

ENTERPRISE DATA AGILITY AND STRUCTURATION BETWEEN CHIEF DATA OFFICERS AND ENTERPRISE ARCHITECTS

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ABSTRACT

This article researches the relationship between data, enterprise architecture (EA) and agility in corporate information technology services. The data responsibilities are represented by the Chief Data Office(r). The articles' assumption is a disrelatedness between CDO and EA as enterprise functions. Where CDO is tasked to monitor and exploit data but might lack connectedness to other relevant business and technology functions to release the potential of the data-driven enterprise. The study is based on grounded research, especially use of the Gioia method, to guide and code semi-structured interviews with ten CDO professionals worldwide. Findings indicate business benefits of connecting or aligning CDO and EA functions and responsibilities in ideas of co-ownership and enterprise-wide collaboration on data resources. The over-arching rationale is velocity of change as represented by agile thinking. Agility can be considered broader and in a more committed form connecting enterprise and data in a proposed Enterprise Data Agility. A key practical implication is that the CDO function has been established to exploit data but are more tasked with data stewardship in form of reporting, integrity assurance, privacy, access policies and similar. The proposed agile thinking suggests more proactive and change-oriented actionability and measurability with a model ranging from isolated EA and CDO function and up to the holistic enterprise with an intense fabric of data and decision within and around the enterprise. Changes in data semantics are used as best indicators for risks and potentials of the enterprise. This article proposes a measurement scheme for assuring agility in the EA and CDO relationship aiming that changes can be accommodated faster and with more timely impact and risk mitigation.

KEYWORDS

Enterprise Data Agility, Enterprise Architecture, Chief Data Office(r), Data, Agility

1. INTRODUCTION

Digital transformation is on the forefront of many enterprise and societal agendas (Anthony, 2021; Engesmo and Panteli, 2021; Gong et al., 2020). Digital thinking makes enterprises focused on extracting and realizing value from their data (Rashed and Drews, 2020). Big Data has been a term embodying use of data in enterprises (Whitman et al., 2019; Fadler and Legner, 2021; Gong and Janssen, 2021; Schembera and Durán, 2020). It is assumed that big data is not a definite solution and big data provide information, but leave responses to top management rather than empowering other governance frameworks, such as EA. Many practices and organization programs exist to enhance capabilities in exploring and exploiting data (Jagals, 2021; Fadler and Legner, 2021; Karkošková, 2022). Stronger qualifications in enterprise data practices comes at the same time when enterprises are more motivated to explore more agile ways in architecting their enterprises, business models, and service platforms. However, there is a topical issue and a question about how connected are enterprises' efforts in implementing agile methodologies in their enterprise architecture management, with their efforts to respond to the increasing data velocity and the need to have more agile data practices (van de Wetering, 2021; Foorthuis et al., 2020). This article analyzes the dynamics of data and the subsequent data management roles in order to understand the need, limitations and opportunities of agile enterprise architecture (Gong and Janssen, 2021). Going from structure to interaction and “softening” of structures of competencies is a motivational theme of this article (Jones and Karsten, 2008).

The motivation of this article is led by seeing incessant changes in business dynamics as reflected in changes in data semantics. The recent years have highlighted a range of situations, e.g., pandemic, supply chain disruptions, materials scarcity, price fluctuations, armed conflicts, tightened regulatory demands. Enterprise IT and architecture focus on systems that are often not being architected for these purposes. This has led to data as the key change indicator.

To further motivate this study, is the understanding of contributions of the domains of data, enterprise architecture (EA) and agility in corporate digital technology landscape. This article adds to the investigation of agile enterprise architecture by exploring the need of embedding a proposed Enterprise Data Agility practice as a necessary Agile Enterprise Architecture practice (Kaddoumi and Watfa, 2016; Zakrzewska et al., 2022). We question the “ownership” model of the enterprise data agility mainly in the light of the mutual relationship between the Chief Data Office (CDO) (Brenneman, 2018) and the Enterprise architecture management (EA/EAM) (Ahlemann et al., 2021). “Ownership” is in the remainder of this article the aggregate of organizational and technological factors determining the key governance responsibility and decision power of data in the organization (van den Berg et al., 2019).

The article is thus identifying the challenges that enterprises might face toward empowering their enterprise data with more agile practices. Which leads to the following research questions:

- Question 1: What is the perception of Chief Data Office stakeholders about the Enterprise Data Agility?
- Question 2: What Chief Data Office stakeholders perceive as main challenges toward achieving Enterprise Data Agility?
- Question 3: How do Chief Data Office stakeholders see the mutual relationship with Enterprise Architecture toward achieving Enterprise Data Agility?

