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Factors that influence the dominance of an enterprise reference architecture: A comparative case study

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Abstract: Reference architectures provide template solutions for particular domains and can therefore be considered as standards. This study investigates whether diversity in enterprise reference architectures is likely to continue or if one reference architecture will gain dominance in the market. More specifically, we examine factors that lead to market dominance. We use the literature on standards battles, the Technology Acceptance Model (TAM), and the Technology-Organization-Environment (TOE) framework to analyse factors for dominance. In this field, network effects apply and provide a force towards the dominance of a single architecture. However, factors contributing to multiple standards are more relevant, as well as those from TAM and TOE, since reference architectures differ slightly in their added value for various categories of stakeholders.

Empirical data from 19 expert interviews provide further insights into the factors that influence the dominance of an enterprise reference architecture. Our results show that it is important that the content and value of reference architectures are straightforward and understandable, not only for architects but for all stakeholders. We extend current standards battles literature by applying it to a new area and combining it with TAM and TOE. We provide an innovative and extensive list of factors that influence the dominance of one standard and the continued coexistence of multiple standards and relate them to phases of technology development. This list can form a framework for future standards battle research.

From the practical perspective, the annex may help parties involved in standard battles to position themselves in the technology development phase, better predict the outcome of the battle, and enhance the possibility to influence that outcome. More specifically, our paper will help adopters of enterprise reference architectures to make better-informed choices. Suppliers of reference architectures can use the findings to stimulate market adoption of their model.

Keywords: reference architectures, standards, dominance

1. Introduction

This study investigates whether the factors previously identified in the literature on standards battles can be applied in enterprise reference architectures (ERAs). The past two decades have seen breakthrough transformations in information and communication technologies (Cubillos González, 2011). The massive use of ICT has generated the need for rules to shape its use (Boh & Yellin, 2006). Many companies and public institutions worldwide have developed ICT architectures to respond to this need. Architecture in the ICT sector is defined as "a series of principles, guidelines or rules used by an enterprise to direct the process of acquiring, building, modifying and interfacing ICT resources throughout the enterprise. These resources can include

equipment, software, communications, development methodologies, modelling tools, and organizational structures" (Gartner, n.d.). The diversity of ICT architectures has led to the creation of reference architectures (RAs), "architecture descriptions that provide a proven template solution when developing or validating an architecture for a particular solution" (International Electrotechnical Commission, n.d.). In other words, RAs are created by considering the essential features of existing architectures and their future needs and opportunities (Cloutier et al., 2009). The concept of RAs in the ICT domain was introduced in the early 1990s (cf. Williams, 1994). ERAs can be seen as standards, because they provide a set of principles, guidelines or rules, and are template solutions intended and expected to be used for a longer period of time by multiple users – this fits De Vries' (1997) definition of a standard: "an approved specification of a limited set of solutions to actual or potential matching problems. It is prepared for the benefits of the party or parties involved, balancing their needs and intended and expected to be used repeatedly or continuously, during a certain period, by a substantial number of the parties for whom it is meant" (De Vries, 1997). A common RA allows interoperability, leading to higher network effects, facilitating communication, and stimulating innovation. This applies to both current and emerging technologies1, such as Cloud computing and Artificial intelligence respectively. However, several private and governmental organisations started developing RAs in isolation despite this common purpose. This led to a fragmented landscape where various formats competed for acceptance or dominance (Janssen & Wagenaar, 2002). Most studies on standard battles address interface standards in ICT and consumer products and ignore the small but impactful category of RAs.

In addition, this paper uses the factors identified by the Technology Acceptance Model (TAM) and the Technology Organisation Environment (TOE) framework. More specifically, we aim to answer the following research question: What are the most relevant factors that affect the adoption of a reference architecture (RA)? Are the factors that are relevant to determine the outcome of standard battles and those identified by the TAM and TOE applicable to the context of RAs? The findings obtained by addressing these questions will allow us to tackle another, more practical research question: How can a party that supports an enterprise reference architecture (ERA) take advantage of these findings and change its market strategy accordingly?

