Enterprise Architecture beyond the Enterprise
Extended Enterprise Architecture Revisited

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Abstract: As the most enterprises are relying on relations to other enterprises, it is relevant to consider enterprise architecture for inter-organisational relations particularly those relations involving technology. This has been conceptualised as Extended Enterprise Architecture, and a systematic review of this discipline is the topic of this paper. This paper is taking a point of departure in general theories of business-to-business relationships along with inter-organisational information systems, interoperability and business ecosystems. The general theories are applied to the Extended Enterprise Architecture to emphasize paradoxes, problems and potentials in extending EA across organisational boundaries. The purpose of this paper is to review the concept of Extended Enterprise Architecture (EEA) theoretically and empirically to identify viability of Enterprise Architecture (EA) initiatives spanning across organisational boundaries. A case is presented of an enterprise engaging in technology-based business process integration that in turn is explicated as enterprise architecture initiatives with both more and less powerful partners. This paper underlines the necessity to be able to have EA spanning initiatives across multiple enterprises, but a range of problems is illuminated related to (lack of) precision, imbalance, heterogeneity, transformation, temporality, and (operational) maturity. The concept of EEA is seemingly vague, however this paper calls for a strengthen emphasis on redefining general architectural frameworks to embrace EEA in order to handle typical and modern forms of organisational designs relying on virtual and cross-company as cornerstones.

1 INTRODUCTION

Most enterprises are increasingly dependent on integration with its suppliers, customers, partners, authorities, prospects, the public, and other external stakeholders (Håkansson and Snehota, 2006). Integration is driven by needs for efficiency, digitization of business processes, prompt information retrieval, and competitive advantages of insight into partners (Lapalme et al., 2015; Goethals et al., 2004; Turnbull et al., 1996). Several dependencies are introduced through necessity or are simply mandated: The enterprise must be connected to the supply chain network, the bank, the tax services, other controlling bodies, environmental control organisations, etc. Dependence and integration is, however, not to be confused with necessarily shared objectives and joint strategies (Engelsman et al., 2011). Dependence and integration is more a strategic choice of the individual organization to posit itself in inter-

organisational fabrics with aims to satisfice its intrinsic organisational success factors. Inter-organisational interaction is in this perspective both representing the necessary evil and the necessary good. Given that most organisations are highly relying upon other organisations (Bengtsson and Kock, 1999), it is relevant to question, if enterprise architecture (EA) is sufficient frame of reference at organisational level, or if enterprise architecture beneficially can be extended to include a broader organisational environment (Bernard, 2012).

The discipline of extended enterprise architecture (EEA) is related to the broadening of strategic motives and technologies from the level of the enterprise to the enterprise in its broader, although defined, context (Daclin et al., 2014). Several contributions are discussing extending EA across traditional corporate boundaries, such as mobile computing, cloud computing, distributed computing, and open enterprises (Lapalme et al., 2015; Norta et al., 2014; Lee, 2013); such initiatives are still to be regarded as controlled by the

individual enterprise and the EA of the enterprise. Following in this paper, EEA is not considered as "the greater spatiality" of the enterprise, but as the enterprise architectures specifically aimed at documentation and governance of collaboration and change across at least two enterprises.

EEA is first mentioned in the scientific literature by Winans (Winans, 1998). The most cited contributions on EEA are by Schekkerman (Schekkerman, 2004; Schekkerman, 2005) and adhere to his suggestions for an Extended Enterprise Architecture Framework (E2AF) and the Extended Enterprise Architecture Maturity Model (E2AMM). Schekkerman is not particularly clear in the definition of the extended aspect of the enterprise, however, the E2AF model (4 x 6 matrix) includes a column on "who" related to EA initiatives. "Who" states among others definition of collaborative partners, value generating "nets", information exchange and responsibilities in relation to information, interoperability, and interconnection between enterprises. With Schekkerman it is not even fully clear, if it is addressing external relations or merely extends motivations and dimensions on existing EA frameworks. However, contributors as (Schuck, 2010; Drews and Schirmer, 2014; Elmir et al., 2015; Goethals et al., 2004) are all explicit on EA with inter-organisational aspects involving a committed relationship between enterprises.

Boardman and Clegg (2001) are in this sense different as EEA is used literally as the (business) architecture of the extended enterprise, and do not related to EA theory but rather are influenced by supply chain management. This leads also to some analytical weaknesses on EEA: By exercising a qualitative approach, there is a risk that enterprise architecture, the extended enterprise as well as EEA becomes colloquialisms with lack of formal definitions and systematic rigor. A separate objective of this paper is to introduce more stringent definitions.

