Dynamic Enterprise Business Development with Dual Capability EAM

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Abstract. Organizational agility combined with high level of enterprise IT control, and both business and IT risk management, shapes the focal problem of this study. We add a third case to a previously published analysis of two cases, where under the business environment pressure, the existing enterprise architecture management (EAM) is challenged by new capability building with new technology and business operations thereby undergoing a change. The development projects lead to a structural change, or change in organizing the operations, reflected also in the allocation of managerial responsibility. The analysis of two cases with the complex adaptive systems (CAS) theory in the earlier study is continued in this paper with the third case, extending the theoretical analysis to a multi-layered organizational structure. An initial outline of a 'dual capability EAM', that was based on the analysis of the two earlier cases, is now developed to a methodic approach to be used in similar situations, i.e., new business capability building and emerging organizational structures, however with controlled development and risk management. CAS is employed as an analytical tool, and with it, a theoretical foundation is suggested for the EAM approach.

Keywords: Enterprise Architecture Management, EAM, Complex Adaptive Systems, CAS, Organizational Capability

1 Introduction

This study builds on an earlier elaboration of two cases focusing on new business capability development, and the role of enterprise architecture management (EAM) with organizational agility, materializing in a dynamically emerging change in the enterprise structure [28]. The present study delves into this problem area with an additional case, showing similar traits as the two previous ones, but a broader scope and a more complex environment. Following the theoretical baseline adopted in the earlier case study, we examine the complex adaptive systems (CAS) paradigm [20-21, 18] as a potential explanation and an analytical tool. Both the two previously presented cases "Alpha" and "Beta" [28], and the new, "Gamma" in focus in this paper, involve the building of a new business capability, at the core of which is technology novel to the respective organization. The development induces an evolutive change even in the organizational

structure. The new case Gamma extends the study to a larger scale and nested governance systems extending over organizational borders.

From the systems theoretical perspective, broadly used in studying EAM and developing approaches for it [26], each of the cases, shows a new *technical system* bringing forth a change at a higher complexity level, or *socio-technical systems* setting in the enterprises our three cases represent. We find the concept of *organizational capability* [6, 32] as a fitting analytical conceptualization at this level. New business capability development is in all the cases an agile response to environment sensing, leading to evolutive changes the enterprise organizations. The IS concept of 'socio-technical' or 'work' systems tend to pertain to a more stable notion of an organization and its information systems.

The focus on enterprise structure touches also the respective *management* or *governance systems*. EAM is understood an approach for implementing IT governance [27]. In CAS terms, we observe the emergence of a new sub-system in a broader system-of-systems. A hierarchy of governance and management systems guides the division of labor and the resources within an enterprise.

The business agility, or the dynamics in the emergence of a new structure, is the third common characteristic for all the cases. The evolution step is triggered under an external pressure, enabled by an agile operations level mode [23]. This challenges the traditional IT governance and enterprise architecture management approaches, which are rather situated at the top managerial or strategic level. Agility in business capability development meets here with the requirement to simultaneously sustain high standards of enterprise IT governance, a norm in all the case organizations. Such controlled development is also understood as a part of the EAM mission. The combination of a required dynamism (agility in business capability development) and the EAM oversight role creates the focal problem for this study, i.e. the requirement for a "dual EAM capability".

IT governance, for IT and business alignment, and coherence of business and IT architectures, is practiced among other things through the enterprise architecture management process [3, 27, COBIT5]. In the cases at hand, this faces the challenge to firstly, maintain a coherent, inter-operable and stable enterprise IT with high standards for information security, and risk management both for business and for IT. Secondly, the enterprise business is driven by the enterprise performance, in its strategies paying heed to the business environment opportunities and threats. The pace of change in the business environment and technologies demands agile business development to seize opening opportunities – also following good corporate governance principles, that point towards strategic advances for maintaining and enhancing the enterprise value and performance.

