

Assessment and Validation of EXCOGITEA[®], an Architecture Discipline and Model for Enterprise's Optimization and Decision Making

Vincent Pállfy
Excogitea

Rue Fond Cattelain, 2,
B-1435 Mont-St-Guibert, Belgium
vpallfy@excogitea.org

Christophe Feltus, Henderik Proper
Luxembourg Institute of Science and Technology (LIST)
Avenue des Hauts-Fourneaux, 5,
L-4362 Esch-sur-Alzette, Luxembourg
firstname.name@list.lu

Abstract—EXCOGITEA[®] is based on professional Architecture, to know an existing discipline/profession (Building Architecture). The claim of EXCOGITEA[®] is to use this existing discipline and apply it to an organization. The aim is not to deny current practice but to revisit it through a professional lens. EXCOGITEA[®] AME (Architecture Model for Enterprise). It is a proposal, an exploitable example. It is not an Enterprise model but an Architecture model. The AME is characterized by the conceptualization of a shaped environment, which allows the heterogeneity and dynamics of an Enterprise to be addressed. EXCOGITEA[®] AME includes a taxonomy, nesting and correlation of the enterprise's constituents at a generic level. It provides (1) coherent scopes to address any further views “of” and “within” the enterprise, (2) the required flows scheme so that the Enterprise can continuously change while executing its purpose, and (3) the reference context for further detailed “enterprise modelling”, which guarantees alignments.

Index Terms—Enterprise Architecture, Organization Design, Organization Governance, Process Optimization, Decision Making, Enterprise Modelling, Business-IT Alignment, IT Governance, Design Science.

I. INTRODUCTION

As a matter of course, organizations exploit several standard artefacts to visualize, manage and assess their scheme, e.g., business model, capability map, organization chart, operating model. They traditionally manage this scheme through diverse practices and methodologies, such as so-called *architecture* practices (e.g., Business, Enterprise, IT, Data, Security), and other methodologies in order to define flows, streams, value chains and team organization and collaboration. Despite practices evolving and new initiatives emerging, as well as the efforts organizations put into these practices, they still struggle to obtain tangible and efficient results. Some key concerns still hampering organizations are, e.g.:

- Business and technology alignment,
- Adaptability to change (e.g., Business strategy, Legal compliance),
- Data and information management,
- Value stream identification.

In parallel, at the academic level, most enterprise architect scientists focus on defining the research domain that they gen-

erally call *Enterprise Architecture Management* (EAM). This consists of developing a framework for modelling enterprises (using building blocks and their associations), Winter et al. [1]. This discipline contributes to reducing the gap between IT and business and while also sustaining IT governance [2], defined by Gartner as *the processes that ensure the effective and efficient use of IT in enabling an organization to achieve its goals* [3]. Accordingly, the EAM has progressively addressed all fields of a company and is specialized in information (data) architecture [3], software architecture [4] [5], technological architecture [6], or security architecture [7] [8]. It enables the synergic capability of evolution/adaptation of both IT and Business to be supported, and the complex ecosystems to be created.

In this paradigm, the artefacts created by the EAM correspond to a set of (meta-)models [9], design patterns, frameworks, and modelling tools, and languages [10]. The management of all these artefacts poses a significant challenge for the EAM community.

Unfortunately, creating and managing these artefacts only partially fulfils the enterprise architect's objectives and does not fulfil the ultimate goal expected by the business, that is to have the right Enterprise *architecture* to achieve the awaited business objectives. In fact, managing Architecture practice, practicing Architecture and operating Architecture are different things. As the matter of facts, most practices related to Enterprise Architecture are defined opportunistically, regarding a given concern, whatever the meaning given to the term “architecture”. Moreover, without even speaking about complementarities, the simple correlations between the practices cannot be consistent and appear arbitrary, despite EAM efforts.

Acknowledging this, the aim of EXCOGITEA[®] is to develop a pragmatic approach, whose goal is to refocus the enterprise architect profession on its core business, namely, the art of designing builds, and to apply it to the “Enterprise” entity.

¹<https://www.gartner.com/en/information-technology/glossary/it-governance>

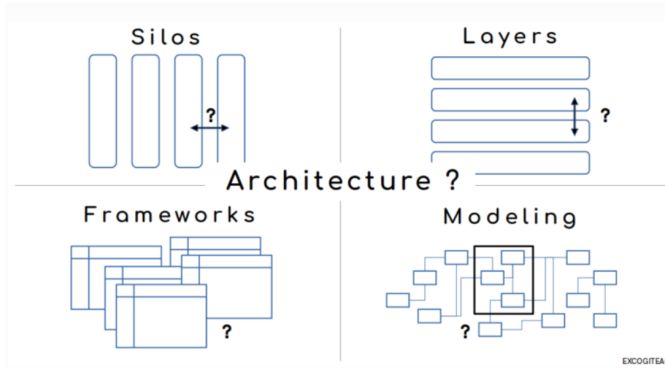


Fig. 1: Enterprise shaping artefacts

EXCOGITEA® revisits and gives sense to Enterprise Architecture, i.e., conceiving the scheme that fit the enterprise’s needs, considering the surrounding incentives and constraints, and taking into account the know-how of the architect in terms of originality, pragmatics, efficiency, and appropriateness.

EXCOGITEA® was inspired by, and to date has been developed on a business fertilizer. Therefore, in this context, our contribution will be to validate EXCOGITEA® from a scientific foreground basis to guarantee not only stability and consistency, but also uniqueness compared to similar works. Accordingly, the research method followed in this article is the design science (e.g., [11]). Hevner et al. [12] explain that the Design Science Research (DSR) paradigm seeks to extend the capability boundaries of humans and organizations by creating new and innovative artefacts. Practically, provided that we aim to design a new artefact (Architecture Model for Enterprise - AME) to support the design of the Enterprise. We thereby acknowledge that this research may be considered as being within the scope of DSR [12].

