptual level.

5   Findings about GEA Grid Dimensions in Situ

During the development of the strategy modeling repository, we discovered that the tabular data given by managers could be automatically visualized as road maps, and thus leverage on everyday governance as suggested in [7]. This launched the design and implementation of the strategy database with a normalized database schema [49].

The database covered the basic entities that are depicted in Fig. 3 as business motivation elements, such goals, long-term objectives and operations, measures and actions as the refinements of the operations. Business motivation (BM) is used from [36] as one of the 'building blocks' of EA [8]. The conceptual diagram inside the rectangle is figurative, since the BM model was not at the focus of our analysis. Instead, based on the reverse engineering and database schema abstractions, *categorizing dimensions* of the BM elements were identified. Fig. 3 illustrates the results as a conceptual diagram of a data-warehouse. BM is related to the categorizing dimensions via a fact table that can be instantiated for any BM element.
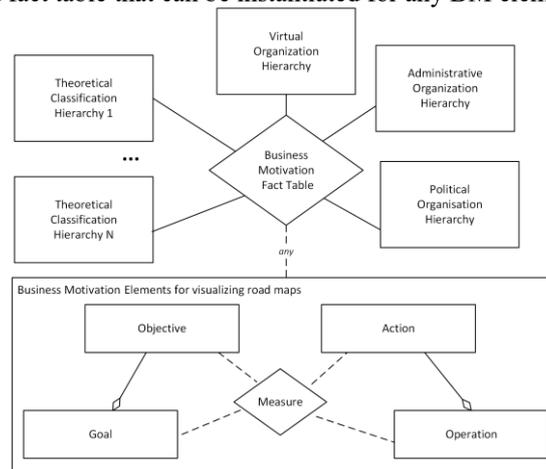
Fig. 3. *Analysis results:* Business motivation elements classified by management structures

The conceptual model in Fig. 3 illustrates the management structures that dictated the management information needs. They are signified as a star-model dimensions for organization hierarchies and a theoretical classification. In our data, all the categorizing dimensions could be hierarchical, and most were. The dimensions also could have relations to each other [49]. There were three types of organization hierarchies. *Administrative organization* refers to line hierarchy of the corporation and its organizational actors. *Political organization* denotes the hierarchical structure of the city council, board, and subordinate boards. *Virtual organization* comprised strategic and political development efforts, e.g., cross-sectoral or cross-agency policy programs, e.g., enforced by the state government or law. In the municipality, these were typically governed by a virtual organization. As one example, the environmental program was one of our pilots when introducing the strategy artifacts. *Theoretical classification hierarchy* refers to the theoretical management classification in use, with possible sub-classes. The number is not limited, some examples are the strategy viewpoints, the EA layers, quality management viewpoints, and various other classifications for various purposes, either district or nation wide. Next, the Geagam propositions (from 4.1) are reflected based on the strategy architecture data.

5.1 From Classifying GEA Models to Classifying the GEA Model Elements

EA models are typically enlisted in EA grid. Our propositions in 4.1 suggested *static GEA grid* with two dimensions as 'GEA model container'. The proposed GEA grid dimensions were the administrative levels, and the expanded EA viewpoints achieved by expanding the business architecture layer to its subparts with the stakeholders.

The assumption in 2009 was that it would be enough to classify the business motivation elements firstly according to the administrative organization, and secondly according to the expanded EA viewpoints. The expanded Kouvola Geagam viewpoints were 1. Operational Environment, including strategies, 2. Service & Customer, 3. Information & Data, 4. Personnel, 5. Systems & Technology, and 6. Finance [47]. In the first development cycle of the strategy modeling repository, CxOs corporately produced the road maps for each of these Kouvola Geagam viewpoints. The road maps for the six partial architectures composed kind of crystallized sub-strategies to town strategy. As for the sectoral management, they depicted their road maps for each of the administrative levels without including this classification to Kouvola Geagam viewpoints. However, the sectoral outputs were of interest to CxOs and virtual organizations' managers, because both had a synthetizing role to the whole. The interests focused on particular objectives, e.g., the chief human resource officer (CHRO) was keen to report the objectives and operations of the human resource (HR) development from the road maps of other managers. Thus, very soon the need to re-organize the road map contents emerged.

During the development cycles, instead of one organization hierarchy, three of them emerged. Also organizational classifications were multiple, even though two of them, the EA and the strategy viewpoints had already been converged as one. Consequently, we provided in the strategy database the three organization structures, and a dimension table for any management classification. The ability to select the description contents dynamically by user was provided.

Based on the strategy artifact development for strategy architecture management, the classification of the strategy descriptions into static grids with 2 dimensions showed inadequate at least for their contents. The strategy model elements were classified in the relational database, to enable the re-organization of the description contents by different areas of concern. As a generalization, this could be done to EA descriptions of the other partial architectures too (such as BA, IA, SA, TA). Why CHRO should not be interested in HR related process phases, objects, etc.? We contemplate it inadequate to classify the current state GEA model elements in 2-dimensional frameworks. A similar kind of argument is presented for the GEA models as an implication and a 'best explanation' [45], in Ch. 6.