1. Theoretical background

1.1 Standard battles

Standards have been with us for over 5000 years and nowadays are seen as facilitators of communication and innovation, especially in the ICT field (Lim, 2006). They are considered a source and driver for growth. The European Commission recognizes the strategic importance of standards: 'European standards have delivered great benefits for companies and consumers, creating a level-playing field in the single market for businesses and increasing consumer confidence (European Commission, 2022, p. 2). Standards can be developed at the global, regional, national, and firm-level (Lim, 2006) and may emerge from committees, markets, and governments (Wiegmann, de Vries & Blind, 2017). This also holds for RAs: committees,

[1] https://www.iso.org/search.html?q=reference%20architecture

private companies, and governments at the national and regional levels have developed RAs which are now competing in the market.

In the field of RAs, network externalities apply: An RA becomes more valuable for an individual user as the number of users increases due to interoperability between systems, the availability of support, and the model's recognition. This provides a natural mechanism for achieving dominance (Farrell & Saloner, 1986; Katz & Shapiro, 1994). Therefore, it is important for organisations developing RAs to understand the factors contributing to standard acceptance (Den Uijl, 2015). The literature on this topic has focused on four main overarching theories (Van de Kaa, Van den Ende, De Vries, & Van Heck, 2011):

- The natural selection view based on evolutionary economics. This theory argues that the survival of a firm is based on a process of natural selection (Van de Kaa et al., 2011).
- The system structural view based on industrial economics. This theory argues that standard dominance is linked to a firm's ability to resist technological change and external market forces (Den Uijl, 2015).
- The strategic choice view based on institutional economics. This theory argues that the strategic choices firms make impact the dominance of their standards (Den Uijl, 2015).
- The collective action view based on game theory. This theory focuses on selection (Den Uijl, 2015). A standard can be selected by the market or by a committee. Lee, O'Neal, Pruett, & Thomas (1995), Chiesa, Manzini, & Toletti (2002), and Suarez (2004) argue that resources, both in terms of finance and reputation, are the most important drivers of success in a standards battle. More specifically, Suarez identifies the relevance of factors during the selection process and treats factors dynamically.

Suarez (2004) identified five phases in the process of technological dominance (see Figure 1):

1. R&D build-up. A firm starts R&D activities to produce a new product. The most relevant factors relate to technology and technological talent.
2. Technical feasibility. With the arrival of the first working prototype, technological superiority becomes the most relevant factor.
3. Creating the market. The product launch shifts attention from technological to market factors such as pricing and marketing strategy and the presence of complementary goods.
4. Decisive battle. The emergence of a firm with a larger installed base in which the firm's credibility, complementary assets, and network effects play an impactful role.
5. *Post-dominance*. The presence of a dominant technology. At this point, network effects, switching costs, and the size of the installed base are important factors.

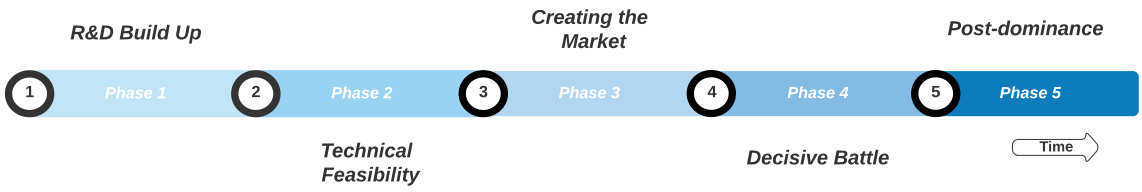

Figure 1 Five phases in the process of technological dominance (Suarez, 2004)

Den Uijl, De Vries, and Bayramoglu (2013) added a "winning the mass market" phase to Suarez's milestones. During this phase, a standard that has already achieved dominance in a market niche competes with others to become dominant in the product category as well.