2. THEORETICAL BACKGROUND

The academic literature that documents the agile nature of the enterprise architecture management is scarce, and that empirical ground in particular is missing (Hauder et al., 2013; Schelp and Stutz, 2007). Agility is in this context defined as “ability to react”, “fast response”, “adapt to circumstances”. And considering lines of events since 2020, the timeframe for many companies is in the area of 7 – 30 days from early indications to stable solutions. Using agile principles and methods in enterprise architecture has attracted some interest (Rouhani et al., 2008; Buckl et al., 2011; Alzoubi et al., 2015; Kaddoumi and Watfa, 2016; Kaddoumi and Watfa, 2021). Defining enterprise architecture has been the subject of multi-faceted publications and research initiatives. However, there are many definitions of the enterprise architecture, no one single agreed definition over all the literatures (Cameron and McMillan, 2013). Achieving the alignment between the business and the IT processes was the main area to highlight in the Systems and Software Consortium definition. Other researchers refer to the enterprise architecture as a set of models and definitions (Kotusev, 2019), with description of the structure of the enterprise, the enterprise divisions and the relationships existing between them, and the relationships with the external environment (Engesmo and Panteli, 2021; Alaeddini and Salekfard, 2013). Another perspective has been presented by (Ullrich et al., 2022; Bente et al., 2012) by introducing the enterprise architecture as an architectural thinking to simplify the management of a complex enterprise IT landscape, by defining the IT strategy, modeling the architecture, evolving the IT landscape, assessing and developing capabilities, and developing and enforcing standards and guidelines. Other researchers (Cameron and McMillan, 2013) refer to EA as a blueprint for the system and the project to be developed. Enterprise architecture scope includes the enterprise technology, enterprise information, enterprise processes, and enterprise people; the relationships between these elements and their external environments are also part of the EA scope (Ullrich et al., 2022; Bente et al., 2012).

Agile methods have become commonplace in software development. This success is assumed to be transferable to other areas of technology development and management specifically and in the fields of business administration and management in general (Kaddoumi and Watfa, 2016; Kaddoumi et al., 2018). Agile seems slowly to affect many enterprise practices, e.g. production management, marketing, strategy execution, etc. Agile methods must be viewed from the ability support controllability, learnability, and continuous adaptation embracing development and management enabling better risk management and success creation (Hoda et al., 2008).

Agile methods (Borad and Rajput, 2015) are contrary to waterfall methods and gives the complete software at the end of its cycle, while agile methods work in sprints and provide the repetitive outcomes after each cycle and complete the implementations as per the customer’s requirements (Hoda et al., 2008). The agile methods satisfy the customers and offer most value in a shorter time, by being focused towards customer satisfaction, and allowing for changes through repetitive and incremental development where only needed functionalities are focused on (Hoda et al., 2008). To embed Agile methods and practices in their change management, decision making architecture and making processes, and more naturally technology change and management, Enterprises have been exploring, piloting, and adopting the Agile Enterprise Architecture (AEA) as a potential Enterprise Architecture adaptation to address Enterprise Architecture complexity (Hauder et al., 2013; Schelp and Stutz, 2007). Agile enterprise architecture is considered as a new method that can solve the challenge of the complex enterprise

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architecture frameworks (Masuda and Viswanathan, 2019) and explain aspects and different viewpoints of a busy and complex enterprise completely which is influenced by unexpected changes in functions and technologies (Rouhani and Kharazmi, 2012). Agile enterprise architecture faces many challenges, mainly when it comes to its ability to ensure early and periodical enterprise architecture deliverables and to be able to adapt to the volatile business environment with changing criteria for goal fulfillment (Buckl et al., 2011). This is due to the fact that enterprise architects dedicate most of their time and efforts attempting to document enterprise architecture artifacts and follow enterprise architecture frameworks. This has created an obstacle toward achieving the main goals and values of enterprise architecture. Per (Buckl et al., 2011) the lengthy nature of enterprise architecture is expected to take a minimum of two years so EA and enterprise teams can realize the full-scale benefits of EA management, this also comes with high cost which leads to dissatisfied information providers who regard their efforts as wasted. According to (Rouhani and Kharazmi 2012), agile enterprise architecture is a new suggested method that might address and solve the challenge of the complex enterprise architecture frameworks, “agile EA is a method that explains aspects and different viewpoints of a busy and complex enterprise completely which is influenced by unexpected changes in functions and technologies a lot” (Rouhani and Kharazmi 2012). Agile enterprise architecture might address the studied challenge, seeing “Agile EA is result oriented and mostly concentrated on people's gumption. The most important advantage of agile EA is that it is faster, cheaper and better in people's relationships” (Rouhani and Kharazmi 2012). In the listing of the characteristics of the future enterprise architecture it is insisted on having the “architecture for agile business” as one of the core pillars of such futuristic enterprise architecture. Additionally, in one of his articles in the website of the association of enterprise architects, Allen Brown (President and CEO of the Open Group) appreciated the agile capability in adapting with the constantly changing business requirements by stating, “Agile software development has emerged as one of the ways for IT developers to adapt to the requirements of constant change”. He also suggested that “adopting the adaptation of the twelve principles of Agile Development to the discipline of Enterprise Architecture would be an interesting place to start” (Brown 2014). In this research it is claimed that traditional EA frameworks such as TOGAF (Sofyana and Putera, 2019) is not well suited for agile approaches as associated analysis, governance and document is too time consuming.