Our initial proposal to tackle this challenge, the guidelines for a 'dual EAM capability model', outlined in a previous study [28], is in this paper extended with new empirical findings from another case. The new case presents a scaling challenge to the initial CAS theorization, through the embeddedness in a complex, hierarchical governance structure and a cross-organizational setting.

The research question is:

RQ *How can EAM support business capability development in an agile manner, when it involves the building of a new system and a new unit, changing the enterprise structure?*

The rest of the paper is structured as follows: In the following section (Section 2), we discuss the theoretical background, first, the systems approaches and CAS for a study of enterprise as a system of systems. Next, organizational agility as the challenge, and further, EAM approaches as a tool for the governance of enterprise IT and its developments. In Section 3, the study method is explained, and in Section 4, the study cases are accounted for. In Section 5, the cases are analyzed and in Section 6 the resulting model for dual capability EAM is presented. In Section 7 we conclude the report, discuss the limitations and openings for future research.

2 Theoretical background and prior findings

2.1 Systems approaches and CAS

Complex Adaptive Systems (CAS) is an acknowledged theory to explain diverse complex problems in the present world, among them, "encouraging innovation in dynamic environments" [20, 21]. Mingers and White [25] point to system hierarchies, and properties emerging at different hierarchical levels, following the Boulding [7] systems hierarchy from mechanical to intelligent systems. At higher complexity level (intelligent agents and social systems), the actors' rationalities and reasoning define the individual agent or sub-system behavior, affecting the overall system performance [25].

Organizational units may be seen as sub-systems in a systems hierarchy. The CAS also show hierarchies. The sub-systems may be called simply *agents* or actors, which is fitting especially if not consisting of several parts. Within an organization, the units (as sub-systems, or *agents*) may be competing for the limited organizational resources, interpret signals for opportunities and threats, receiving them both from their immediate environment (other sub-systems / agents, governance or management systems, or lower-level systems such as technical systems), and from the environment of the enterprise, i.e., the system-of-systems. Seen as a CAS, an organization or enterprise can be analyzed for EAM questions with the following concepts [12, 18, 20, 24]:

- *Agents* as individual organization members, groups or teams, or collectives thereof, (organizational units) as sub-systems, interacting with their environment [24]. Following this, the concept of *agency,* or ability to take meaningful action, pertains to the next concept:
- *Self-organization* as the capability of an agent to adapt (cf. the '*adaptive'* trait of CAS), i.e., re-direct and re-organize its resources and activities, according to the interpretation of its environment and signals received. This leads to a change at the agent and sub-system level, which again changes the whole system, or system-of-systems.
  - *Degrees of freedom* for individual agents within a system to enact upon signals they receive ("dimensionality"; [12]).

- *Emergence* is the notion of system evolution due to changes induced by agent or sub-system adaptive behaviors, cumulatively perceived as system-of-systems change, as change in performance, in structure etc. as the system and individual agents aim at *fitness* in their *environment* [12], or optimal behavior in their given conditions.

— *Signals and interactions.* The concept of signals [20] pertains to the interactions and activities of the agents. Haki et al. [18] further explicate the interactions as the "dynamic connections between agents and resource flows", entailing from the "mutually adaptive" (self-organizing, or co-evolutive) behaviors of the agents [18].

— *Environment.* The focal system as in all systems theories is confined by a system boundary. With organizations, the boundary is drawn by the ownership of the resources under the control of an enterprise [13], and the environment forming the external conditions for the system.

Significantly, signals from the external environment may be interpreted as changes in the external conditions that require action by the system, in order the system to survive in the long term, or to influence the system performance in short or medium term. The focus of our study is to understand the dynamics in a business organization, detecting signals in their environment interpreted as business opportunities and leading to the need of new capability building around a new technological asset. The traditional top-down governance approach to EAM is challenged with initiatives coming from lower echelon 'agents', and signals not observed by the governance systems but away from the central governance, in the line-of-business or organizational unit, which is systems terms means the sub-system level. We discuss the related organizational agility concept next.