A risk in discussing EEA is that such a relatively narrow concept tends to become self-referential. Many contributors are referring to Schekkerman. Davis et al. (2013) refers to Schuck (2010), Bernard (2012). Elmir et al. (2015) refers to Chalmeta and Grangel (2003), Choi et al. (2008).

This paper reviews the literature of EEA and relates this to selected theories on inter-organisational relations and technologies. The further purpose of this is to identify the current state within the EA literature and theory on how to address EA initiatives are transcending organisational boundaries. This entails a critical discussion of the definition of the extended enterprise and the feasibility of defining extra- and inter-organisational EA initiatives.

The methodology of this chapter is qualitative, case-based, sociologically inspired, and with elements of interpretivism (Walsham, 1995; Chen & Hirschheim, 2004). With regard to the elements of formal methods in EA, the methodology is post-positivistic and systems-oriented, although conversion between organisational processes and their systems representation entails disciplines such as hermeneutics, structuration, and tacit knowledge elicitation. This is done in the tradition of information systems research as stipulated by Goldkuhl (2012). The literature review of EEA is done in major search databases (Google Scholar, IEEE, ScienceDirect, SpringerLink, ACM, Wiley, Taylor and Francis) with EEA as the exact search phrase. From 1998 to 2016 a total 354 references are found. As stated above, some references are however more colloquial in the use of EEA. Several further references were either lacking precision on EEA, or were narrowly aimed at using systems theory as a theoretical frame of analysis.

2 BACKGROUND

Enterprise Architecture (EA) represents the discipline of managing and developing the business strategy alongside and narrowly together with the technology of the enterprise (Bernard, 2012). Traditionally EA has been aimed at well-defined business functions or business units. Bernard (2012) suggests in the EA3 cube framework to design EA from a perspective of adjacent and strongly interrelated line-of-businesses (LOBs). With business strategy as a fulcrum of the EA, the enterprise has to be regarded as an organisational entity with the authority, motivation and capability to define business strategy. A business conglomerate is most likely to have EA at its LOB level. A trans-national car manufacturer is most likely to have EA at its top-most corporate level. In crossing organisational or inter-firm boundaries create added requirements for EA.

2.1 Defining the Extended Enterprise

The extended enterprise is a scholarly term for the network of partners and parties surrounding an enterprise and with a focus of collaboration or interaction based on any form of desire, motivation, need, mutual advantage, or regulatory requirements (Buhman et al., 2005). Although an academic term,

the extended enterprise is characterised by a lose coupling of entities i.e. a relatively vague definition not clear on leadership or delineation although Boardman and Clegg (2001) suggest a stronger definition and a clearer view of the structures described by extended enterprises. The concept of the extended enterprise is highly related to management studies within information systems and manufacturing and is generally seen quite unrelated other commonplace theories of organisational interrelatedness. In the following three other perspectives are presented: Supply chain management (SCM), industrial marketing and purchasing (IMP) and inter-organisational information systems (IOIS).

2.2 Business Interaction from Supply Chain Management

In SCM, any organisational activity is seen as a consecutive order of activities aimed at transforming any kind of raw material into finished and processed goods that can be floated into a market (Halldorsson et al., 2007). SCM is combining transportation, stocking and manufacturing. To any activity within a supply chain, a flow of information is expected, and appropriate systems should generally be in place to ensure optimal management of information (Gunasekaran and Ngai, 2004). Differing perspectives of stakeholders in supply chains are well recognised with such perspectives ranging from trust to opportunism to power. The principal agent theory (PAT) would emphasize asymmetries in business relations (Halldorsson et al., 2007). The transaction cost analysis (TCA) is related to observe any interfirm relation as cost related with connection motives of cost reduction (Halldorsson et al., 2007). The resource based view (RBV) paradigm is calling for a necessary heterogeneity in relations to sustain viability (Wynstra et al., 2015).