The Data Management Body of Knowledge identifies data management as the development, execution and supervision of plans, policies, programs and practices that control, protect, deliver and enhance the value of data and information assets (Brackett and Earley, 2009; Baars et al., 2021). However, the data management practices are not free of challenges, the data management strategies implementations tend to be challenged with traditional and documentation-heavy mindset which results in onerous, bureaucratic strategies that more often than not struggle to support the goals of your organization (PMI, 2022). Moreover, it is reported that enterprises often apply data driven approaches, from predictive systems to AI-driven automation, sporadically throughout the organization, which leaves the value that enterprises anticipate on the table and creates inefficiencies, this has been reasoned by the fact that problems still get solved through traditional approaches and take months or years to resolve (McKinsey, 2022). According to (Lee et al., 2014) leading organizations have learned an important lesson that seemingly tedious data problems are often fundamentally business problems, which can reflect weaknesses in business strategy and operations. To address the need to solve data issues and ongoing concerns, a large number of enterprises established an enterprise-level, executive-rank Chief Data Office (CDO) (Treder, 2020; Lee et al., 2014; Earley, 2017). Enterprises might have

different expectations from the Chief Data Office role (Nie et al., 2019). Commonly they expect the function to define the enterprise data strategy and priorities, to identify new data business products and offerings, and to position the data as an enterprise strategic asset (Schilling et al., 2020). Although multiple studies highlight the critical mutual relationship between the data and enterprise architecture either by identifying the data as a key product of the enterprise architecture management practices (Sessions, 2017; Kurniawan, 2013; The Open Group, 2022), or as a supporting asset toward achieving better enterprise architecture. However, aside from having studies addressing the agility of very specific and technical data practices e.g. data science (Närman et al., 2011; Journey, 2017) and data warehouse (Zimmer et al., 2012; Hughes, 2012; Corr and Stagnitto, 2011), there is little material in the academic literature that documents the application of the agile principles and methods on the enterprise data assets, mainly by being part of studying the agile enterprise architecture, and the implementation of the agile methodologies on the enterprise architecture.

3. RESEARCH DESIGN

Literature search has aimed at the academic literature on CDO and Enterprise (Data) Agility. To solidify the literature basis, the Grounded Theory method is used. Considered as appropriate when little is known about a phenomenon to produce an explanatory theory that uncovers a process inherent to the substantive area of inquiry (Chun Tie et al., 2019). The grounded theory method is concerned with the generation of theory, or theorization (Glaser and Strauss, 2017). The most useful characteristic of grounded theory is that it should infer new theory strictly by analyzing the primary data. Thus, Grounded Theory is most accurately described as “a qualitative research method that uses a systematic set of procedures to develop an inductively derived grounded theory about a phenomenon” (Strauss and Corbin, 1998).

The Gioia methodology is one implementation of the Grounded Theory approach, which is specifically designed to generate grounded theory, so the emergent theory rooted in the data constitutes the theory. According to Gioia, “Theory is a statement of concepts and their interrelationships that shows how and/or why a phenomenon occurs” (Corley and Gioia, 2011). Relatedly, theoretical contributions arise from the generation of new concepts and/or the relationships among the concepts that help us understand phenomena. The concepts and relationships developed from inductive, grounded theorizing should reflect principles that are portable or transferable to other domains. The position of this article is rooted in enterprise architecture. A motive is to reach out of CDOs to consider professional “partnerships”.

3.1 Sampling and Sampling Strategy

The empirical foundation of this article is acquired using case-based methodology within a global professional services company. The professional services tasks are organized as projects, programs or ongoing processes that serves the needs of external clients and customers rather than internal management (Stumpf et al., 2002). Our research case study company is a well-established professional services firm with a long history in the field. The company has established their Chief Data Office for more than five years. The Chief Data Office structure has global and local presence by having a Global level Chief Data Office, and local entities Chief Data Offices. The research sample group of our study from the case study firm is a

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representation of the firm’s CDO team representing leadership, management, and functional roles and representation. We interviewed 10 informants with the criteria that interviewees should be part of the Chief Data Office team for the last three years, with not less than 10 years in the professional services domain. The sample is sparse but selected from is strong character of experience and global connect.