Given that our artefact is motivated by a real problem and relies on the knowledge of the field, we need to involve operators of the build throughout the artefact building activities. Therefore, we applied the design research method proposed by Sein et al. [13]: the Action Design Research method, whose objective is to strengthen the connections between the operators and researchers by combining the building, intervention and evaluation (BIE) activities. Lastly, according to March et al. [14], the evaluation of a designed artefact must use precise evaluation criteria. Given that the goal of our research is to support operators with an architecture model for Enterprise, the validation criteria is the operability of this model, defined in ISO 25010 [15], by the ability of AME to be easily operated by a given user in a given environment.

A. Architecture : common language VS. profession

Overall, the current practice is to define components, and their orchestrations, which are intended to fulfil or support identified business activities. Created components and their links (relations) constitute an overall mesh which presents some sort of structuration. This mesh of components is what is denominated as “architecture” in everyday language. As a

matter of facts, in common language, “architecture” is used as a synonym of “structure”. That approach in current practice has consequences:

- The term ‘architecture’ is used to name any structured item, whether an overall mesh, a part of it, or even the internal structure of a sole element. The relevancy of an architecture practice remains ambiguous.
- By extension, the term architecture is associated with any practice as soon as it involves any structured item. The architecture practice, as such, remains undefined.
- By extension, the term architecture is applied to any function title of any stakeholder involved in a practice related to a structured item. The role of the architect remains undefined.
- Furthermore, the term architecture is associated with different “subsets” (e.g., BDAT, Security, Privacy). These relate to viewpoints. The boundaries remain undefined.

Obviously, existing practices are supported by several existing frameworks. They can be adopted, adapted and/or combined. They provide several canvases with predefined sets of naming, sequences methods, etc., and guidance, but in practice, they frame the approach of the practice rather than the practice itself, see Figure 1.

In conclusion, there is a non-negligible lack of consistency in current practices [16], [17], which is not resolved by current frameworks. As a consequence, current practices fail to manage boundaries, correlations, roles... and, therefore, fail to support organizations facing efficiency and adaptability challenges [18].

B. Related works

Enterprise architecture reference models such as TOGAF® [19] are sets of tools and guidelines. Enterprise architecture is a technique used to give businesses and IT static views of the corporate architecture as well as of the links between those views. The advantages of an enterprise model are that it proposes a mean to model and better understand the Enterprise, interconnections and interdependencies between the processes, people and systems.

ArchiMate® [20] is a metamodel and a standardized notation tool for modelling business and IT layers of the Enterprise. ArchiMate® allows the reduction of complexity and proposes a mean to model and thus better understand the Enterprise, the interconnections between the processes, the people, the information, and the systems.

COBIT® [21] is a framework for IT governance and security which includes a RACI chart [22] defining four types of specific responsibilities that cover most of the obligations within a company. This RACI chart also enables a business function to be associated with one or more of these four types of responsibilities.

Finally, the Zachmann Framework [23] is an ontology of the intersection between the fundamental principles of communication found in primitive interrogatives and a fundamental structure for Enterprise architecture that *yields the total set*

of descriptive representations relevant for describing the Enterprise. In summary of our review, we have observed that current frameworks and tools provide guidance and frame the approach for modelling activities.

C. Our contribution and structure of the paper

In this paper, we present the EXCOGITEA[®] discipline and its resulting Architecture Model (AME) [24]. We start by illustrating the scope of EXCOGITEA[®] (section II), by conveying the concepts of current practices presented in the related works (sub-section I-B). Then, we describe the AME model (section III) and summarize the EXCOGITEA[®] approach (section IV). Afterwards, we explain its benefits in terms of decision-making and Enterprise optimization, and we validate the relevance of its approach and of its model (section V). Finally, we conclude the paper and propose future works in section VI.

II. CURRENT PRACTICES AND EXCOGITEA[®] SCOPE

To explain this scope, we use the well-known ArchiSurance case study [25], which illustrates the use of ArchiMate[®] in the context of TOGAF[®]'s business and IT viewpoints.

A. Case study description and Architecture deficiency

Figure 2 shows the model of the “Handle claim” process supported by the applications used by the Home & Away division [25] of ArchiSurance.

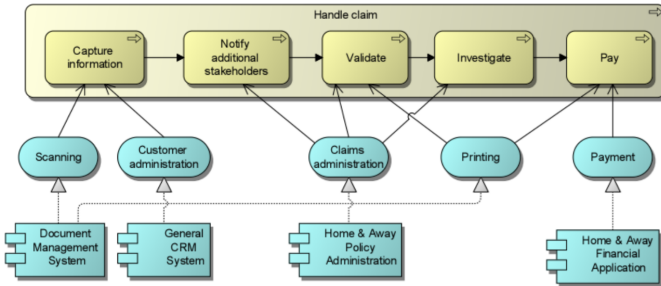


Fig. 2: ArchiMate[®] Application Usage View [25].

As illustrated in this figure, the process “Handle claim” is composed of five sub-processes, namely: *Capture information*, *Notify additional Stakeholders*, *Validate*, *Investigate*, and *Pay*. These processes are undertaken by application services in blue ovals, which are themselves carried out by application components in blue rectangles. For example, the *Home & Away policy administration* provides the *claims administration* service that undertakes the notification of additional stakeholders, as well as the validation and the investigation. *Architecture* refers to the structure resulting from the way components are linked, and sub-processes are assembled to constitute the larger process (i.e., “building blocks” in TOGAF[®]). Nevertheless, *Architecture* is not just a synonym for structure, nor masonry work.

B. Case study representation with EXCOGITEA[®]

Figure 3 shows how EXCOGITEA[®] represents the “Handle claim” process of ArchiSurance while including the following considerations:

- **When modelling a process**, which is part of the Organization’s activities, one might need to consider which activity unit is accountable for that process.
- **When addressing a human intervention in a process**, one might need to consider his authority in terms of decision-making, or simply his functional adequacy regarding his know-how, training, etc. Therefore, the profile of the human must be considered. Furthermore, it means considering the person assignment to the activity team. And *in fine*, all persons within the Enterprise
- **When supporting activity (processes) with applications**, one might need to consider software dedicated to the activity unit, as well as non-dedicated software providing shared information and processing (Enterprise-wide).