Van de Kaa et al. (2011) designed a more comprehensive framework that includes 29 factors determining the outcome of a standard competition originating from the theories mentioned above. The authors identify five categories of factors:

- Characteristics of the format supporter: Factors related to the characteristics of the organisation developing the standard;
- Characteristics of the format: Characteristics of the standard itself, such as technological superiority;
- Strategy of the format supporter: Strategic options (i.e. marketing and strategy) for an organisation to win a battle;
- Other stakeholders: Stakeholders who do not belong to the main group of standard supporters (e.g., users);
- Market characteristics: Factors (e.g., the bandwagon effect) that are not controlled by the organisation managing the standard.

Research has also studied factors leading to the coexistence of different standards rather than focusing only on factors prompting the dominance of a single standard. De Vries, De Ruiter, and Argam (2011) conducted a literature review and a study on flash memory cards and identified eight factors leading to the coexistence of different designs:

- Distinct features in product niches and consumer communities;
- Gateway technologies;
- Multi-channel systems;
- Appropriability regime;
- Persistency;
- Speed in technological development;
- Application drives design;
- Low price.

Using the smartphone case, Riegman and De Vries (2013) added four additional factors for the co-existence of multiple designs:

- Fear for monopoly;
- Interference of competition authorities;
- Need for differentiation;
- Timing of fast followers.

Den Uijl (2006) identified four factors that simultaneously support single and multiple designs:

- Switching costs;
- Cross-side network effects;
- Same side network effects;
- Local network effects;
- Low costs of development and maintenance of designs.

Appendix 1 lists, defines, and explains the factors identified by the literature on standards battles.

1.2. The Technology Acceptance Model

The Technology Acceptance Model (TAM) is a theoretical framework that is employed to explain users' acceptance of a (information systems) technology (Davis, 1989). It is based on two theories. The theory of reasonable actions predicts how individuals behave based on their pre-existing attitudes and behavioural intentions. The theory of perceived behaviour states that people's performance to act is caused by their intent to execute that action (Marangunic & Granic, 2014). In the TAM, system usage represents an action determined by external stimuli, including system characteristics and capabilities (Marangunic & Granic, 2014). Motivation is determined by perceived usefulness and ease of use. Davis (1989) identified perceived usefulness as "*the degree to which the person believes that using the particular system would enhance her/his job performance"* (Marangunic & Granic, 2014, p.85). This attribute enjoys a direct positive relationship with the acceptance of emerging technology (Gallinaro, 2020). He recognizes perceived ease of use as *"the degree to which the person believes that using the particular system would be free of effort*" (Marangunic & Granic, 2014, p. 85). This attribute is positively related to adopting the emerging technology since it is linked to the "learning costs" a user faces when learning how to use new technology (Gallinaro, 2020). Figure 2 shows the final version of the TAM.

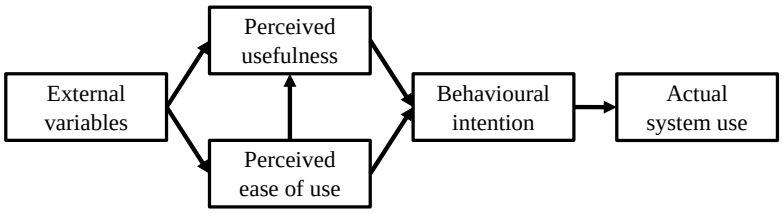

Figure 2 Final version of TAM (Chutter, 2009, p.10)

The model is used to understand the potential of many technologies in various sectors. For example, it has been used in the retail industry to understand the potential of e-commerce (Qiu & Dong, 2008), omnichannel, and the Internet of Things (IoT) (Constantinides, Kahlert, & De Vries, 2017). It has also been employed to understand the power of smart technologies, such as smart houses (Hubert et al., 2018), and digital banking services, such as banking apps and e-payments (Ahmad, 2018). Recently the TAM has also been used in contexts other than technologies. It has been applied as well to understand and analyse the public sector's challenges when implementing enterprise architectures (EAs) (Guo, Li, & Gao, 2019). The authors found that all the challenges related to EA were caused by a lack of perceived usefulness from a user's perspective, especially businesspeople.