Table 1. Expert informants of CDO

#	Geo, years	Professional Demography	Feedback Summary and Highlights
Inf1	US, 10	Finance background, focus on finance and audit use cases,	Perception: data agility is necessary in order to help CDOs and EA teams at the same time to achieve the quality state of data they should be looking for. Challenges: culture, CDO org structure, legality.
Inf2	UK, 20	Background in retail, professional services and consulting. Focus on data modeling and architecture.	Perception: data agility is necessary; however, it might depend on the size of the enterprise and the maturity of the CDO. Challenges: CDO centralization, culture; as culture can be the main driver toward 1) achieving the agile culture (vs the monolithic and the waterfall) and to 2) ensure the alignment between the two teams (CDO and EA).
Inf3	India, 10	Retail and ecommerce background, helped many retail company in building smart and agile data products.	Perception: data agility is necessary Challenges: culture, agility awareness and training. We all talk about agility because we have to, however many employees are not really ready to practice and be agilists in enterprises and firms.
Inf4	US, 20	Intensive experience in aviation and airlines solution and data services.	Perception: data agility is necessary Challenges: data quality and readiness, people and culture. While both teams can collaborate, challenge, and spend time and efforts on alignment, data quality is mainly the main challenge to promote the level of the data agility, the less data quality the firms have, the less understanding, and the less agility of moving the data.
Inf5	Canada, 20	Professional services. Heavily involved in data modeling and data operations.	Perception: data agility is desired Challenges: lack of measurement, politics and confrontations
Inf6	UK, 15	Technical Business Architect with focus on master data management and data quality.	Perception: data agility is desired Challenges: people are reluctance to change, people have competing priorities and minimal short-term ROI
Inf7	US, 10	Airlines and transportation.	Perception: data agility is necessary Challenges: lack of a good positioning of the CDO within the enterprise having CDO as Org under the IT organization (the EA role as well!), so CDO (and again EA) still report and under the strategic leadership of CTO and CIO offices which is not the right approach.
Inf8	UK, 20	Background in data law and legal use cases.	Perception: Desired in larger companies. Less desired in smaller companies with less diverse data ecosystems Challenges: People....tech people think you need all of the data...analysts this they want perfect data...
Inf9	US, 20	Background in finance and auditing.	Perception: Data agility is necessary and should be a CDO goal. Challenges: Global organizations had different functions, each with their own version of needing to interpret facts in the form of complex data, and what those facts mean. Data Sharing approvals, data privacy, data protection and organization dynamics are some of the challenges.

Inf10 UK, 10 Background in consulting and advisory.	Perception: Necessary. Managing data as an asset and enabling innovation is no longer a differentiator for organizations, it is a must do activity to stay relevant for customers/clients and to compete with competitors. Challenges: Typically scale of change required, cost, understanding of the vision by the relevant people.
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3.2 Data Collection

The data collection method is based on a series of individual semi-structured in-depth interviews organized around a set of predetermined open-ended questions, with other questions highlighted during the interviews. The interviews have been conducted virtually due to the pandemic situation, the social distancing considerations, and the multiple geographical locations. The interviews lasted for a period between 30 to 45 min. Notes were taken and related to the voice / interview session recording. Due permissions were obtained from the interviewees. Each interview was initiated by requesting the informant to describe his/her role and to describe his/her responsibilities in their team. Following this, the informants have been requested to answer the following questions:

1. How do you perceive the Enterprise Data Agility? necessary, desired, not desired? Why.
2. Considering the role of your company Chief Data Office, do you perceive Enterprise Data Agility as one of the Chief Data Office objectives/goals? Why.
3. Do you see your role participating in achieving Enterprise Data Agility? Why? Can you provide some examples?
4. What are the main challenges your company CDO, and/or you, face toward achieving the Enterprise Data Agility.
5. How do you describe the relationship / interaction between the Chief Data Office and the Enterprise Architecture function (alternatively the ‘central enterprise (IT) planning’ function)?
6. Do you consider your company and / or the Enterprise Architecture function sufficiently responsive to data? Can you support with examples?

These questions have been utilized as a driver of the interview discussion. The open discussion statements were coding from the structure of the questions. Although no further limitations were added to the discussed depth.