2.3 Business Relationship Management

Network theory (NT) is a lead explanatory theoretical framework of inter-business interaction, particularly the IMP school (Håkonsson and Snehota, 2006) that stresses interfirm relations as ubiquitous and the foundation of innovation and wealth. The action is the fundamental event, business independence is regarded as a myth as all business depends on relations, and knowledge within the single business is incomplete, only within relations knowledge can be actionable. Often business relations are seen as triads of buyers-suppliers-costumers (e.g. farmer-diary-retailer)

(Wynstra et al., 2015) that underlines little difference between physical products and delivery of services. A network in the IMP sense is not neutral to the stakeholders: In any network, there is a centrality defined by necessity, size, elements of power, and communication (Wynstra et al., 2015). Depth of integration between partners in business relations is given by collaboration, involvement, dependency, behaviour, level of interaction, and the relatedness between either parties to third and fourth parties (Håkonsson and Snehota, 2006; Turnbull et al., 1996).

Despite relationships as positive, relations are not in any sense stable. Relations are cyclic and do change although some last for decades. Gadde and Mattson (1987) describe these processes as recognised by patterns of entry and exit and describe that even, if technological necessities bind relations these can in practice be substituted. Episodes are critical in establishing, maintaining and closing of relations more universally rational processes (Turnbull et al., 1996; Buhman et al., 2005; Wynstra et al., 2015). The dynamics of business relationships will constantly necessitate changes of the technologies supporting the relationship.

2.4 Inter-Organisational Information Systems (IOIS)

IOIS are systems that enable inter-organisational exchange of data, integration of business processes, shared utilisation of infrastructure and resources. Brandt (2014) is outlining the research agenda on IOIS recognised by (1) decision making on when to enter IOIS, (2) measurement of impact and outcome, (3) a representation of buyer-supplier relations, (4) technology adoption studies. Chang et al. (2010) states IOIS as derived from exercised power (from either parties), executive support, and perceived complexity; moreover IOIS performance and long-term business relationships are demonstrated as tightly related. Other contributors add to the issue of investments in IOIS and the necessity that all involved parties bear their own costs (reciprocity). Others suggest IOIS for supply chain flexibility and information visibility, and states on asymmetry that "The results support our main contention that introducing an IOS system is an uneven process as the buyer gains more than the seller."

IOIS generally observes business relations dyadic or triadic, although engagement of business communities is recognised as a possibility (Brandt, 2014; Chang et al., 2010; Håkonsson and Snehota, 2006).

Key characteristics of IOIS are furthermore stated as relationship construction, commercial interdependence, business monitoring, collaborative platforms, knowledge sharing platforms, and management of opportunism. Often studies of IOIS do involve TCA and RBV in recognition and controlling of asymmetry in the relations.

Above all do IOIS studies describe technologies transcending organisational boundaries. IOIS raises issues of necessary business eco-systems, business complementarity, and technology-based business relationship management. Related to governance and strategic adherence of IOIS, EEA is logically motivated and most likely critical in the relevant IOIS contexts.

2.5 Extended Enterprise Architecture

The earliest contribution on EEA is related to technologies suitable for representing business architectures and inter-business services and is predominantly technological in its orientation (Winans, 1998). The E2AF of Schekkerman is defined as an extension of IEEE 1471-2000 (now ISO 42010). Its definition of the extended enterprise is cautious, and narrowly related to the lead organisation and not "random" networks of organisational entities. This is expressed at the frontpage of (Schekkerman, 2004) as the enterprise surrounded by customers, prospects, partners, investors, logistics, business relationships etc. The E2AF is clear on requiring strategy and scope; the lead organisation perspective is clear as strategy in this context only can be valid for one organisation, what is required by other organisations is sharing, complementarity, and agreed benefits.

Another strong contributor to the EEA field is (Goethals et al., 2004) Goethals with a least 5 publications. The main technology connecting enterprises is integration technologies. In Goethals et al. (2004), it is very precisely described, how the interaction between business requirements and ICT traverse the strategic-tactical-operational hierarchy in the individual organisation, where after it seeks integration with its congruence in the extended enterprise. The extended enterprise is regarded as an enterprise as it, despite its virtual character, does have a strategically founded objective.

Going further in the literature reviewing process, a number of analytical considerations on EEA have been picked up (Lapalme et al., 2015; Goethals et al., 2004; Schuck, 2010; Chalmeta and Grangel, 2003; Chipriano et al., 2014):

- EEA as a foundation for innovation although separating inhouse and community efforts

- Methods and maturity assessment of partner networks for interoperability
- EA maturity models vs enterprise systems; generic governance framework
- Capturing decision making and stakeholder perspectives in EA modelling frameworks
- Comprehensive architectural framework for Virtual Enterprise Chain Collaboration
- Inclusion of external system components in pseudo-formal EA language
- Specific focus on resilience as part of EA in the EEA context. EEA resilience concluded as a function of vulnerability; flexibility; adaptability; agility
- Inter-organisational value creation, conflict resolution, governance
- Socio-cultural, functional, structural, infological and contextual alignment using EA
- Mapping of organisational antecedents of the EEA
- Establish important definitions EA envisioning, planning, enforcing, documentation and communication.