2.2 Organizational agility

Tallon et al. [33] in their review study on organizational agility point to the sensing of the environment, in CAS terms, receiving and interpreting signals as the key mechanism of the system to interact with its environment. The ability to do so is in organizations related to the structures and hierarchies of an enterprise, as Tallon et al. [33] point out: "there may be significant delays in getting information to top executives" with whom the decision-making power is, "while the richness and immediacy of the source information may also be lost", meaning that the *interpretation of the signals* is, due to the structure and decision-making hierarchy, not done by agents with best ability to interpret their significance. Tiwana and Kim [34] point to the decision-making power vs. requisite knowledge for the decision needing both business and IT understanding. Tallon et al. [33] further point to the information overload and bureaucracy as possible causes for missing significant signals. This is noteworthy for an EAM study, since EA as an approach is known for susceptibility for exactly these phenomena [16]. Lee et al. [23] brings forth the need for ambidexterity and elaborate this at the strategic and operational levels of business-IT alignment. This reflects the opportunity for not only capturing and interpreting signals, but also to act accordingly, i.e., guide new capability development, achieving agility at the business operations level. The related phenomena

have been explained with the *dynamic capability* concepts, also adopted in several EAM studies (e.g. Abraham et al. [1]), which is another plausible way to explain the sensing and the seizing. However, with CAS, we find an analytical tool for the change taking place with the emergence of a new technical system, around which a new business capability (entailing one or more socio-technical systems, or organizational subsystems, and new, requisite IT capabilities) and in some cases, also a new organizational unit is forming. Such structural change may entail also changes in the decision-making structures. Such situations are delicate within an organization, and in CAS terms, the mutual adaptation [18], or *co-evolution* may also mean rivalry and competitive behaviors [12].

2.3 Enterprise Architecture Management

For over two decades, the complexities of managing organizational IT have been tackled with EA management approaches. EAM has been evolving from a technical design of IT infrastructures and systems architectures to a strategic management approach, aligning the enterprise business and IT developments [31]. It has a role in enterprise IT governance, to maintain a portfolio of technologies and applications for enterprise performance, and among other things, also manage both business and IT related risks. An architectural approach is requisite for information and data security management [30]. Beyond *alignment*, a rather project-by-project effort, EAM creates an oversight to all enterprise IT assets and resources (*awareness*), targets the ensuring of business continuity (*assurance*) [3, 5, 15], all the above further essential in managing information security.

Support for agility has early on been attributed to EA [30], as the awareness provided by a managed EA gives a headstart in developing business and IT. The later emerging EAM, a research area in its own right, has repeatedly been studied in the context of business agility, often with the conceptualizations of dynamic capabilities [1, 4, 36], and agile development [11, 19]. Systems approaches have a long-standing and broad interest in the enterprise architecture research area [26], early EA approaches applied e.g., the living systems concept [29, 37], following with systems approaches to EAM, e.g., the viable systems model [2009], the hierarchical, multi-level systems [2] and recently also CAS [18, 22].

In our cases, the focus is on the role of EAM and combining to its best practices the dynamism of a systems evolution, induced by a new technical system implementation, leading to the emergence of a new organizational capability (entailing socio-technical level systems as a sub-systems or sub-CAS within a “CAS of CASs”, i.e. the entire enterprise). This leads also to changes in the enterprise governance structures, pertaining to resource ownership and location of control. We see a need to examine the management and governance systems as a type of system or sub-system within the entire enterprise. It is a sub-system where decision-making power over resources and actions of also the other sub-CAS have been concentrated. One of its core activities is to allocate and guide the resources to other-sub-systems and control their use through monitoring of sub-system performance.

In our previous study [28], with two cases we illustrated the capability of EAM to support the evolutive change, allowing for piloting solutions at the level of a business function or organizational unit (in EA terms, a 'segment', or domain; Bruls et al. [9]; Pulkkinen [29]). As stated over the results, "changes in the EA segment structures mean that the systems structure of the enterprise evolves. New technology is the core technical system, entailing a new socio-technical system to emerge, with among other things a new business process to be designed as the core of a new capability to be established. New EA segment structure means an evolution of the sub-CASs within the enterprise" [28].