As it is conceivable that non-dedicated software is managed by another team through other activity units, maybe even in different business lines, one can also conceive having dedicated software managed by another team, e.g., an IT team could be in charge of functional maintenance, technical instantiation and deployment.

The activity unit obviously uses and produces data/information. Again, it must be considered whether input data can be provided by other units, and output/produced data can be of use to other units.

Such discussions leverage the context of cogitation to another level. Indeed, although current practices may address all modelled processes with an “enterprise-wide” scope, Enterprise Architecture goes way beyond the execution items. It addresses all constituents, regarding their nature and not only their usage. Acknowledging this, going further up, one might need to only consider the units and their orchestration, without details (e.g., for overall governance purpose).

Hence, the *Home&Away*, aside an *Home&Present* unit, within a *Home&Troubles* business line, having the shared usage of information and applications defined in other dedicated units (e.g., accounting, invoicing, CRM), managed by different teams, etc. This, regarding their respective identified goals, and without being blinded by the detailed level of their content. Actually, shaping happens at different scales. For example, conceiving a hospital does not start by water distribution in the surgeon’s locker room [26].

These few points, yet key, bring an awareness and understanding of Architecture that goes beyond current practices.

Designing an overall scheme requires the consideration of many more and much larger concerns. This is also the point of EXCOGITEA[®].

Besides revisiting current practices and redefining the approach, EXCOGITEA[®] has developed an Architecture Model for Enterprises: EXCOGITEA[®] AME.

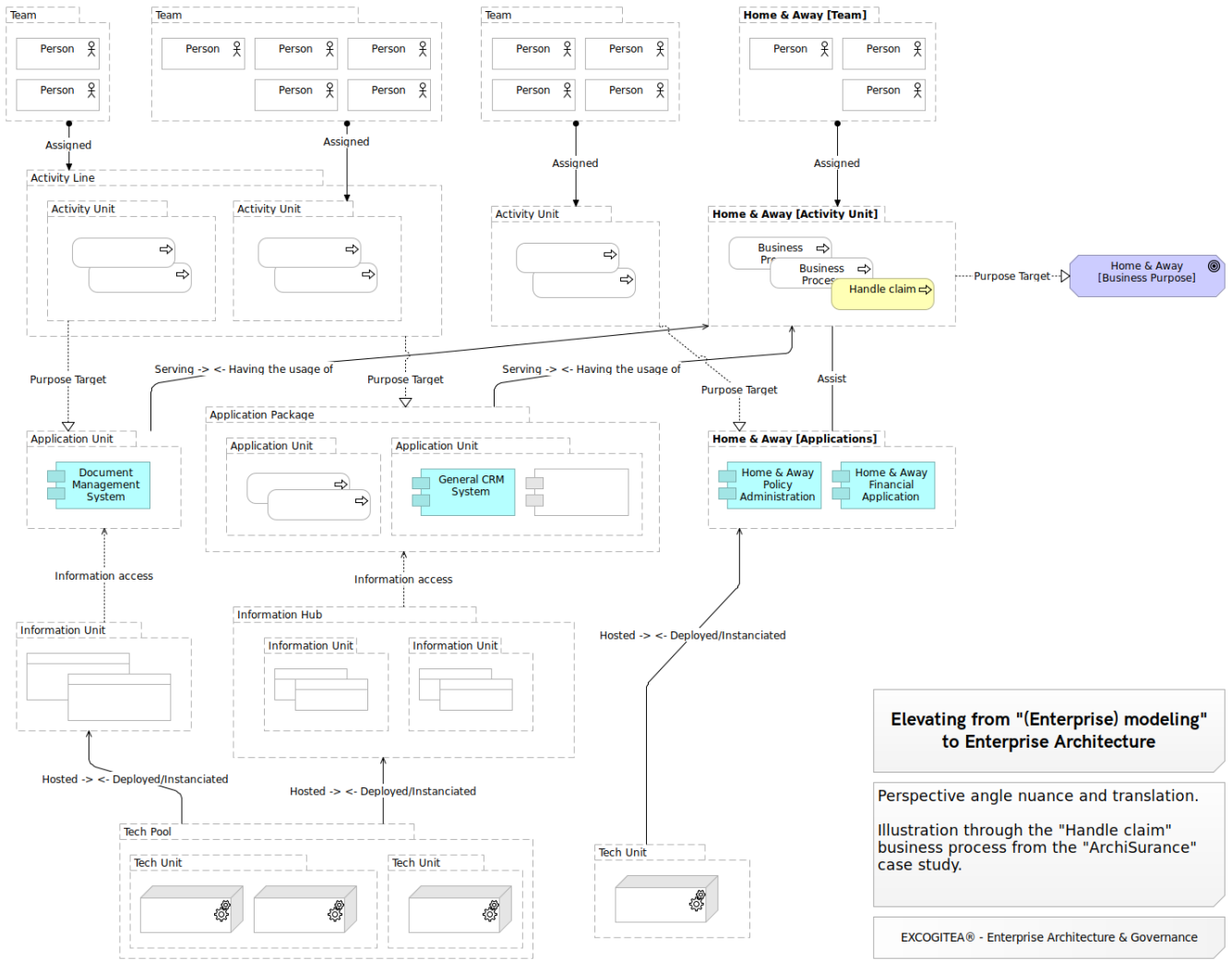


Fig. 3: “Handle claim” process represented with EXCOGITEA®.

III. ARCHITECTURE MODEL FOR ENTERPRISE DESCRIPTION

The goal of EXCOGITEA® is to use existing professional architecture and apply it to an *organization*.