In general, theory is not strong when it comes to address the issue of inter-organisational collaboration. Most contributions view EEA from the lead-organisations perspective, however several contributions review EEA much more as a loosely coupled network or ecosystem. The extended enterprise is an augmentation to the host EA. Therefore are joint strategic objectives in risk of being lost. Some publications are contributing significantly to the EEA construct by being precise on the multi-enterprise engagement (Drews and Schirmer, 2014; Elmir et al., 2015).

For theorising the subsequent study, it is interesting to consider EA frameworks and the realised fragments of EEA in the perspective of the SCM, Network Theory, and IOIS theories presented, thus, being theoretically explicit in business motivation, decision making, life cycle, and governance.

3 CASE STUDY

The focal company of this study is named "Company B" for purposes of anonymity. Company B is a trading company mostly based in Northern Europe buying and selling fashion products. Products are bought from some hundred suppliers and sold in 3000 stores and additionally through several larger retailing and e-business organisations. Commercial activities are executed in more than 50

countries. For years, B offered e-mailed printouts and e-mailed "flat files" for information exchange with its business partners. Some closer business partners had computers at their facilities with a shared disk drive with company B, where data files for the specific customer would be stored for potential automatic loading.

Over the years, Company B faced increasing pressure for streamlining its interorganisational interfaces to customers and business partners. In an initiative to deal with the expected challenges, an organisational unit were created to purely focus on integration services. The unit had both to ensure proper technologies in place, but also to align integration services with corresponding business processes. A document provisioning system was made, where sales representatives or customers themselves could create subscription profiles on documents like pricing catalogues, delivery forecasts, dispatch advice, and invoices. With selected partners, an extensive information flow was implemented reflecting the guidelines of e.g. EDIFACT and UBL XML. The integration initiative was not initially defined as architectural nor an EA initiative. However, the effort did receive strategic attention from its inception, and along its implementation it has gained most characteristics of being a part of the company's general EA. As it relates to a professional discipline of systems and data integration, the most business decision makers are not clearly aware of its existence, and only at a professional and dedicated level, there is strategic insight in this matter. Typical responses from customers have been: "We need to integrate our businesses, but please ask our technology people, as we don't know what we need." Likewise could technology representatives state: "We know our business is dependent on this, but please tell us what to do, and we will do it." Company B's integration initiative is paradoxical as it is regarded by business decision makers as a technical effort, whereas the technical staff is grasping for strategic support and adequacy of business processes both inside and outside the company.

Of furt her strategic issues within company B's inter-firm integration have the following been raised:

- Company B is collaborating closely with online stores that continuously need to retrieve data on existing and coming goods, pricing catalogues and product data. At some point in history, company B did split data between its supply chain and its online activities. There is a vision of to become an important data provider of high quality product data to online

customers. Here data needs to be collected from relevant sources and aligned with the business processes of the (large) online retailers. There is an architectural vision of creating a leading European platform of data exchange between the parties.

- Large department store companies have for years not been fully satisfied with the data quality from company B. The customers want to have quite complex and dynamic delivery patterns to easily redistribute goods between store and online channels, but company B can't fully support delivery patterns, where goods are rerouted. There is an architectural vision of enabling better and closer collaboration with department stores in ensuring optimal utilisation of logistical resources and commercial opportunities.

- Company B implemented a private bonded warehouse to avoid paying customs for goods before actually circulated into the European market. The tax authorities had created an open interface for the support of the information tracking on the goods. This interface was however expected to be used for public bonded warehouses and for customs software providers. Company B was therefore the only company to implement (and test) the open interface. The architectural vision of the tax authority was to digitize business processes. The reality was more to act as an IT support office. The architectural vision of company B was to ensure that no goods had levied customs upon on them unless they were specifically shipped to EU destinations.

- Company B has from time to time been requested to support consignment sales with various resellers or countries having this style of trade as praxis. Consignment sales (buyer pays first when products are sold from his premises) require a detailed setup of electronic integration processes as stock and product turnover needs close monitoring, prompt replenishment, and timely invoicing.