3 Research method

Case study is a multifaceted research approach [38], established for exploring phenomena not yet fully understood or explained by existing theories and conceptualizations. As pointed out by Eisenhardt and Graebner [17], missing a theoretical underpinning is a reason to conduct qualitative inquiries. They also reinforce Yin's [38] view to examine subsequent cases to elicit sound evidence for the suggested explanation. The initial study [28] continued in this paper, started out by exploring two cases capturing research attention by a dynamism in EA development cases not fully explained by existing views, conceptualizations, and methodologies for EA management. The cases also offered an opportunity for qualitative data collection, in form of a series of documented workshops, in addition to the guiding project documentation. These, accompanied by discussions with the people in oversight positions in all cases, allow for a deep insight into the organizational reality. Both the documentation and the workshop outcomes remain with the researchers for later study. For the third case in focus in this paper, we follow the same scheme for research data collection. As the material base from the three cases is very extensive, the documents are analyzed selectively, concentrating on material on the focal phenomena of organization evolution and the required EAM approach.

The workshop participation of organization members with rank and authority for decision making, on both business and EA, as well as organizational IT issues, sheds light to the related organizational issues. In the scope of the analysis, the mass of documentation on e.g., finer technical design details for the cases is given less attention, but the analysis is concentrating on how key issues are solved, and how a man-aged path in developing the EA, satisfying all requirements, can be found.

An author participating in the development projects gave in all three cases a unique opportunity for participant observation [8], where the focus of the study, the aspect of emergence in a system and the organizational change, is 'objective reality' from the perspective of the researcher. Not an organization member, he can retain observer objectivity. The long-term observation during development requiring on-site time with the organizations was needed to observe the organizational evolution take place to the point where the new structure is planned, and the new capability is developed. This was for case Alpha 6 months, case Beta 12 months, and for case Gamma 6 months, "virtual" participation due to the distributed organization and the pandemic conditions 2020-

2021. Contact with the case organizations continued after the project completion, giving the opportunity to observe if and how the developed solutions are deployed, and induced changes are permeated.

4 Case introduction

As this study builds on top of the two earlier cases [28], a short review of those cases is provided. Case "Alpha" was a large public agency, "Beta" a private corporation. A shared strategic choice in both was, to develop a new business capability with a technology new to the enterprise, the corporate IT and the business units. The strategic intent entailed a fast move. Alpha leveraged AI to build a virtual customer service assistant and aimed at a 'first mover' status with this technology. Beta built an IoT platform to enable a new business service concept and to support the users of their physical technology-intensive product customers. Relevant characteristics of the earlier cases for this study are represented and compared to case Gamma in this chapter.

Case Gamma is a cross agency collaboration project with two public agencies that participates in an EU program that has a goal to harmonize domain specific processes across member countries. The case project is part of a collaboration on control and risk management in the EU, and the goal is to enable agencies to become compliant with the EU level processes and to become more data driven. The case's organizational structure is represented in Figure 1.