1.3. Technology Organization Environment framework

The Technology Organisation Environment (TOE) framework relates to the innovation process from creating innovations to their acceptance and usage by users in big corporations and firms (Baker, 2011). It explains how the external environment interacts with the acceptance and application of innovations. It identifies three main contexts:

- Technological: Technologies critical to the firm, both outside and inside. The technological context comprises features such as the technology infrastructure and compatibility, relative advantage, complexity and security, and technical competence (Kimiagari & Baei, 2021).
- Organisational: The assets and characteristics of the company, such as its size, the extent of centralisation and complexity of the managerial structure, human resources, top management support, and communication methods.
- Environmental: Market characteristics, the availability of technology service providers, and the regulatory environment (Bakers, 2011). It deals with the space surrounding a company, including a vast array of stakeholders such as competitors, suppliers, customers, and the government (Angels, 2013).

Figure 3 shows a representation of the TOE framework.

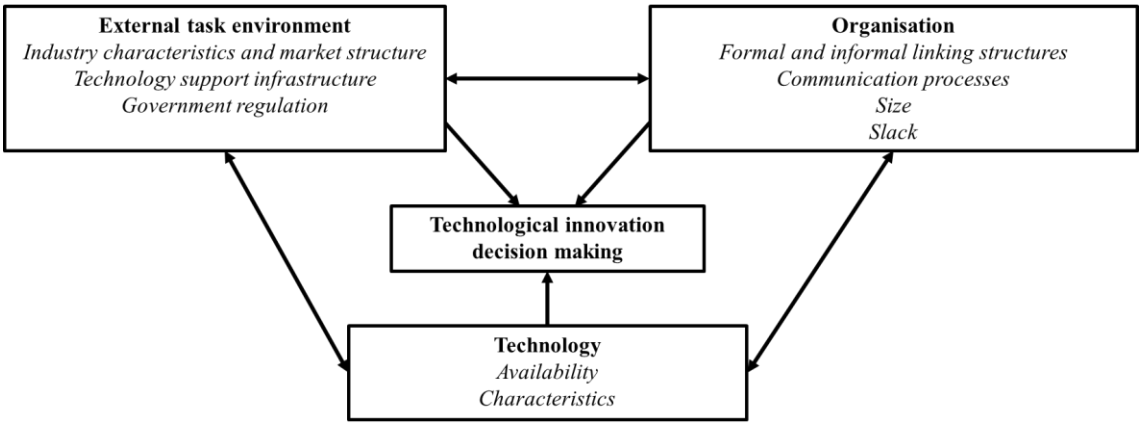

Figure 3 TOE framework (Baker, 2011: 6)

The TOE framework can be used to forecast the adoption and implementation of innovations in a wide array of heterogenous contexts. For example, it has been applied to assess the potential of e-commerce and business analytics in the retail sector (Amit & Bala, 2020; Ghobakhloo, Arias-Aranda, & Benitez-Amado, 2011) and to understand the usage of cloud computing (Hiran & Henten, 2019), blockchain technology adoption (Kulkarni & Patil, 2020), and cybersecurity (Wallace, Green, Johnson, Cooper, & Gilstrap, 2020). Ahmed et al. (2020) used the TOE framework to identify the factors required to achieve more applications of EA in the Malaysian public sector. They found that clear communication, coercive pressure, expected benefit, good governance, mimetic pressure, normative pressure, and organisational size impact the adoption of EA in the public sector.