3.3 Data Analysis and -Structure

Recorded interviews transcripts analyzed in a semi-manual process. Per Gioia et al. (2013), authors should revisit the data in iterations of discussions, and develop decisions about how to code terms. The authors performed coding as per the Grounded Theory methodology (Gioia et al., 2013; Charmaz, 2014) and applied the ideas of Thematic Analysis which is a process to encode qualitative input to be used as part of qualitative methodologies (Boyatzis, 1998). The coding process was conducted in successive phases: Phase 1: The authors read all transcripts and generated codes, where codes are terms used by interviewees or a reflection of authors on the meaning and the language of interviewees (Strauss and Corbin, 1998; Gioia et al., 2013). Phase 2: Generating first-order categories. Authors grouped the codes from Phase 1 in higher-level concepts per similarities. Step 3: Generating second-order themes. Authors used

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the axial coding as per (Strauss and Corbin, 1998) to link the first-order codes and to group them in higher-order themes. The results of the coding process are showed in Figure 1.

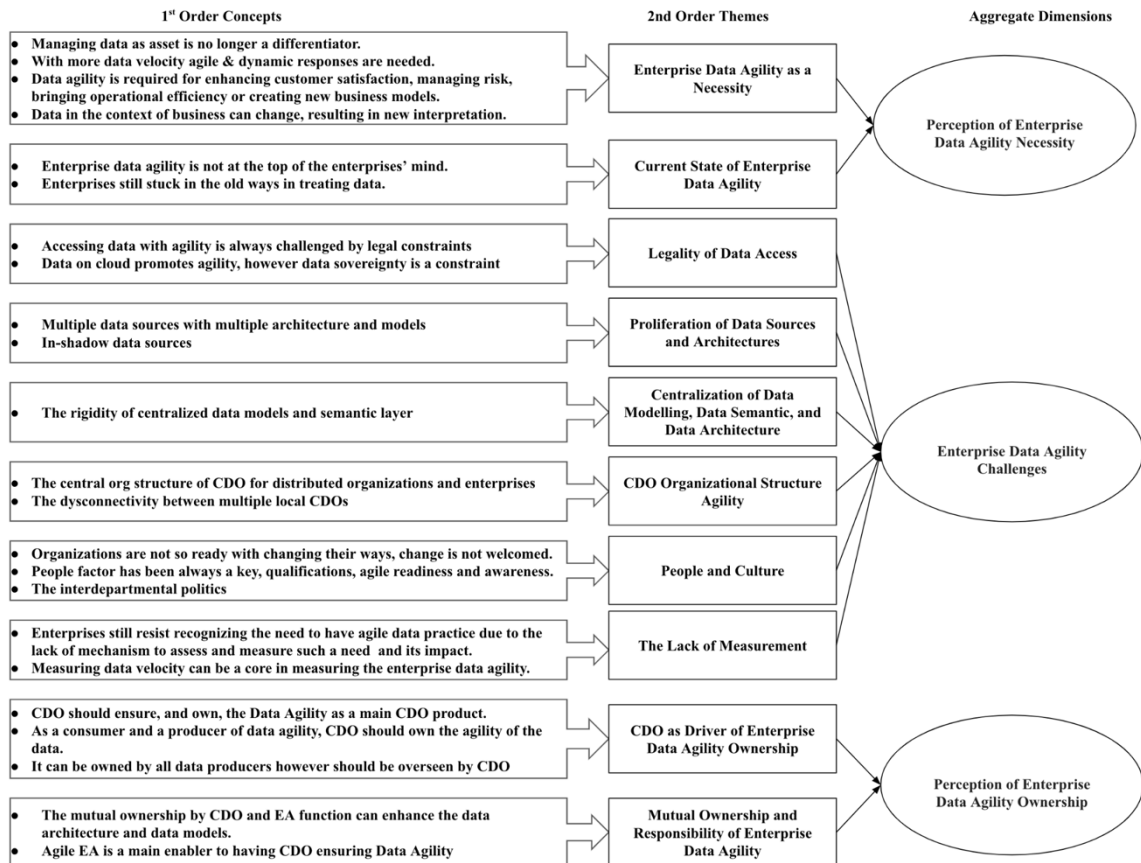


Figure 1. Causality of data, architecture and agility derived from the interviews