Company B is now having a complex and multi-faceted toolbox for information exchange along its supply chain and service partners. The architecture is supporting a range of business process integration patterns. With suppliers, the company is considering itself as having relational power even, if supplier opportunism is observed from time to time. With customers, the company is generally subjected to the power of large customers, whereas smaller customers are content with having the company to

organise and manage information exchange and integration.

4 DISCUSSION

EEA assumes establishment of shared objectives among the involved participants in form of formal B2B relations or informal relationships such as business ecosystems (Schekkerman, 2004). ISO42010 states the 'Architectural Rationales' justifies 'Architectural Decisions' that can be changed by 'Concerns' raised by 'Stakeholders' this is also reflected in TOGAF. In the case above, shared objectives were derived from shared business data and sales effort in the first two instances, and from regulatory requirements in the last instance.

From the literature review, terms are somewhat broadly defined and the verbalisation of EEA is soft, broad and quite inclusive. From the business relationship literature, from the studies of IOIS, and from the case, it is indicated that EEA has a range of complexities that is not sufficiently illuminated in the existing literature. In focusing on EEA it is problematic not to consider the architecture of the departing stakeholder-organisations of the organisational and technological differences of these. EEA is definitely also exposed to commercial factors, macro-economic conditions, regulatory delimitations, commercial foundations of the stakeholder relationship, and idiosyncrasies of individuals. As such there is an intrinsic dynamic and volatility of EEA. In the case this is illustrated with relationships lasting from 20 years to relationships not even going into operations due to commercial issues or lack of maturity in the execution of architectural transformation. In the following, a series of key notions are further discussed in the light of EEA as both cross-organisational and cross-architectural. The notions are: (Lack of) Precision, imbalance, heterogeneity, transformation, temporality, and maturity, and are to be discussed below. These notions are together proposed as an analytical framework aimed at assessing EEA as an early screening of the inter-organisational bindings in order to ensure benefits of an EEA-mindset rather than parallel EA not having explicit shared objectives.

4.1 Critical Case Study Discussion

In discussing EEA, there are several fundamental issues that must be raised. There is good evidence that well-planned technological support of business relationships is beneficial. Many industries are now strongly dependent on information services integrated with business partners. But can we resolve that strong dependency can be supported by a joint EA? And is EEA actually more than two parallel EA's? Can two companies share a joint strategic objective? From the principal actor theory, it is relevant to consider, if there should be an identified lead-organisation in the EEA, and henceforth if EEA is more a reflection of a power-relation than it is a "neutral" inter-business technology. Likewise from the network theory, should there be a centrality in the network most likely related to one lead-organisation. It can thus be questioned, if EEA is only to be seen from the lead-organisation perspective, or if there can be EEA with equal partners? The most literature seems to define EEA from the lead-organisations perspective.

Relevance of EEA must be present. Central actors in networks and principal actors can pursue initiatives, but due assessment and viability of such depends on identified business motivations (Sunkle et al., 2014). Chapin et al. (Sunkle et al., 2014) defines such motivations as consisting of well-defined "Ends and Means of business plans" including policies, rules, goals and objectives. (Sunkle et al., 2014) use the term "influencer" similar to the lead-organisation.

Establishing information flows and business process integration in Company B have from early on been following the multi-theoretical patterns of PAT, TCA, RBV and NT.

Several internal EA activities have over time been conducted to improve quality of data, technical solutions and the business integration. A key issue is if Company B is considering EEA in its technology governance, of if the integration with external parties is more "EA with interface designs". Given the large number of integration points and electronic business documents, some interaction with external parties do have the character of being commoditised and regarded as everyday business services not implying strategy. However, EEA must be assessed from a common understanding among the parties of sharing strategic objectives and EA artefacts at a certain level.

4.2 Precision

EEA, ISO42010 and Schekkerman are quite embracing and inclusive towards stakeholders. As illuminated from the case, EEA projects must have precisely defined stakeholders as a lot of responsibilities lie with stakeholders, in particular, strategy formulation, definition of mutual

relationships and obligations, architectural design, and operational implementation. Definition of stakeholders should beneficially distinguish between organisational stakeholders, e.g. suppliers and customers, and stakeholders of competences that can provide commercial or technological insight internal or external to stakeholder organisations. The case illuminated imprecision as a key factor in delaying implementation of EEA.