1.4. ICT reference architectures

Architectures relate to the synergy of art and science in designing complex structures that allow a company to control complexity and functionality. ICT architectures deal with the relation and alignment between an enterprise, the "soft" component, and its ICT assets, the "hard" component (Lankhorst, 2013). This research deals with a specific category of ICT architectures: ERAs. These architectures capture the essence of existing architectures and the vision of future needs and evolution to guide the development of new systems architectures. According to Cloutier et al. (2009), RAs are required to:

- Manage complexity and the increasing size of ICT systems;
- Keep up with the increasing pace and dynamics of today's markets;
- Create effective products;
- Achieve interoperability among organisations, companies, and countries;
- Develop strategies and missions;
- Guide future implementations.

An RA must gather input from existing architectures and customer and business needs. It should address both the technical and business context in its vision and a mission (Muller, 2020). Its main purpose is to provide guidelines and best practices (Cloutier et al., 2009) so stakeholders can exploit it, thereby enhancing common understanding, knowledge management, and risk mitigation.

TOGAF, The Open Group Architecture Framework, is probably the most well-known ERA. It has achieved the widest market penetration (Kotusev, 2018). According to The Open Group (2016), TOGAF represents the most well-known and reliable EA standard in the world with 80% of companies from the Fortune 50 list and 60% of companies from the 500 list using it. TOGAF was first published in 1995 and provides tools and methods for the acceptance, production, use, and maintenance of EA (The Open Group, 2018). TOGAF is composed of four architectural domains (business architecture, data architecture, application architecture, technology architecture), six main core concepts (Architecture Development Model (ADM), ADM supporting guidelines and techniques, ADM content framework, Enterprise Continuum, Reference Models, and Architecture Capability framework) (The Open Group, 2018). Appendix 2 provides a description of TOGAF.

1.5. Enterprise Architecture Success Factors

Over the years, EA research has primarily focused on identifying factors for the successful implementation and management of EA. EA research has especially underlined the presence of shared understanding (Ylimäki, 2006; Van den Berg & Van Steenbergen, 2006; Lucke et al., 2010; Lange, Mendling & Recker, 2016), the availability of experienced and skilled architects (Lucke et al., 2010; Van den Berg & Van Steenbergen, 2006; Ylimäki, 2006;), and communication (Lucke et al., 2010; Rouhani, Ahmad, Nikpay, & Mohamaddoust, 2019; Ylimäki, 2006;). Muller (2020) and Greefhorst (2015) identified several quality criteria for the adoption of ERAs:

- understandability;
- maintainability;
- specific domain;
- business value;

- jointly drawn-up;
- presence of community;
- presence of governance.

1.6. Reflection on the literature

To conclude, the literature on standards battles, the TAM, and the TOE provides many factors that contribute to greater technology adoption. The literature on standards battles has identified factors contributing to achieving dominance and those favouring the co-existence of various standards in the market. Research has identified six phases of the dominance process and the relative influence of each factor per phase. The TAM and the TOE literature have discovered other factors for successful adoption, and the literature on architectures helps us to understand why organisations need a reference framework. However, to the best of our knowledge, research has not identified the factors an RA must show to gain greater acceptance and achieve market dominance. As RAs benefit from obtaining higher interoperability, it is crucial to investigate whether other, yet unidentified factors apply to RAs. This paper aims to discover the factors contributing to the successful market adoption of an RA that could lead to achieving dominance and unleashing the potential of interoperability. The factors identified in standards battles, TAM, TOE, and EA literature can form a starting point. By combining these streams of literature, we hope to identify factors for RA market success.

2. Methodology

2.1. Research Design

Several public and private organisations have *developed RAs that compete for market acceptance. To gather* empirical data about these battles, we study four ERAs, two from the private (Table 1) and two from the public sector (Table 2).