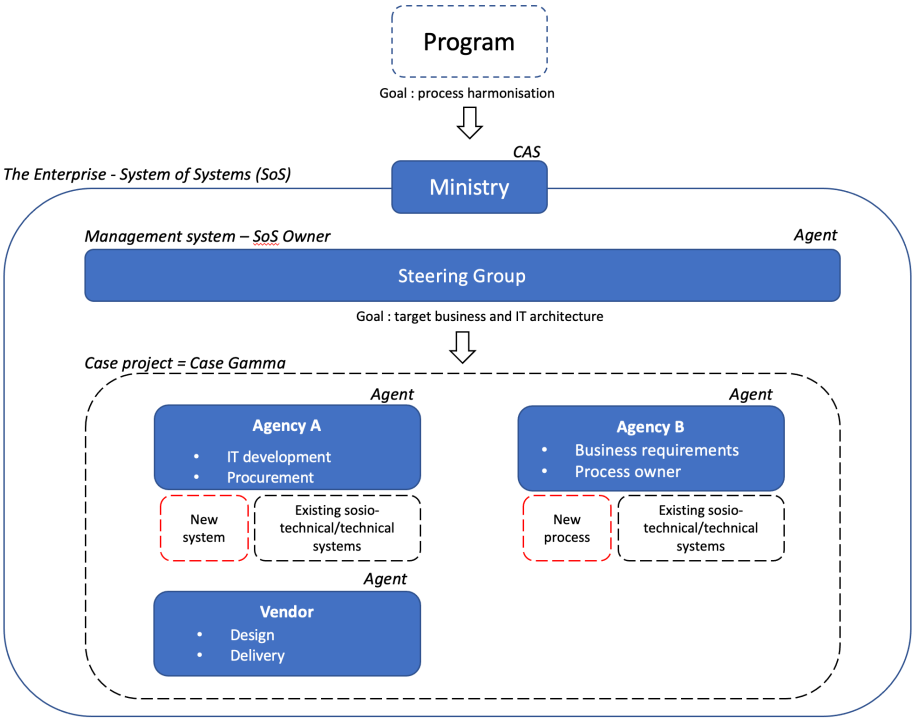

Figure 1. Organizational structure of the case.

The *ministry* governs a large domain which both case agencies are part of. Ministry's role in the case is not direct, but it has the overall ownership of the whole.

Steering group is a temporary structure created by ministry to govern the program's implementation. Steering group is the decision forum that is responsible for the operational management of the program and the coordination between case agencies. Part of steering group is the Architecture Forum that has the ownership of the program's IT system landscape and architecture into which the project is to deliver. The key steering mechanisms are project management and target architecture.

Case Gamma is organized as a temporary cross agency collaboration project under the ministry. Gamma's goal is to design and implement the new cross-organizational process and enriching an IT system outlined by the target architecture.

Agency A represents the IT Development capabilities and procures the new IT system as a licensed system from the selected vendor. Agency A owns the system.

Agency B represents the business requirements and owns the to-be business process. *Vendor* does the detailed design and implementation with an agile delivery methodology. The vendor operates the new system during production phase with a small team, becoming a part of the organizational structure.

Both Gamma's agencies have ICT departments with associated EAM functions. Agencies EAM functions ensure that the new capability is integrated properly to agencies' own architectures.

The research data is like with the two cases presented in Poutanen and Pulkkinen [28] and is represented in Table 1. The first author did participatory observation in case Gamma during the design phase of the project.

Table 1. The data for qualitative analysis.

Data sources available	Case Alpha	Case Beta	Case Gamma
Strategy and plans	Yes	Yes	Yes
Organizational guidelines & standards (documents)	5	4	6
Project plan	Yes	Yes	Yes
Number of design workshops (1-2 hours each)	21	18	35
Number of workshop participants	5-6	2-11	1-8

The urgency to Gamma comes from the from EU-program timeline.

Table 2. The Case Analysis: The Emerging of a New Capability as a Sub-Subsystem.

Case attribute	Case Alpha	Case Beta	Case Gamma
Business driver	Strategy deployment, customer service improvement	Strategy deployment, growth generation	Process harmonization
Capability developed	New AI-based virtual assistant service channel for customers	New business concept: After-sales product service with IoT support	New digitized process and risk analysis system
Business goals	Service quality improvement Cost savings First agency to deploy AI	New revenue from novel service business Customer commitment to product	Inter-organizational process coherency
Key technological goal to develop enterprise IT	AI adoption in a pilot service area for further deployment	IoT platform deployment Sensor data analytics adoption	Process enrichment with ML, secure use of public cloud
Initiative and project ownership	Customer Service Development Unit	Business Development Unit – to be	Top-level organization

	– to be handed over to customer channel management	handed over to a new unit	
Novelty of the solution	High (no prior AI implementations)	High (no prior implementations or IoT / SDA)	High (no prior public cloud and ML)
Type of solution	Pilot implementation	Production quality	Production quality
Intra organization connection	No	No	Yes

Table 3. The role of EAM prior to the project.