Organization can be used as a very generic term. However, there is a variety of terms used to designate this entity, whatever it is non-profit, non-governmental, or commercial, different terms are used, e.g., *company*, *association*, *society*, *corporation*, *group*, or *firm*. *Enterprise* is an interesting term, which is already used in current practices to designate broader views (e.g., Enterprise-wide). But mostly, it relates to entrepreneurship. It designates *what is being undertaken*. Hence, the purpose is to revisit current practices through a professional lens and to define EA practices with the following principle:

“Shaping space, by integrating constraints, to serve a purpose.”²

²Source: EXCOGITEA®

Our approach is holistic by definition, and the principle is to conceive a build which serves the activity of the future owner. Instead of considering a static structure with a foreseen enterprise-wide scope, EXCOGITEA® reasons in terms of shaping the space for what’s undertaken and goes beyond current practice(s). It considers the Enterprise not only as “enterprise-wide” but as “enterprise as-a-whole”.

Accordingly, this section describes the Architecture Model for Enterprises [24], which is composed of the three following related elements:

- AME Layered Matrix (Sub-section III-A)
- AME Synopsis of Dynamics (Sub-section III-B)
- AME Modeling Environment (Sub-section III-C)

AME, as-a-whole, constitutes a foundational reference frame for the Enterprise. Further views and oriented descriptions can be generated from any scope (constituent, component, unit, unit type, link type).

A. AME Layered Matrix

The AME Layered Matrix (Figure 4) represents the virtual shape of the Enterprise. It describes the Enterprise, with its heterogeneity's, at the highest level and fundamentally addresses its shaping to serve its Purpose. The latter is commonly shared by the enterprise's constituents.

Conceptually, the AME identifies the constituents by their nature, i.e.:

- the *Humans* constituent. It groups together the descriptions of all human units that serve the Enterprise activity;
- the *Applications* constituent. It groups together the descriptions of all units that execute or provide automation of any part of the Enterprise's activity. This description relates to a functional viewpoint (see technology constituent for the technical viewpoint).
- the *Information* constituent. It groups together the description of all information units that are required, involved and produced through the Enterprise activity;
- the *Technology* constituent. It groups together the descriptions of all technical, technological and concrete units involved in the activity of the Enterprise.

The activity of *doing business* is the purpose of the Enterprise. It contains two parts:

- One part describes the activity itself, to know its **execution**.
- One part describes activity's enabling, to know the usage it has from the units described in the enterprise's constituents.

These descriptions are grouped together in a *purpose related* activity component, whatever the enterprise is a commercial company or a non-profit organization.

The AME also identifies the need of constituents to organize themselves because they obey to rules specifics to their nature. Besides, the Enterprise, as such, also needs to organize itself. This leads to other activities dedicated to their respective scopes. Therefore, the AME Layered Matrix defines the following activity components, i.e.:

- the *purpose related* activity component dedicated to enterprise's purpose;
- the *enterprise related* activity component dedicated to the Enterprise entity;
- the *humans related* activity component dedicated to *humans* constituent;
- the *applications related* activity component dedicated to *applications* constituent;
- the *information related* activity component dedicated to *information* constituent;
- *Technology related* activity component dedicated to *technology* constituent.

All activity components are grouped in an activity constituent, which contains the description of all activities of the enterprise. The AME Layered Matrix is the foundational view of the Enterprise, comprising its shaping and the nesting of its constituents. The Enterprise is a heterogeneous environment and each constituent is also an environment on its own. Hence,

the AME Layered Matrix allows to address and orchestrate the further views, "of" and "within" the Enterprise, e.g., business operating model or organisation chart. Finally, the AME Layered Matrix makes it easy to scope out further views, "of" and "within" any constituent, e.g., data landscape or vehicle fleet.

B. AME Synopsis of Dynamics

The AME Synopsis of Dynamics (Figure 5) illustrates the dynamics of the Enterprise. It shows global flows of how the Enterprise operates and evolves.

The Enterprise interacts with the market by executing its business activity through its build. To define its strategy, the Enterprise gets aware of market expectations and opportunities, and ensures that it fulfils compliance matters (e.g., regulations, internal norms). Besides this, the Enterprise has to assess its build and identify changes that need to be made. These considerations are combined and orchestrated at a level being aware of the Enterprise's built and capable of evaluating the impacts, the enterprise architecture team. The considered changes are then defined, scoped, and formalized into *programmes*, which are listed in a portfolio. Each *programme* is budgeted, and planned in a *strategic roadmap*. Financing the budget of a *programme* can impact the pace of its realization and thus, the *roadmap*.

A *programme* is further described, and eventually split into *projects*, regarding phases and/or impacted teams. Each *project* is planned, regarding prerequisites and resources availabilities. In practice, *projects plannings* are related to *strategic roadmaps* because they may impact the foreseen planned strategic milestones. The realizations, achieved through *projects*, affect and modify the Enterprise's built. The AME Synopsis of Dynamics illustrates the mechanism to address the triggers which build and continuously change the Enterprise. It addresses the Enterprise's dynamics.

C. AME Modeling Environment

The AME Modelling Environment embodies the guidance for Enterprise modelling activity. As a reference environment, it uses the AME Layered Matrix which already integrates taxonomy and nesting axes.

The AME Modelling Environment defines foundational rules in order to *model the units*. The principle is to define a unit type and its grouping element for each constituent. The AME Modelling Environment does not exclude potential derived sub-types of units for a same constituent. However, the purpose is to have a unique canvas for each constituent to describe any of its units. The AME Modelling Environment identifies and provides the following available elements, by default:

- the *activity*, grouped by *line*, within *activity*;
- the *person*, grouped by *team*, within *humans*;
- the *application*, grouped by *package*, within *applications*;
- the *infos*, grouped by *aggregation*, within *information*;
- the *tech*, grouped by *pool*, within *technology*.