Precision is also tightly connected to the constraints imposed by existing enterprise architectures of the involved stakeholders and the willingness and affordances of acceptance of changes. Likewise consequences of EEA for existing or remaining EA in the stakeholders' organisation must be precisely defined, also meaning that each stakeholder is likely to have a non-EEA that potentially can affect the EAA by lack or precision, unawareness of impact, and defined cross-architectural organisational boundaries as presented in figure 1.
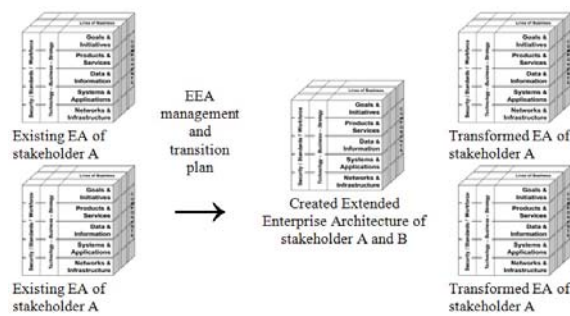

Figure 1: Creation of an EEA and associated EA's.

4.3 Imbalance

As demonstrated in the business literature, relationships as well as ecosystems and virtual organisations are dynamic, fluctuant with elements of opportunism, but also exhibiting mutual dependency. When more than one organisation with one enterprise architecture are involved in changes, the organisational complexity increases, which in turn can lead to conflict, abandonment, loss of stakeholder relevance and disputes in technological and commercial matters. Clearly, there is a balance of power between stakeholders on both the commercial and technological dimensions. In the case, customers would normally have more power than suppliers, but as the focal company had more experience on technology, it was often asked to lead design processes.

A solid persistence of relationships is implied in EEA. Important business relationship are generally expected to last for decades (Håkonsson

and Snehota, 2006; Wynstra et al., 2015). Harrison (2004) discusses dissolution of business relationships and highlights a range of causes to this. Pankowska (2013) is likewise pointing to the need for designing corporate and inter-corporate information systems from perspectives of longevity and business sustainability; a mature EA praxis is seen as a key prerequisite for this. In clarifying EEA frameworks, a higher level of specificity must be introduced, when it comes to the involvement and interrelatedness between the enterprises this should also include management of potential and underlying opportunism.

4.4 Heterogeneity

EEA must assume differences at all organisational and technological levels of the involved stakeholders. The activity of creation of an EEA is under all circumstances based on stakeholder differences, typically with stakeholders being positioned along a supply chain or value chain. Heterogeneity can be surpassed by adopting standards, although this might also be incommensurable in complex legacy environments. The ARDIN framework is suggesting the creation of a reference architecture that either requires reengineering of host-architectures or creates a shared technological infrastructure.

In the case, heterogeneity could range from misconceptions at data level and up to deviating understandings of complex supply chains. At the architectural level, EEA could beneficially augment traditional architectures with means of adaptation between stakeholders. Daclin et al. (2014) suggest a method for enterprise interoperability aimed at both semantical, syntactical and conceptual layers of cross-organisational integration, although not addressing issues of the remaining architecture within the focal stakeholders.

4.5 Transformation

Multi-stakeholder EA initiatives are restricted by differences between existing and future architectures at single-stakeholder level. Efforts in alignment, sharing and integration are thus likely to require added architectural components of transformation between artefacts to fit stakeholder architectures. Transformation can relate to data, definitions of systems, networks and similar concrete components, but also tact within each stakeholder which in turn leads to a requirement for orchestration between stakeholders.

4.6 Temporality

Several matters of EEA relate to time (Lee, 2013): The extent of the EEA as a transforming activity, the overall lifecycle of the EEA including termination, and the actual timing and synchronisation of the focal business and technology.

Considering EA to consist of as-is documentation and to-be transformation, life-cycle management of EEA is particular critical as EEA is strategically rooted in a business relationship with a power balance and probably commercial outcome. Moreover, indicated in the case study, EEA initiatives must reach a stable level faster and remain stable in phases of operations for longer, as changes are much more complex and typically also impact non-EEA architectures of the involved stakeholders. Major events need to be accounted for in the EEA, typically stakeholder take-overs, mergers and termination of the focal business area as well as the business itself.

As focal business processes underlying the strategic objectives of an EEA are associated with different organisational and technological contexts of the involved stakeholders, EEA is thus challenged by differences in validity of data, information, systems and processes as a function of time.