4. FINDINGS

4.1 Perception of Enterprise Data Agility

4.1.1 Enterprise Data Agility as a Necessity

The majority of the interviewed informants highlighted that enterprise data agility is a necessity. The necessity of enterprise data agility has been reasoned by multiple drivers and motivators. First, “*enterprise data agility plays a critical role in addressing the important role of data as an*

asset toward having businesses more able to reflect on business changes". Second, it was highlighted that *"enterprise data agility is necessary due to the dynamic business environment, which leads to more data velocity due to vibrant data sourcing and more data created and requested for analytics and insight products"*. Third, informants advised that *"enterprise data agility is required due to the current changing nature of the data that is evolving with a variety of data schemas and formats"*. Fourth, it has been underlined that *"anytime a new data source, data shape or form is recognized, agile & dynamic responses are needed"*. Third, during the interviews, some informants reported that *"enterprise data agility is required for enhancing customer satisfaction, managing risk, bringing operational efficiency or creating new business models"*. Fifth, informants reflected on the need to have the enterprise capable of coping with *"the agile meaning of data, mainly the same data, in the context of business keeps changing, and new challenges such as pandemic, divisiveness, geopolitics, healthcare challenges etc. are resulting in new interpretation of data in many cases"*.

In reviewing the interviews, ideas, suggestions, and desires have been evaluated as it was convenient answers rather than answers based on shortcomings in existing business designs. Here informants generally were well-argued on the positions. As such necessity is not just "nice", but a matter of sense-making on value-creation of data, management and architectural resources.

4.1.2 Enterprise Data Agility Challenges

Six common themes have been extracted from the discussions with the informants in regards to the enterprise data agility challenges.

- **Legality of Data Access:**

First, it has been identified by many informants that data access and legal constraints and obligations to facilitate the data access and movement is a main challenge that informants and their Chief Data Office teams face while trying to access data and improve the agility state of their data practices. Multiple cases have been given as examples during the interviews, e.g. cross territories access of data, cross entities access of data, and data privacy and laws related constraints.

- **Proliferation of Data Sources and Architectures:**

Second, the rapid, diversified, and ungoverned introduction and addition of data sources to the enterprise data architecture has been identified by most of the informants as a main challenge that ensuring enterprise data agility because of the lack of identification and awareness of these data sources the Chief Data Office data modeling and architecture practices face.

- **The Centrality of Data Modelling, Data Semantic, and Data Architecture:**

Third, it was reported by many informants that the state of having enterprise data models and data semantic layers owned and maintained by the Chief Data Office is among the main challenges that data consumers and citizens report always while expressing their struggle with being able to access the data in a more agile way. This has been illustrated with use cases where multiple business teams and data citizens groups with multiple business perspectives request to access data and they have to adapt their request to be compatible and aligned with the Chief Data Office driven enterprise data models and semantic layers; although the informants have recognized the criticality of these enterprise data architecture artifacts (i.e. data models and

semantic layers), however they raised the fact that these models are usually static, outdated, and not able to reflect the very fast moving need to have models and semantic layers able to cope with the business changes and the multiple perspectives, meanings, and contexts the enterprise data citizens might have.

- **CDO Organizational Structure Agility:**

Fourth, and one of the most widely reaching challenges that have been proposed, informants who work for Chief Data Office teams in geo-distributed enterprises highlighted the lack of agility in the organizational setup and implementation of the Chief Data Office organizational structure. This is one of the challenges that enterprises face while attempting to establish more agile state of the enterprise data. This challenge has been elaborated with details related to having a central Chief Data Office for multiple territories organizations with or without local CDOs, where central Chief Data Office acts as a single version of control over Chief Data Office products and services leading toward slow and unresponsive state of data.

- **People and Culture:**

Fifth, almost all informants raise the issue of people and enterprise's culture in accommodating and being ready for change. It has been agreed upon that the journey towards agile enterprise data is not an easy journey, and it requires people and enterprise culture shift to accept, adopt, enable, and promote the agile data state and its practices. However, similar to any agile transformation journey, this has the potential to be resisted by cultural resistance and inter-departmental politics and conflicts. Examples have been given mainly in relation to the multiple stakeholders involved in managing data, specially when it comes to stakeholders who have been traditionally involved in owning and managing enterprise data (e.g. Information Technology) and Chief Information Office team.

- **The Lack of Measurement:**

Interesting insights have been extracted from a few interviews where the issue of the lack of measuring enterprise data agility, and enterprise architecture agility in general has been raised. Related to the previous challenge, i.e. People and Culture, it was pinpointed that to shake a current state, where enterprise data agility is not appreciated as a necessity or recognized a critical enterprise need, chief data office team would struggle to deliver well measured argument about the need for more data agility without having measured impact on the current state and/or a well measured assessment of return on investment in the efforts required to transform into a more enterprise agile data state. Velocity of data has been nominated as a core element to build an index upon by categorizing the enterprise department use cases per data velocity and assigning a data velocity index value to each case and/or category, and then assigning data agility index in form of As-Is index value and To-Be index value to identify the prioritization and efforts needed to address, enhance, and achieve the data agility of each category and/or use case.