Role of EAM	**Case Alpha**	**Case Beta**	**Case Gamma**
Focus of the EAM team	Business systems, Administrative systems	Administrative systems	EA-compliancy
EAM role in the project	Informed	Consulted	Authority
Perceived role of EAM	Slow, no value	Slow, limited value	Necessity
EAM role in post-implementation phase	Standardization of the solution Created EA knowledge retention	Standardization of the solution Created EA knowledge retention	Standardization of the solution Created EA knowledge retention

5 Case analysis

Poutanen and Pulkkinen [28] concluded with a model of a dual capability EAM for steering new capability development in emergent, agile, and yet, controlled manner. In this section, case Gamma is analyzed using an updated and visualized version of that model, represented in Figure 2.

The model is a workflow containing phases and activities that an organisation can follow to create new capabilities with novel technologies in emergent settings. Observed characteristics of case Gamma are reflected to each activity of the model and compared with characteristics of cases Alpha and Beta. The goal is to provide insight how the model performs in more complex cases like Gamma.

Detect signal
In earlier cases business units (agents) of an organization (CAS) detected the signals from the environment and in case Gamma the top-level organization (CAS). Signal detection is agnostic of the organizational hierarchy level.

Evaluate
- *Business potential*: in cases Alpha and Beta, business units identified an opportunity and were able to create a strong business case. In Gamma, the top-level organization did the evaluation. In all cases a joint agreement was made before the project start
- *Risk*: Case Alpha's planning with the concepts of Dual EAM model resulted in lower project risk, allowing purposedly less engagement by the management. Both Beta and Gamma involved a high financial risk, due to the scale of the work, resulting to stricter management policies of the project. In all cases, all involved parties inserted their arguments to the project evaluation and an overall risk appetite was determined by the top management. Of the technological risks, business units had the best understanding. High risk level requires to increase in the level of steering.
- *Novel elements*: all cases faced novel technologies to leverage. This is an important point, as it helps to define what knowledge needs to be acquired into the team

Form the team
- All cases used a *temporary team.* In riskier and larger cases Beta and Gamma, a more formal structure was used, due to the larger scale of the effort
- *Owning business unit leads:* in Alpha and Beta business units ('agents' of the CAS) led the development, in Gamma a temporary collaborative project, with overall steering from the owning organization
- *Engage affected business units*: In all cases business units collaborated actively. In Alpha and Beta, the business units detected who were needed. In Gamma the CAS detected, and gave the project ownership and an active role to business units
- *Resource skills*: all cases leveraged external resources due to the novel technology. This was a fast way to resource the project and to acquire skills transfer into own organization

Prepare
- *Study the context*: in all cases EAM played a critical role in this activity, enabling understanding of the current business and IT architectures. In case Gamma, EAM provided the target architecture for the project (top-down). In Alpha and Beta, target architecture was unknown at start, it had to be designed (bottom-up), but with clear integration points known *a-priori*, reducing the risk of incompatibility.

- *Reduce scope*: all cases limited the cost of a potential failure by designing a temporary EA-segment with clearly defined interfaces to their environments. Alpha additionally limited the functionality of the virtual assistant focusing strictly to the novel elements of the solution.
- *Use temporary development environment*: all cases leveraged a public cloud to provide speed and to avoid capital costs. Majority of the work could be developed on cloud due to the black-box design. In case of failure, effects would be minimized on the existing IT environment