Private architecture	Main characteristics	Information
Integrated Architecture Framework (IAF) by Capgemini[2] (Wout, Waage, Hartman, Stahlecker, & Hofman, 2010)	• General framework • Multi-domain model: business, information, information system, and technology	• Wide availability • Wide accessibility
Boston Consulting Group architecture (Boston Consulting Group, n.d.)	• Comprises many planning tools • Growth-share matrix[3] that helps companies understand which business processes to prioritise	• Scarce availability • Scarce accessibility

[2] https://agilearchitect.azurewebsites.net/useful_material/iaf/

[3] https://www.bcg.com/about/our-history/growth-share-matrix

Deloitte[4] architecture (Deloitte, 2014)	• Niche architecture • IT- and cloud-focused	• Scarce availability • Scarce accessibility
Accenture[5] architecture (Accenture, 2014)	• Niche architecture • IT- and cloud-focused	• Scarce availability • Scarce accessibility
McKinsey[6] architecture (McKinsey, n.d.)	• Niche architecture • Data-focused	• Scarce availability • Scarce accessibility
Cisco[7] architecture (Cisco, 2014)	• Niche architecture: IT-focused • Modular approach to network design • Comprises enterprise campus module, enterprise edge module, service provider edge module	• Wide availability • Scarce accessibility
BIAN financial architecture (Banking Industry Architecture Network, n.d.)	• Niche framework for the financial sector • Service-oriented architecture • Defines standard capabilities for a bank e.g. payments, loan offerings, and trading facilities • Includes a service domain landscape, a business capabilities map, and many businesses scenarios	• Wide availability • Scarce accessibility
Gartner architecture (Brand, 2020)	• General framework • Offers an established consultancy service on enterprise and ICT architectures • Continuously updated reference architecture	• Wide availability • Scarce accessibility
TOGAF architecture (The Open Group, 2018)	• General architecture	• Wide availability

[4] https://www2.deloitte.com/tl/en/pages/about-deloitte/solutions/digital-enterprise-framework.html

[5] https://www.accenture.com/us-en/services/software-engineering/it-systems-architecture

[6] https://www.mckinsey.com/business-functions/mckinsey-digital/mckinsey-technology/overview/enterprise-architecture

[7] https://www.ciscopress.com/articles/article.asp?p=2202410&seqNum=6#:~:text=The%20Cisco%20Enterprise%20Architecture%20model%20separates%20the%20enterprise%20network%20into,and%20facilitates%20implementation%20and%20troubleshooting.

	• Four comprehensive levels: business, application, data, and technology • Deep market penetration and adoption in the market (Kotusev, 2018)	• Wide accessibility

Table 1 Candidate reference architectures in the private sector

Public architecture	Main characteristics	Information
Federal Enterprise Architecture Framework (FEAF) (Federal Enterprise Architecture (FEA), 2012)	• Aims to achieve interoperability between the US Central Government and federal agencies • Standards and principles for how business, information, and technology architectures should be developed across the federal government	• Wide availability • Scarce accessibility
Singapore Government Enterprise Architecture (SGEA) (Singapore Government , 2018)	• Aims to build and develop a digital government • Framework addressed to businesses, citizens, and public officers	• Scarce availability • Scarce accessibility
EIRA and EIF (European Commission, 2021e)	• European Interoperability Reference Architecture and European Interoperability Framework • Four main interoperability levels: legal, organisational, semantic, technical	• Wide availability • Wide accessibility
Nederlandse Overheid Referentie Architectuur (NORA) (Nora, 2021c)	• Dutch government reference architecture • Four basic elements: principles, standards, building blocks, conceptual model	• Wide availability • Wide accessibility

Table 2 Candidate reference architectures in the public sector

We used the following criteria for our selection: (1) degree of adoption or market share, (2) information availability and accessibility, and (3) both private and public ERAs. For the private ones then IAF would be the best candidate. However, IAF's content has later been assimilated into TOGAF (Wout et al. 2010). Since we had already decided to select TOGAF, we took the Gartner architecture framework as the second private method, also because interviewees for Gartner were more responsive to our request to be interviewed. From the public side, we took a regional (European) and a national one: EIRA and NORA. Appendix 2 provides descriptions.