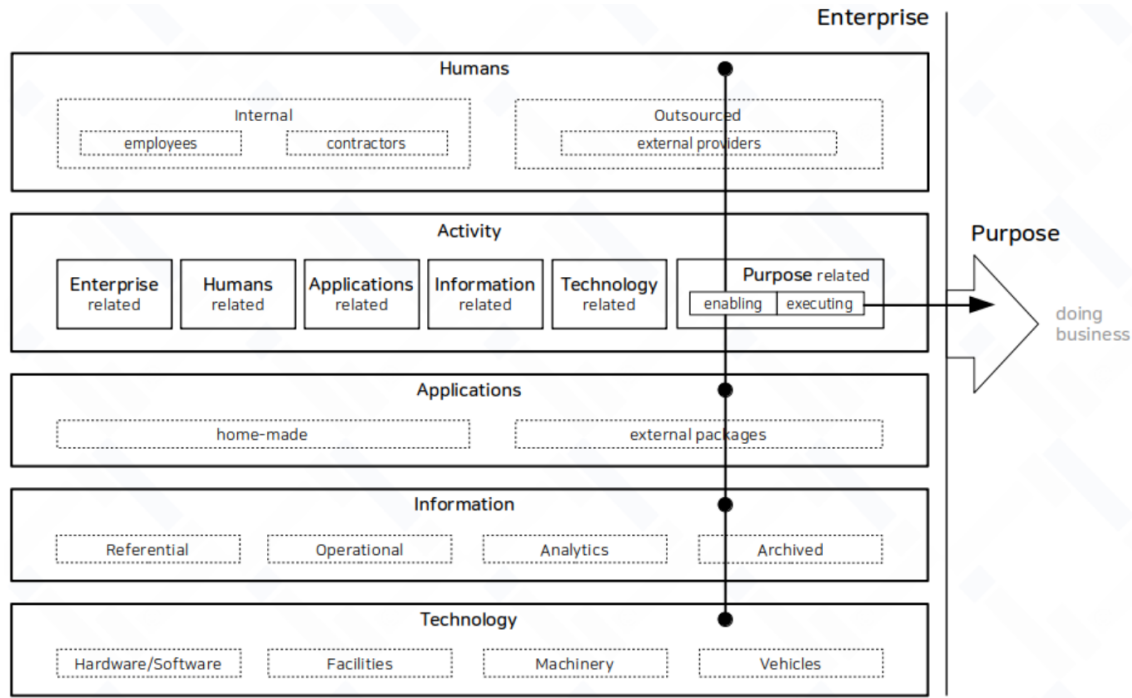


Fig. 4: EXCOGITEA® AME : Layered Matrix – source: Pálffy [24].

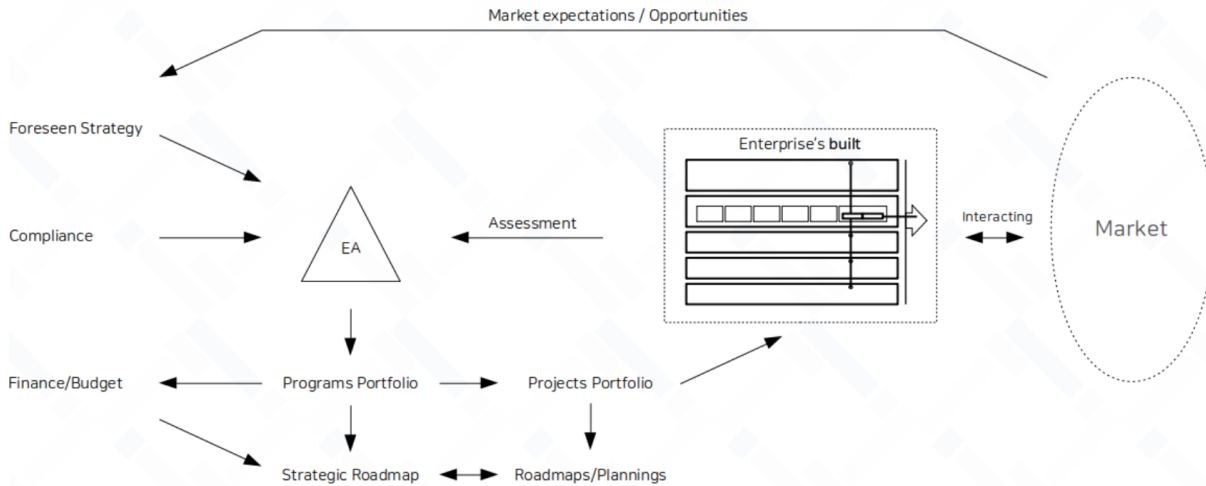


Fig. 5: EXCOGITEA® AME : Synopsis of Dynamics — source: Pálffy [24].

The AME Modelling Environment defines foundational rules in order to model the linkage. The principles are as follows: An element (unit, group of units, layer, Enterprise, purpose of the Enterprise) is always addressed through an *activity* item. A *person* item is always assigned to an *activity* item. An *application* item is assigned to an *activity* item when it represent its automation. The following link types are defined (Figure 6):

- the *target* link between an *activity* and any element to be address;
- the *assignment* link between a *person* and an *activity* items;

- the *usage* link between an *activity* and another element from which it gets partly or entire use of it;
- the *assist* link between an item which provide a capacity to another item.

IV. PRINCIPLES OF EXCOGITEA®'S APPROACH

As for applying Architecture discipline to an *Enterprise*, the overall entity, its purpose, and its implantation in the environment must be addressed. Then, it is also about considering its heterogeneity and its dynamics. The conceiving work starts by identifying and integrating the needs and the constraints. Constraints, in architecture, does not mean pain-points. It means considerations that guide the architect in his/her creative