Experiment

- *Design business processes*: in Beta, the new processes were novel to the organization. In Alpha, a new customer service channel was introduced with several new roles. New boundary spanning roles between business units were needed to train the virtual assistant, e.g., from linguistic and legal aspects. In Gamma a new cross-organizational internal process was designed to enhance business capability and to meet EU targets
- *Identify and apply integrations and standards*: in all cases, EAM played a critical role in identifying the required integrations. All cases used a black-box integration as a strategic choice, to reduce technical risks and to enable more agile and faster future changes. Gamma represents a more complex case architecturally, as the solution had most integrations to the current environment. In all cases identifying existing legislation, related constrains and standards played a critical role in helping to design a viable solution
- *Minimized EAM control*: The cases indicate that the development case attributes affect greatly what is the optimal level of control needed. This must be decided case by case. With Alpha, a totally isolated development environment allowed to reduce EAM involvement to only to understand future integration needs and to create future-compliant design for the experimentation. In Gamma, EAM team controlled only the defined interface of the new solution thanks to the black-box design approach. This enabled Gamma to design the content and the internal architecture autonomously behind the interface.

Ensure viability

- The risk/opportunity level of the case determines the level of steering and management that is needed. It is important to ensure that the proposed value and quality could be achieved. A failing project must be stopped.
- In very novel cases the produced solution's value for the business must be evaluated. The solution needs to be consolidated to the current EA. With proper preparation-phase work, the effort is optimized. In case Gamma, EAM team was involved from the start within the steering group.

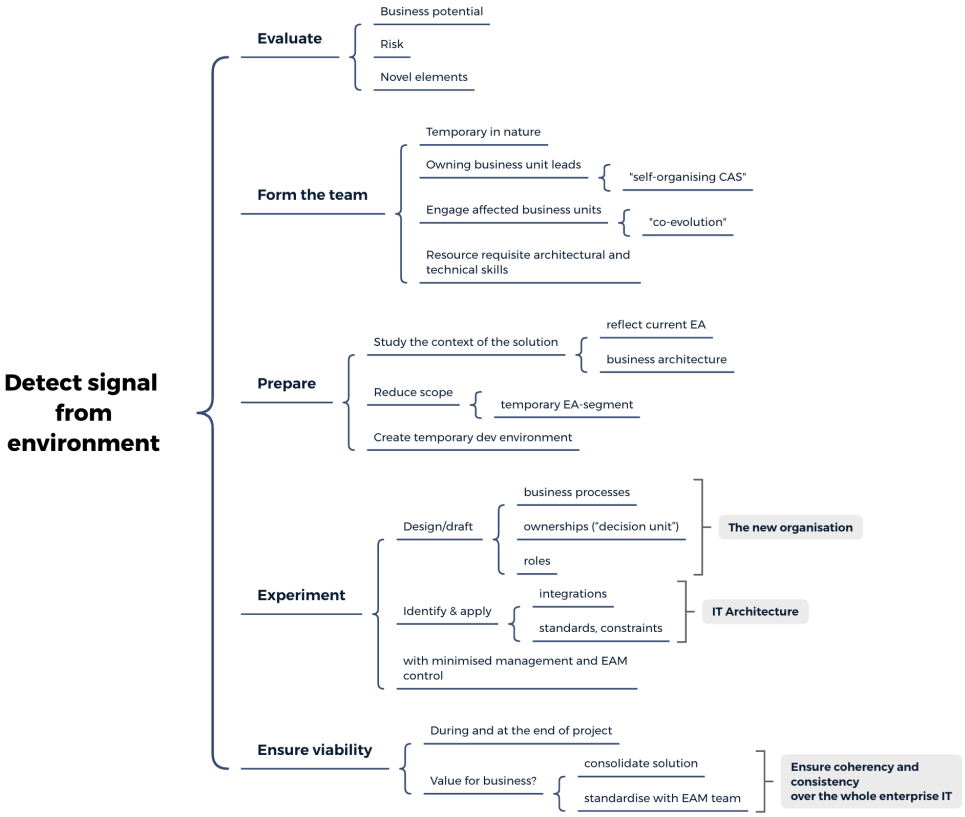

Figure 2. Dual EAM model

6 Discussion

Case Gamma provides a context and elements that enable evaluation of the CAS-based Dual EAM model represented in Figure 2 in a more complex case. In Gamma, additional organizational hierarchies (Fig. 1) are in place, and the new capability development requires cross-organizational change. The following evaluation is performed trough CAS theoretical lenses [12, 18, 20, 24]. Essential phases and activities of the model for answering the research question are explored from the case analysis.