2.2. Data collection

Data stemmed from both primary and secondary data sources. Desk research provided information on each of the four ERAs. The first author conducted 19 interviews with a heterogenous set of stakeholders with different backgrounds and working in various contexts. When selecting the interviewees, we applied two selection criteria: the architecture of origin and the kind of expertise. In terms of expertise, the researcher interviewed professionals with market or technical expertise: salespeople, project managers, architects, and two generalists in this field to reduce bias in the research. The final set of interviewees comprised eight experts from the private sector and eleven from the public one. This imbalance was due to difficulties in reaching out to professionals in the private sector. Table 3 provides an overview of interviewees' profiles. The interviews were semi-structured and included tailored questions. The interviewer took notes during the interviews and identified and highlighted the main points at the end of each interview.

Interview	Architecture	Company	Role	Sector	Side
1	TOGAF	Van Haren Publishing	Director	Private	Supply
2	TOGAF	Van Haren Publishing	CEO	Private	Supply
3	TOGAF	The Open Group	Member of the Board of Directors	Private	Supply
4	TOGAF	The Open Group	Chief Architect	Private	Supply
5	Gartner	Gartner	Leadership Partner	Private	Supply
6	Gartner	Gartner	Chief of Research	Private	Supply
7	Gartner	Gartner	Architecture Analyst	Private	Supply
8	EIRA	Istituzione Istituto di Scienze e Tecnologie della Cognizione (ISTC) – Italian National Council of Research (CNR)	Former reviewer – current researcher	Public	Supply
9	EIRA	International Consulting company	Senior Manager	Public	Supply
10	EIRA	European Commission	Chief Architect	Public	Supply
11	EIRA	European Commission	Solutions Architect	Public	Supply
12	EIRA	European Commission	Consultant	Public	Supply
13	NORA	ICTU	Program Manager	Public	Supply
14	NORA	ICTU	Architecture Advisor	Public	Supply

15	NORA	ICTU	ICT Architect	Public	Supply
16	NORA	Central Bank	Architect	Public	Demand
17	NORA	GGD Amsterdam	Information Architect	Public	Demand
18	No specific ERA	Multi-national consulting company	ICT Consultant	Private	Supply
19	No specific ERA	ArchiXL	Director	Public	Supply

Table 3 List of interviewee profiles

3. Data analysis

The first author used open and deductive coding. She actively checked for factors identified in the literature on standards battles, TAM, TOE, and EAs and RAs. She conducted axial coding to unveil the interconnections between initial codes. This process resulted in broader themes or categories, including various factors with common points. Finally, she identified interconnections among various themes and created two aggregate dimensions.

4. Empirical findings

4.1. Overview of the field

A first observation is that we should distinguish three levels: EA metamodels with a high level of abstraction, ERAs that provide template solutions, and EAs developed for single specific organisations. Most respondents highlighted that, at the metamodel level, TOGAF is the de-facto standard, as it has already won the competition. At the second level, direct competition between ERAs is not so common. Each ERA focuses on a specific niche and therefore differs in its value proposition as it targets different customers and stakeholders.

In the public sector, ERAs typically originate from administrative bodies at the national, provincial, and municipal levels. Although based on shared understanding, such as a principle-based approach and architecture layering, each serves its own purpose. In the European Union, the EU level is relevant as well. The EU developed the European Interoperability Reference Architecture (EIRA) and its accompanying European Interoperability Framework (EIF). To a certain extent, these compete with ERAs at the national level, designated as by the EU as National Interoperability Frameworks8. The differences primarily relate to particular architecture principles, policies, and terminology. Although EIRA reuses terminology and paradigms from TOGAF such as architecture patterns, architecture building blocks, and architecture views and viewpoints, these do not match one to one with the member state equivalents.

In the private sector, ERAs are proprietary assets of consultancy firms, and since these organisations compete, so do their ERAs. Public and private sector ERAs do not appear to compete. Moreover, most ERAs reuse elements from TOGAF. And despite being a metamodel

[8] https://joinup.ec.europa.eu/collection/nifo-national-interoperability-framework-observatory/national-interoperability-initiatives

providing a basic reference framework, TOGAF also contains many more specific elements that single users can pick and choose, along with elements from other specific ERAs. Rather than providing a pre-defined ERA, Gartner takes elements from various ERAs to provide tailored solutions.