5.2   From Description Levels to Multiple Management Hierarchies

We proposed the administrative levels of a public corporation as one GEA grid dimension in 4.1. This was implemented in both of the strategy artifacts. Strategy descriptions hierarchy followed the administrative hierarchy. Notification of the line organization seemed an essential management requirement. The organizational rules may have had effect on that, since the objectives and measures were required at the top administrative levels in the annual budgeting and strategic planning process.

Strategy architecture modeling supported dependencies between the administrative levels in the deep line hierarchy. The administrative managers insisted strategic representations of the subunits under them. E.g., the team of the mayor prioritized and picked the most important objectives of the sectoral and central management road maps into the budget book, as illustrated in Fig. 2. It seemed that a description becomes strategic only after strategic way of processing. Two road maps seemed similar by notation, but the other had been processed strategically and the other not. Strategic descriptions sprang up by prioritizing, synthesis, summing, mean values, or iterating in top-down and bottom-up workshops between administrative levels.

5.3   From GEA Layers to Multiple Theoretical Classifications

Very typically EA grids refer to conventional BA, IA, SA, and TA layers. We proposed in 4.1, that the CM concern areas should be supported by expanding EA viewpoints in the adapted GEA grid. Fig 3 shows one theoretical classification entity for the *expanded GEA layers* of Kouvola Geagam (listed in 5.1).

To support the CM concerns, we made an attempt to combine the EA and strategy viewpoints by converging them into one classification. This classification was used for both GEA management and strategy planning purposes. CxO were in the practitioner role both while creating Kouvola Geagam, and in strategy modeling. The first strategy descriptions in 2009 were corporately produced by CxO's. They followed the expanded GEA layers, and were close to the CM units' division as a result but not enough. They could not serve as corporate 'sub-strategies', because CxOs had difficulties to differentiate their 'own' objectives from others'. Accordingly, the next strategy modeling repository version was organized along the CxO roles. In different ADR cycles of the strategy artifacts, no one-to-one

relationship between the extended GEA viewpoints (EA + strategy) to prevailing CM functions were reached. This would have required organizational changes, which were not due. This is not necessarily to be aimed either, since theoretical classification is not same as management functions. If CxO roles cannot be mapped to an existing classification, CM functions could be implemented as another one for reporting needs.

As a generalization, we suggest, that any theoretical classification used in the adopting public organization could be presented as a dataware dimension. EA and strategy viewpoints integration could in principal work, since both are theoretical classifications. However, this presumes agreement in the adopting corporation, and in the research society. Next, the findings are discussed and generalizations propounded.

6 Discussion

We suggested in the results that classification of the current state GEA model elements should situationally reflect the prevailing real-world management structures of an adopting public organization. This is illustrated in Fig. 4a) as a conceptual data-warehouse model. The management structures refer to prevailing organization structures or theoretical classifications as described in Ch. 5. Their amount is situational as indicated in Fig. 4a) by 1…N. The possible practical implications are discussed in 6.1, and the theoretical ones, the validity and reliability in 6.2.
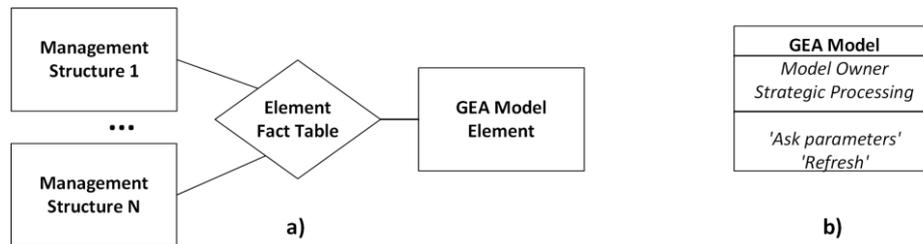

Fig. 4. a) Generalization of the results as a conceptual model b) GEA Model Class

6.1. Practical Implications: Dynamic Hypercube for As-is GEA Management

The as-is, or the current state GEA management of a public corporation could benefit of a dynamic hypercube implementation, based on the proposed generalizations in Fig. 4. *The GEA Model* Class in Fig. 4b) comprises the attributes 'model owner' and 'strategic processing' manner. It relates to many GEA Model Elements (not drawn into Fig. 4). *Model owner* refers to the unit of the adopting organization, which is responsible for the development and maintenance of the model notation and instantiation in situ. For example in our case, the responsible unit was sought and officially named for the process modeling. *Strategic processing* of the strategy road map was described in 5.3, e.g., as the synthesis and prioritization of the descriptions. Both of the exemplary attributes of the GEA model are dependent on the organizational hierarchies. GEA model entity could thus also benefit from a similar

fact table as we proposed for the GEA Model Element in Fig. 4a). GEA model associations to management structures could also be further added and differentiated. For example in the strategy database, the strategy model elements were associated to management structures via association types *owner*, and *report*.