The case *structure* would allow to select other options for the boundaries of this study, but the selected unit of analysis is the Ministry, as the top-level organizational layer and the resource owner, representing the CAS [18]. EU and the program represent parts of the CAS's *environment*. Steering group, case Gamma as a temporary organizational structure, both agencies A and B and the vendor are internal agents of the CAS. The vendor is interpreted also as an agent, as it provides a development team and later a support team to the CAS, that becomes part of the organization, as part of the emergent change or re-structuring of the organization

As Choi et al. [12] points out, modern CAS theories and models of CAS focus on the interplay between a system and its environment and the co-evolution of both the system and the environment. In this case, Ministry *detects a signal* from then environment as a member of the EU program and identifies the need to build new capabilities leading into this development project. The new capability for the CAS (ministry) represents an attempt to increase the global fitness of the CAS within its environment.

In contrast to Gamma, in cases Alpha and Beta, business units as internal *agents* were the environmental signal detectors and triggered the change. Agents behave in a manner to increase *fitness* of the system that they belong to - either locally or globally [12]. The success of Alpha and Beta cases indicates that organizations should allow and encourage business units to be active environmental scanners.

Additionally, being able to detect and interpret signals more accurately [33], business units as also understand best their existing resources, strengths, and weaknesses, making them optimal organizational level to lead the design of new local capabilities in a *self-organizing* manner. Fostering active collaboration between business units during the capability development in a *co-evolutionary* way is also a trait of a CAS. The vendor is also an important part of the internal agent network, participating in the co-evolution and knowledge transfer into the network of agents. In all cases, the vendors' role was critical to achieve an agile development speed and more importantly, to acquire requisite knowledge of the new technologies.

A key tenet of this research is, how an organization can steer new capability development in an agile yet controlled manner. This is a balancing act between freedom and control. As pointed out in Section 2, the traditional approach where top-level management system and its EAM govern the development has its well-studied challenges.

The *dimensionality* of a CAS [12] is defined as the *degrees of freedom* that individual agents within the system must have to enact behavior in a somewhat autonomous fashion. Controls reduce dimensionality [14]. Controls, such as rules and regulations, both system internal and external, ensure that an individual agent's behavior is greatly limited and helps the CAS to behave more predictably, or as in case Gamma, in a compliant way.

In case Gamma, target architecture and the use of a steering group leverages EAM as a control tool to ensure requisite external *fitness* could be achieved. A high-level target architecture with clearly defined interfaces for business units represents an efficient way to steer design and control the cross-agent (business unit) collaboration. Simultaneously, this approach allows for innovation within the new capability's boundaries.

7 Conclusion

Through three studied cases, Alpha, Beta and Gamma, where in each, a new business capability is developed, a Dual EAM Model is suggested. In these cases, around a novel technological solution (AI, IoT, and ML respectively), a new business capability is developed, inducing organizational change in structures and managerial responsibilities. The EAM model supports organizational agility for both the business operations and the IT developments, among other things by shifting control flexibly, enabling the

business units (agents, in CAS terms) to take control and guide the development, as in the two first cases, or keeps it centrally, as in the third one. The model allows for a flexible development path retaining the amount of organizational control needed for architectural coherency and risk management.

The enterprise architecture field of research has early understood the systemic nature of organizations and the IT systems in them, and adapted several systems approaches for method development in the areas of EA and EAM. Recently, the complex adaptive systems paradigm has been in the focus, and we find through the analysis of the three cases, that it does offer explanations and a fitting analytical tool, that supports the development of the suggested Dual EAM model.

The study has the limitations of a case study, leaving the suggested model to be tested in both practice and in further research. The evidence from multiple cases, however, strengthens the developed result, and the three cases show not only similar traits, but also differences that allow for testing the flexibility of the suggested model. We hope that this model finds ample use and will be tested in further cases.

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