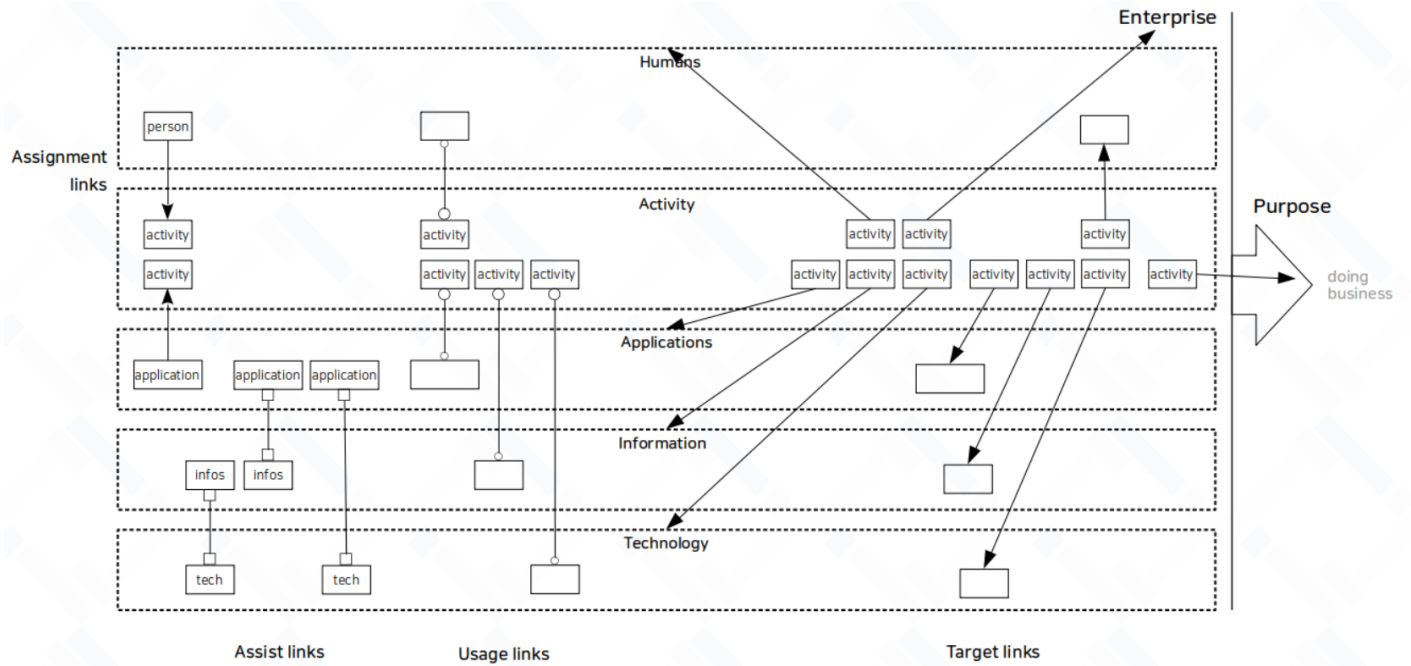


Fig. 6: AME Modeling Environment: Linking Rules - source: Pálffy [24].

work. The principle consists of identifying criteria and their relevancy in terms of shaping.

This shaping happens at different scales [26], for example, when designing a hospital, the architect does not begin by one treatment room. From the overall to the detailed levels, shaping involves different scales and levels of granularity. Architecture starts by defining main axes of shaping which will constitute generic criteria for further and more detailed shaping (i.e., this is what makes the scheme scalable and adaptable).

Furthermore, architecture can integrate it all because it does not shape from a viewpoint, a particular focus or any specific concern. As a matter of fact, a built is not made of views and is not an assembly of views. Views are used to illustrate a conceived build.

Architecture addresses the Enterprise constitutively. This is how and why Enterprise Architecture can address the Enterprise as-a-whole. In fact, it is by shaping the whole, constitutively, that you can fulfil respective concerns.

Another point is that Architecture is about shaping space. The principle is to define the different spaces needed and dedicated to the different activities. The difference with building architecture is that the space size is limitless, with the interest being the assignation of the space. This also means that Architecture is not about modelling activities but rather, about shaping their dedicated spaces. Actually, components exist as such, within space, and not through their links representing their usages. This is the first key point to introduce **adaptability**.

In summary, while current practices are stuck in modelling, at a detailed level, professional architecture (building) shapes spaces and provides an environment for modelled activities. That environment, being shaped, already integrates the relevant

generic criteria in order to assure overall coherence. This is what introduces **stability**.

Overall, thanks to its original approach, EXCOGITEA^{®3} allows to address concerns and brings concepts which are often overlooked, ignored or even unknown by current practices and which are yet key, foundational.

EXCOGITEA[®] does not deny current practices but brings into play the broader missing context, providing overall coherence and higher-level correlations.

EXCOGITEA[®]'s approach redefines the practice and the scope of Architecture. It gives sense and meaning to "Enterprise Architecture".

V. RELEVANCY VALIDATION

Shaping the Enterprise as-a-whole is foundational. Current practices consider more specific scopes and sub-domains (e.g., BDAT, security), but, unless the whole is shaped, their real boundaries, and their real correlations, cannot be known.

Considering scales (which is natural in the building architecture discipline) is key. It allows to manage the granularities, of constituents and stakeholders' sights and scopes. Furthermore, in terms of design, it can be used to address genericity and modularity. This is also what constitutes correlations, from overall coherence to diversity of specificity.

Whether items are static or dynamic, EXCOGITEA[®] brings a constitutive approach. It considers items not only due to their usage but also regarding their existence, their nature. In this sense, it is also 'viewpoint-agnostic', that is a piece of data/information can be seen from a business, technical or legal viewpoint. While current practices deal with separated

³<https://www.EXCOGITEA.org/>

canvases (e.g., Business model, Operating model, Capability map) and wonder what can be the correlations, EXCOGITEA[®] addresses the shaping of the *build* per se. And a build is not an assembly of views. Rather, views are derived from the build. Instead of anticipating a resulting mesh, EXCOGITEA[®] shapes spaces, purposely. Correlations are defined at a generic level, through shaped spaces. This is what makes the scheme stable. Links between components can be created and modified at will, upon needs. This is what makes the scheme adaptable. Based on its original approach, EXCOGITEA[®] has developed an Architecture model: EXCOGITEA[®] AME [24].

EXCOGITEA[®] AME integrates a decoupling but correlative mechanism. It allows to address any needs and concerns, of any stakeholders, from any viewpoints, at any granularity levels, within the same overall coherent scheme. It defines tangible boundaries and therefore clarifies the scopes of sub-disciplines.