4.7 Maturity

In assessing viability, professionalization and operability of EEA, both EA maturity models could be considered, such as ACMM, Gartner, CMM, but also E2AMM (Schekkerman, 2005). The case however suggests a phase of normalisation after the managed and optimised stages, where interorganisational relationships are commoditised at the technological level, but are as prone to commercial considerations as any other business context. Various models suggest 'optimized', 'ubiquitous' or 'holistic' as the highest level of maturity. It is worthwhile addressing EEA from perspectives of continuous operations with critical issues related to

- loss of organisational memory of design,
- life-cycle/age
- technological obsolescence,
- insufficient inclusion of new architectural initiatives within the stakeholders organisation unrelated to the EEA
- lack of clarity and division of responsibilities at the operational level

Table 1: Factor – influence schematics.

	Influences				
	Funda-mental ratio-nale	Establi-shing com-mon grounds	Reali-sation of the EEA	EEA in opera-tions, Metrics	Long term impr-ove-ment
Precision	X	X			
Imbalance	X				X
Hetero-geneity		X	X		
Trans-formation			X	X	
Tempo-rality				X	X
Maturity					X
	EEA life cycle				

4.8 EEA as a Research Construct

EEA is a construct reflected in the scientific and (to a lesser degree) in the practitioners literature. Within its bridging between commercial issues, organisational matters and technology, EEA interacts with the core of business design and business opportunity creation. Table 1 pinpoints the relationships and influence at a construct level between the six factors of business transformation and the five dimensions of EEA. EEA is recognised by:

- A steady publishing volume since 2006 from an exact search keyword perspective.
- No systematic publishing outlet leading to a large spread in used outlets, and a following adherence to terminology in the chosen but non-systematic outlets.
- A relative low number of citations of each academic contribution. Schekkerman (2004a) is leading with 482 citations, the very most other publications have less than 20 citations.
- A drift ("buzz") in focal terms leading to that "extended enterprise" was seminally defined in the 1990ies, whereas the general business literature has over the last 10 years rather used the term "business eco-system", which is not less vague.
- A number of publications, where EEA is used out of EA contexts, partially as a colloquialism, or referencing one of the top-5 publications, mostly of Schekkerman.

The vagueness of several of the key terms in EEA represents an academic problem. Likewise is the terminological shift or focal drift problematic, especially as illustrated in (Elmir et al., 2015) with EEA being contested by terms and frameworks like

"Collaboration Framework for Cross-enterprise Business Process Management", "ARDIN Extension for Virtual Enterprise Integration", "Virtual Enterprise Chain Collaboration Framework", "Architecture for Collaborative Network of Reference".

4.9 Rephrasing EEA

Referring to the fundamental necessary of inter-organisational collaboration, the practical and academic need for EEA is justified from perspectives of SCM and IOIS, the literature review also demonstrate a range of contributions (partially) supporting the EEA construct. When looking into precision of terms and definitions, demonstrated practical applicability, the terminological drift, and the lack of defined academic environments, then EEA is weak as both academic and practical construct. A stronger and more precise research agenda is proposed including fundamentals of inter-organisational technological relations, and studies of governance of initiatives across and inside the engaged organisations.

5 CONCLUSIONS

Thinking in terms of EEA, the concept is not obvious from general learnings of EA. EA generally relates to internal corporate artefacts and is unique to the enterprise. However, as many business processes have dependencies to the Extended Enterprise, it makes sense, when enterprises can identify common strategic objectives. However, EEA is not without problems.

EEA as a current state mapping must uncover depth, motivation, capabilities and details of the parties involved. Competitive matters in certain parts of the extended enterprise can encounter legal and social barriers where information must be shared with outright competitors, or less than full insight in partnering enterprises is given. EEA as a future state lacks many of the traditional governance measures related to single-enterprise projects.

EEA could benefit from further research. More empirical cases and practitioners perspectives is needed, also more precise analysis of participating enterprising with respect to insight, competencies, power, and capabilities.

Given the unevenness of the found literature, and given the large spread in methodological approaches in the found literature, EEA can't be concluded to be a well-defined concept for

implementation. The literature is however providing a large range of options and proposals for construction EEA initiatives. The six notions of this paper (precision, imbalance, heterogeneity, transformation, temporality, and maturity) are proposed to form an analytical apparatus for soundness of EEA and thus promoting solving inter-organisational architectural challenges using EEA as a research and practitioners approach.

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