4.2 Enterprise Data Agility Ownership

Informants reflected on the enterprise agility and highlighted the ownership as a main area to focus on, and every informant identified the Chief Data Office organization as a main owner of the enterprise data agility, however with nominating one or more co-owner along with the Chief

Data Office. It has been emphasized that the Chief Data Office organization is expected to own, ensure, and consider data agility as a main Chief Data Office product. Informants suggested that collaborative ownership is expected as well, by proposing that enterprise data agility can be owned by many or/and all data producers however such ownership should be overseen and maintained by the Chief Data Office function within the enterprise. Enterprise architecture function/team has been identified by many informants as one of the potential co-owner of the enterprise data agility; the co-ownership between the two functions (i.e. Chief Data Office and enterprise architecture) has been proposed as a leverage to address more than one areas, first the lack of communication and collaboration between the two functions in regards to the overlapping areas, e.g. enterprise data modeling, enterprise data semantic layer, the effectiveness of data implementations between application layer and Chief Data Office products. Some informants also recognized that agile enterprise architecture can be an enabler toward having more efficient ownership of the enterprise data agility by the Chief Data Office team.

5. DISCUSSION AND PROPOSAL

The findings propose that enterprises should recognize the need to introduce, embed, and adopt Enterprise Data Agility to achieve the motivators suggested by the informants. The three research questions that we raised in the beginning of this research are:

1. What is the perception of Chief Data Office stakeholders about the Enterprise Data Agility.
2. What Chief Data Office stakeholders perceive as main challenges toward achieving Enterprise Data Agility.
3. How do Chief Data Office stakeholders see the mutual relationship with Enterprise Architecture toward achieving Enterprise Data Agility.

On RQ1, the research data collection, analysis, and findings led to the following results. All interviewed informants, who presented their professional services industry Chief Data Office team agreed on the necessity of having the enterprise data agility. Not as the phenomena of 'agile' but due to the increasing need to recognize data as an asset and in order to have enterprises more capable to reflect on the objectively more changing business environments. Informants however highlighted that their Chief Data Office teams face challenges and are not capable of providing and maintaining the needed level of agility of the enterprise data.

On RQ2, the informants raised many "challenges" (i.e. business risks and workloads) during the interviews, the four common themes of these challenges were about: 1) Legal constraints of accessing data, 2) Proliferation of data sources and architectures, 3) Centralization of data modeling, data Semantic, and data architecture, 4) Chief Data Office organizational structure agility, 5) People and Culture, and 6) The Lack of Measurement.

On RQ3, according to the interviewed informants, it has been established that Chief Data Office is the main owner of enterprise data agility in enterprises, and data agility should be considered as one of the main products and deliverables of the Chief Data Office practice. Informants also recommended and encouraged having co-ownership of the enterprise data agility, mainly between the Chief Data Office and Enterprise Architecture team. A secondary co-ownership model was suggested between the Chief Data Office and the data owners, consumers, and citizens.

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The answers are suggested to be considered as a model in Figure 2 for convergence and integratedness of EA, CDO and the enterprise landscape at large. Figure 2 is derived from the need for organizational collaboration as reflected in literature and Figure 1 summarising the informants.

Island		Collaborative		Integrated	Extended	Holistic
Top management level		Top management level		Top management level	Top management level	Top management level
EA		EA	CDO	EA / CDO	EA / CDO	EA / CDO
	CDO					
Operating Business Model		Operating Business Model		Operating Business Model	Operating Business Model	Operating Business Model
External environment		External environment		External environment	External environment	External environment

Figure 2. Suggested model for EA and CDO enterprise agility models

In the Island, enterprise responsibilities are distributed and well-defined. This definition creates a risk of a possessive ownership and lack of expedite communication. The collaborative thinking ensures EA and CDO interaction, but with no clear pathways for responsiveness. The integrated level sees EA and CDO as a tight-knit entity with mutual analysis and reactions well-defined. The extended level assures clarity throughout the organization and short pathways from acquired data to decision-making and actionability. The holistic level is open to the surrounding stakeholders and business environments. An analogue to this could be early days of the COVID pandemic.

A further discussion is that EA and CDO are not alone as enterprise governance entities. Numerous corporate functions have been emerging. From financial management, controls, to sustainability, corporate social responsibility, corporate affairs, human resources, legal affairs and many more. The idea of thinking from islands to integrated, extended or holistic is well applicable. Also to underline the data driven nature of any of these entities and the importance of informed responsiveness under the umbrella of enterprise agility thus leading to enterprise data agility. Hereby also drawing on the dynamic capabilities thinking suggested by van de Wetering (2021).