EXCOGITEA[®] AME addresses the dynamics of the Enterprise. Going far beyond the descriptions of processes (Business, Operational), AME defines how the Enterprise lives and evolves, covering Strategic, Tactical and Operational types of sight. Besides, AME allows to confront envisioned strategies, as-is situation assessments, mandatory compliance and legal obligations. The benefits of EXCOGITEA[®] AME are numerous:

- 1) It covers the Enterprise, as-a-whole.
- 2) It allows the enterprise to continuously evolve while executing its purpose.
- 3) It permits the enterprise to be reactive by targeting the changes to impacted units only, regardless of timescales and granularity levels and without changing its whole model.
- 4) It allows to solve conflicts and overlaps of undertaken subjects, and brings consistency to a proper Programs/Projects portfolio.
- 5) The Enterprise and its dynamics are shaped, independently of detailed level modelling.
- 6) The Enterprise can address further views, “of” and “within” the overall scheme, with coherent scopes.
- 7) It constitutes the build of the Enterprise so that the related disciplines can map and locate their scope.
- 8) As a shaped space, an environment, it acts as a canvas for mapping legacy schemes, and assessing their coherence, relevancy and maturity.

In summary, EXCOGITEA[®] AME provides a complete, coherent, constitutive and orchestrated scheme for the Enterprise as-a-whole. In addition, EXCOGITEA[®] is fully aligned with COBIT[®]’s 5 Principles [27], not only for IT though, but furthermore extended to the whole Enterprise:

- 1) Meeting stakeholders needs
- 2) Covering the Enterprise end-to-end
- 3) Applying a single integrated framework
- 4) Enabling a holistic approach
- 5) Separating governance from management

In brief, EXCOGITEA[®] is granting Companies a conscious-

ness of their *built*. Besides the building activity considerations, EXCOGITEA[®] allows to evaluate *Operational Excellence* and trigger *Enterprise optimization*. In addition to the Operational perspective of view, EXCOGITEA[®] covers Tactical and Strategic ones. Actually, these are visions of the build over time. EXCOGITEA[®] provides a realistic and accurate view of the build which integrates all required criteria in terms of impact, feasibility and costs, among others, to support *decision-making*.

VI. CONCLUSIONS AND FUTURE WORKS

In this paper, we have presented an innovative architecture approach for Enterprises. We have illustrated and validated the approach, with the ArchiSurance, according to the requirements dictated by the ADR method, and based on and in compliance with the existing literature. During further development, we foresee the enhancement of the semantic and syntactic aspects of EXCOGITEA[®] AME, e.g., by [28].

EXCOGITEA[®] gives a new sense to Enterprise Architecture. Its original approach brings the missing elements to current practices and allows us to frame them when needed.

EXCOGITEA[®] constitutes a foundational context, a cradle for existing disciplines. Therefore, the principle is not to deny current practices, but to support them.

A. Business Architecture

Enterprise Architecture addresses the shaping of an “Enterprise” type entity, whatever the specific Business domain of the Enterprise. EXCOGITEA[®] provides a clarification of boundaries and allows Business actors to focus on the Business. While several actors provide “prefab” models specific to business and industry types, EXCOGITEA[®] allows us to assess the maturity and coherence of these models.

B. Data Architecture & Data Governance

Data Governance is a mature discipline ([29], [30] and GDPR [31]). To date, Data Architecture mostly relates to some mapping of data usage within applications. EXCOGITEA[®] goes further and identifies the need for data to be organized, precisely to support their usage. And EXCOGITEA[®] clarifies the boundaries and defines a dedicated space for this. EXCOGITEA[®] has already developed models (yet to be published) for Data landscape and architecture.

C. Security Architecture

While the current practice of security “architecture” relates to the definition of security principles, EXCOGITEA[®] provides the build required to implement them. Not to mention that the awareness of the Enterprise’s built makes it easier to identify security concerns [32].

D. Human resources

The human aspect in current Architecture practices is reduced to a human stakeholding within processes. In the meantime, companies manage functions through an organization chart, and roles depend on the methodology chosen. Through its constitutive approach, EXCOGITEA[®] considers a human

as an individual, considering his/her profile, including his/her expertise and trainings. Again, it defines a dedicated space, to organize the workforce of the Enterprise. Furthermore, EXCOGITEA[®] provides the required correlations in terms of functional adequacy, authority level, and access rights. EXCOGITEA[®] supports HR and recruitment disciplines.

E. Program management and development methodology

EXCOGITEA[®] provides the required support context, in terms of functional adequacy, accuracy of views, and flows of dynamics., EXCOGITEA[®] will also go beyond this context and has already started to design a model which covers the entire cycle by bringing correlations between strategic milestones, feature management, portfolio, impacted teams, and realization methodologies (e.g., Prince2 [33], Agile [34]).

F. Architecture tools

Besides repository tools, current tools are logically aligned to current practices, and are hence detailed and low-level. Yet, some which integrate *grouping* items are still relevant since we are talking about “shaping spaces”. The weak point would be the lack of high-level correlations between the defined groups. So far, tools like ArchiMate[®] and BizzDesign Enterprise Studio & HoriZZon⁴ look interesting.

G. Architecture training

EXCOGITEA[®] plans to create a complete course and additional training material for Enterprise architects within Organizations, as well as to accredit Consulting Companies.

The perspective of professional (building) Architecture might be the opposite of current practice. Nevertheless, the point is that it is complementary, but not only. It brings what is missing and provides an upfront proper context which frames and fixes current practices.