Relating the GEA models and model elements situationally to management structures would presume hypercube data-warehouse implementation. This type of development of the current state GEA management would open chances to almost unlimited implications. Here we are restricted to mention just few. Any GEA model contents could be refreshed according to user preferences (e.g., categorized by the chosen management structures), as suggested in Fig. 4b) by the class functions 'ask parameters' and 'refresh'. Organization types in a public corporation could be implemented as a categorizing dimension with associations to any GEA model as a recommended on for that organization type. The static 2-dimensional grids for any organizational actor could be excerpted in real-time by chosen dimensions. Even if the hypercube implementation was not on tap, for an enterprise architect entering in a public organization to implement the current state descriptions, he could anticipate the interests of the various stakeholders by identifying the situational management structures of the organization as *enterprise* (architecture) *dimensions*.

If GEA information followed the prevailing management structures real-time, the prevailing management structures would appear transparent, and the understanding of organization could be enhanced. This is essential among organizational actors that should be interoperable. Kotusev [30] points out, that in [23] the EA is defined as a tool also for developing the organization structure, however, without any means for it. Transparency of the prevailing management structures would help to develop the consistency of the organization. GEA would evolve as a tool for general management for supporting the rationalization of the organization structures and dimensions.

6.2. Theoretical Implication: Differentiating Current and Target State GEA Fit

Typically, in the EA theory, no specific difference is made between the current or target state use of an EA framework. The results here incline to differentiate the GEA methodology for current state and target state GEA management. The current state grid would 'fade out' to become dimensions in a data-warehouse. If the current state GEA management evolved into this direction, it might shift the GEA grid notion towards adaptive EA frameworks [23,24], and closer to practice of using 'no grid'[6]. According to Buckl et al. [42], the EA grids are often too abstract for real use as such, or too massive and large for practical deployment. They [42] present paths and dependencies of EA models for rearranging them according to management requirements. Our results have resemblances also to model driven architecture [24], which also presumes presenting model and model element dependencies.

Discussing the target state EA grid adaption is beyond the paper. However, the situational EA grid adaption by Hoogervorst and Dietz [41] might suit for the target state GEA development. Kotusev [30] classifies EA management methods as traditional, rigid ones, e.g., in [8,10,11,28], and to more flexible ones concentrating more on the target state EA development, e.g., in [18]. Even though his literature analysis concerns basically IT architecture management methods, the results might be

considered indicative to our suggested theoretical implication about separating the adaption principles for GEA grid in the current and target states.

Reliability and validity. The generalization in Fig. 4 is presented with the humble notion, that it is restricted to primary data concerning the strategy architecture development. A municipality is an extraordinary case organization for public administration studies. It has a wide geographical service outlet, multiple service domains, deep hierarchies at least in a dual organization, various enterprise forms, and typically a separate corporate management. As such, it shares structural analogies with the state government. However, one case, principally one researcher, and a single partial architecture set limitations to the generalizability. Consequently, the results cannot be validated based on this study, even though according to the observations, the management requirements for re-organizing the descriptions contents seemed to hold for other architectural viewpoints too. The construction of the artifacts is also never subject independent. Their interpretation as the primary data source is therefore challenging. In the study, the use of recursive artifacts exponentiates the challenge. The development of the artifacts and minutes of the workshops and meetings were submitted to participants. The arguments are also based on conceptual models to make the inferences transparent and arguable. The strategy artifacts and excerpts were published for reliability in [49], and in annual budget and audit books. The results can still be considered initial, typically abductive logic.

7   Conclusions

We described the reflection and learning of an action design research case study in a Finnish city corporation. Government enterprise architecture (GEA) framework adaption guided the development of the strategy architecture. GEA framework adaption principles were evaluated and reconsidered based on that work. As a generalization of the results, we proposed implementing GEA framework as a dynamic data model of the prevailing management structures for the current state GEA. This would facilitate deeper understanding of organization structures, and enhance the GEA method use as a strategic general management tool in public sector.

We reflected on traditional EA framework assumptions, critically questioning the concepts of a given framework and its dimensions. The results imply the current state GEA implementation as a dynamic hypercube along management structures in situ. The suggested approach comes close to model and content driven EA approaches. We acknowledged the restrictions of the study, as for the generalizability of results. Accordingly, we call for further constructive case studies on the GEA framework adaption, differentiated for current state GEA management and situational target state GEA development. GEA tool development as data-warehouses seems a fruitful area to study. Many more research areas can be perceived, e.g., how to automatically visualize the GEA descriptions for each model type, and how to gather the needed tabular information, and classify it according to management structures.

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