The model can be quantified and made systems oriented with organizational insights. Quantification can be enabled in a simple one to 5 Likert scale as shown in Table 2. E.g. could data responsiveness be measured as time from change (frequency, value, action). Changes in market behavior could also be measured in how these are turned in to reactions in product portfolios, buying, segmentation. The measurements of Table 2 are held in generic terms, but more detailed measurement would serve better.

Table 2. Measurements parameters for Figure 2

Top driver	Detailed driver	EA – CDO measurement principles from figure 2. Examples and proposals for organizational adaptation	
		Score 1	Score 5
Strategy	Awareness	Top management little aware of potentials in EA – CDO	Top management well aware and actively using
	Willingness	Enterprise little willing to integrate	Enterprise willing to think holistic
	Appreciation	Operatives are not rewarded	Operatives are rewarded
	Resource allocation	Not earmarked resources	Specific funding or resources available
Shared systems	Value definition/creation	Value not specifically measured	Value creation is strategically embedded
	Collaborative tools	Absence or no-use	Presence and use
	Data definition repositories		
	Architectural platforms		
Monitoring platforms			
Intra-organisational	Belonging	EA and CDO related to own objectives	EA and CDO belong to same overall goal
	Relationship	Functions feel not related	Functions feel in relationship and use this
	Openness, collaborativeness	Function objectives comes first	Engagement and sharing are a key objective
	Value and contribution	Measurement not explicitly enabled	Measurement and open reporting, e.g. ESG
Work practices	Social rewarding	Operatives have individual objectives	Operatives have sharing objectives and mutual rewarding
	Tactical buy-in, stakeholder engagement	Isolated knowledge and insights	Deep engagement with other supporting business entities
	Terminologies and definitions	Office based communication	Enterprise-wide communication
	Outreach and guidance	Office caring on specific responsibilities	Office aimed at the extended organization for sharing and learning
	Measurement	Office measured for own accomplishments	Office measured for enterprise benefits

This study has been conducted in professional services industries. The viewpoint of respondents covers global operations and business process services to clients across most industries. This provides a perspective of common drivers and obstacles across most business. Furthermore, it provides an aspect of methodological triangulation. Information technology organizations are often regarded a homogeneous viewed from outside, this article contributes to matters of multiple strands of governance that often contradict and establishes IT governance more heterogeneous. This article suggests through the model in Figure 2 to strengthen and explicit “co-ownership” across data resources and to measure status and opportunity by the model outlined in Table 2.

6. DELIMITATION

The qualitative nature of this research has its natural limitations in terms of generalizability and verifiability. However, the motive of this research is not to establish a broad quantitative basis with associated data uncertainties. The purpose is to reach out to practitioners to get elements for discussions in how Enterprise Data Agility is organized – and not organized. The focus on professional services industries is also adding limitations, also here is this industry regarded as a strong influencer on enterprise best practices in larger global enterprises. This study is made on CDO with informants from the CDO domain but contrasted on the EA domain. This is a deliberate research design as the viewpoint overarching this study is the EA and the research for explanatory frameworks for EA patterns in the field of data and data agility. The stated limitations can be addressed in further studies by extending the research community and population by including more industries in the data gathering scope and practitioners from more domains insights.

7. CONCLUSION

Enterprises recognize agile methodologies as evolutionary methods in the field of technology development and management specifically and in the fields of business administration and management in general (Kaddoumi and Watfa, 2016; Kaddoumi et al., 2018). Agile principles are expected to positively impact other areas than software development; e.g. production management, marketing, HR, strategy execution, etc. This expansion of agile practices, frameworks, and methodologies from the technology domain of an enterprise to the business and operation domains raises the challenge of having better enterprise agility mainly when it comes to the data of the enterprise as a foundational platform between technology and business. The empirical works, analysis and model proposal of this article set a contour of Enterprise Data Agility suggested realized according to the proposed model for developing the organizing and collaboration around Enterprise Architecture and data responsibilities. Here core enterprise systems – in some ways represented by the enterprise architecture management – establishes a less agile state of data in the enterprise. This article highlights the overlapping area between the Chief Data Officer team and the Enterprise Architecture Management teams in term of “owning” the agile state of enterprise data. Models are proposed for convergence of the strategic and organizational structures around the collaborative nature of data. Co-ownership and sharing is central and an increasing intra- and inter-organisational thinking is required. Structuration is balancing the organizational entities of competency and routine with the need for interaction and broader explanation (Jones and Karsten, 2008). The research confirmed that the enterprise data agility faces a set of challenges that the Chief Data Office should be aware of toward owning, delivering, and maintaining the agile state of the enterprise data.

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