“Architecture: shaping space, by integrating constraints, to serve a purpose”⁵

REFERENCES

- [1] K. Winter, S. Buckl, F. Matthes, and C. M. Schweda, “Investigating the state-of-the-art in enterprise architecture management methods in literature and practice,” *MCIS*, vol. 90, 2010.
- [2] C. Feltus, D. Khadraoui, B. De Remont, and A. Rifaut, “Business governance based policy regulation for security incident response,” *Crisis*, vol. 7, 2007.
- [3] W. H. Inmon, *Data architecture: the information paradigm*. QED Information Sciences, Inc., 1992.
- [4] M. Richards and N. Ford, *Fundamentals of Software Architecture: An Engineering Approach*. O'Reilly Media, 2020.
- [5] D. Garlan, “Software architecture: a roadmap,” in *Proceedings of the Conference on the Future of Software Engineering*, 2000, pp. 91–101.
- [6] J. M. Rodríguez Caballero, “Wolfram model and the technological architecture of the fourth industrial revolution,” *arXiv e-prints*, pp. arXiv-2111, 2021.
- [7] S. AlGhamdi, K. T. Win, and E. Vlahu-Gjorgievska, “Information security governance challenges and critical success factors: Systematic review,” *Computers & Security*, vol. 99, p. 102030, 2020.

- [8] B. Gateau, C. Feltus, J. Aubert, and C. Incoul, “An agent-based framework for identity management: The unsuspected relation with iso/iec 15504,” in *2008 Second International Conference on Research Challenges in Information Science*. IEEE, 2008, pp. 35–44.
- [9] C. Feltus, E. Dubois, E. Proper, I. Band, and M. Petit, “Enhancing the archimate[®] standard with a responsibility modeling language for access rights management,” in *Proceedings of the Fifth International Conference on Security of Information and Networks*, 2012, pp. 12–19.
- [10] S. Kotusev, “Exploring the roles of different artefacts in enterprise architecture practice,” Ph.D. dissertation, RMIT University, 2018.
- [11] C. Feltus, L. Lessard, F. Vernadat, D. Amyot, E. Proper *et al.*, “Conceptualization of a value cocreation language for knowledge-intensive business services,” in *Information Technology for Management. Ongoing Research and Development*. Springer, 2017, pp. 3–23.
- [12] A. Hevner and S. Chatterjee, “Design science research in information systems,” in *Design research in information systems*. Springer, 2010, pp. 9–22.
- [13] M. K. Sein, O. Henfridsson, S. Purao, M. Rossi, and R. Lindgren, “Action design research,” *MIS quarterly*, pp. 37–56, 2011.
- [14] S. T. March and G. F. Smith, “Design and natural science research on information technology,” *Decision support systems*, vol. 15, no. 4, pp. 251–266, 1995.
- [15] I. IEC, “25010: 2011-systems and software engineering-systems and software quality requirements and evaluation (square)-system and software quality models,” *International Organization for Standardization, Geneva, Switzerland*, 2011.
- [16] L. S. Rodrigues and L. Amaral, “Issues in enterprise architecture value,” *Journal of Enterprise Architecture*, vol. 6, no. 4, pp. 27–32, 2010.
- [17] V. Seppänen, K. Penttinen, and M. Pulkkinen, “Key issues in enterprise architecture adoption in the public sector,” *Electronic journal of e-government*, vol. 16, no. 1, 2018.
- [18] F. Nikpay, R. Ahmad, and B. Rouhani, “Current issues on enterprise architecture implementation evaluation,” *International Journal of Social, Education, Economics and Management Engineering*, vol. 9, no. 1, pp. 112–115, 2015.
- [19] A. Josey, *TOGAF[®] Version 9.1-A Pocket Guide*. Van Haren, 2016.
- [20] M. M. Lankhorst, H. A. Proper, and H. Jonkers, “The architecture of the archimate language,” in *Enterprise, business-process and information systems modeling*. Springer, 2009, pp. 367–380.
- [21] I. Rolling Meadows, *Cobit 4.1: Framework; Control Objectives; Management Guidelines; Maturity Models*. IT Governance Institute, 2007.
- [22] C. Feltus, M. Petit, and E. Dubois, “Strengthening employee’s responsibility to enhance governance of it: Cobit raci chart case study,” in *Proceedings of the first ACM workshop on Information security governance*, 2009, pp. 23–32.
- [23] J. A. Zachman, “The zachman framework for enterprise architecture,” *Primer for Enterprise Engineering and Manufacturing.[si]: Zachman International*, 2003.
- [24] V. Pálffy, “AME – Architecture Model for Enterprise,” May 3 2020, Belgian Patent BE1027471A1. [Online]. Available: <https://patents.google.com/patent/BE1027471A1/>
- [25] H. Jonkers, I. Band, and D. Quartel, “The archisurance case study,” *The Open Group*, pp. 1–32, 2012.
- [26] V. Pálffy, “Scale in enterprise architecture.” [Online]. Available: <https://www.excogitea.org/articles/scale-in-enterprise-architecture/>
- [27] A. C. Delgado, “Cobit 5 foundation – reference and study guide,” 2016.
- [28] D. Moody, “The “physics” of notations: toward a scientific basis for constructing visual notations in software engineering,” *IEEE Transactions on software engineering*, vol. 35, no. 6, pp. 756–779, 2009.
- [29] D. International, *DAMA-DMBOK Data Management Body of Knowledge 2nd Edition*. Technics Publications, 2017.
- [30] C. Feltus and E. H. Proper, “Towards a security and privacy co-creation method,” in *2017 12th international conference for Internet Technology and Secured Transactions (ICITST)*. IEEE, 2017, pp. 75–80.
- [31] P. Voigt and A. Von dem Bussche, “The eu general data protection regulation (gdpr),” *A Practical Guide, 1st Ed., Cham: Springer International Publishing*, vol. 10, no. 3152676, pp. 10–5555, 2017.
- [32] I. Band, W. Engelsman, C. Feltus, S. G. Paredes, J. Hietala, H. Jonkers, and S. Massart, “Modeling enterprise risk management and security with the archimate language,” *The Open Group White Papers*, 2015.
- [33] C. Bentley, *Prince2: a practical handbook*. Routledge, 2012.
- [34] J. Highsmith, *Agile project management: creating innovative products*. Pearson education, 2009.

⁴<https://bizzdesign.com/>

⁵Source: EXCOGITEA[®]