4.2. Overview of the factors

Table 4 ranks the top ten factors that influence the adoption of an ERA as mentioned by our interviewees. The second column indicates whether the factor has a positive (+), negative (-), or non-linear (U-shaped) effect on ERA dominance. More specifically, a U-shaped effect emphasizes a nonlinear relationship between two variables: in case of the "architecture scope", to be valuable, the focus of an RA would have to be fairly general and not focused on a specific sector or subject, or very specific, aimed at a certain niche. This means that an RA that is not too specific or too general is unlikely to gain dominance. Each cell also lists the number of interviewees mentioning the factor under consideration. The other columns show whether the factor was mentioned spontaneously by the interviewee (worth 1 point) or mentioned only after an explicit prompt by the interviewer (worth half a point) which are added in the last column. Please keep in mind that there are three respondents more from the public sector than the private sector. Appendix 3 shows the complete table with all the identified factors ranked according to their relevance by the scoring system adopted by De Vries & Go (2017).

		Private sector		Public sector		
Factor	**Effect**	**Mentioned spontaneously**	**Mentioned with the help of the researcher**	**Mentioned spontaneously**	**Mentioned with the help of the researcher**	**Total**
Perceived ease of use (TAM)	+	4	3	9	2	**15.5**
Perceived usefulness (TAM)	+	4	3	7	2	**13.5**
Fitness for use – supply-side (Standards battles)	+	3	3	7	4	**13.5**
Complementary assets (Standards battles)	+	4	1	3	4	**9.5**
Educational support (Empirical findings)	+	3	1	3	5	**9**
Scope of the architecture (Empirical findings)	∪	1	3	5	3	**9**
Updatability (Empirical findings)	+	3		4	3	**8.5**
Community (Standards battles)	+	2	2	4	2	**8**
Comprehensiveness of the architecture (Empirical findings)	+	1	1	6	1	**8**
Firm's credibility and reputation (Standards battles)	+	2	5	2	1	**7**

Table 4 Ranking of the top ten factors influencing the adoption of ERA's

Following the Gioia framework (Gioia, Corely & Hamilton, 2012), the factors are clustered in themes and aggregate dimensions, as shown in Figure 4.

Themes were created by clustering factors:

1. *Clear purpose*: Factors related to RA's fitness for purpose, emphasizing the importance of a clear architecture value.
2. *Ecosystem:* Factors representing the added value of the architecture itself and the related product and service package for the user community.
3. *Prepared for the future*: Factors related to RA's fitness for use over time i.e. flexible to accommodate the diverse variety of changing customers' needs and requests.
4. *Brand strength*: Factors related to the marketing mix, contributing to the perception of the RA's importance in the market.
5. *Cost of the architecture*: Factors related to the prices and costs connected to RA.
6. *Technical quality of the architecture*: Factors contributing to the quality of the RA from a technical point of view.
7. *Timing of entry – supply-side*: Time when RA becomes available for use.
8. *Organisational characteristics – supply-side*: Factors corresponding to the characteristics of the organisation creating, managing, and maintaining the RA.
9. *Organisational characteristics – demand-side*: Factors related to actors embodying the characteristics of the user organisation, impacting the adoption of the RA.

Taken together, these themes constitute *Bold and straightforward value*: All the themes a company creating and managing an RA can use and control to increase the clarity and understandability of the value of its model.

Factors 10 and 11 relate to successful implementation. These factors do not impact the choice of the architecture, but the final success for the user depends on them. From a different angle, if a government intervenes and prescribes an architecture, then there is no choice – factor 12. We combined these to *Potential users' readiness to adopt*: All the themes influencing the preparation and ability of a user company to adopt, understand, and use an ERA that are outside the control of the company creating and managing the model.

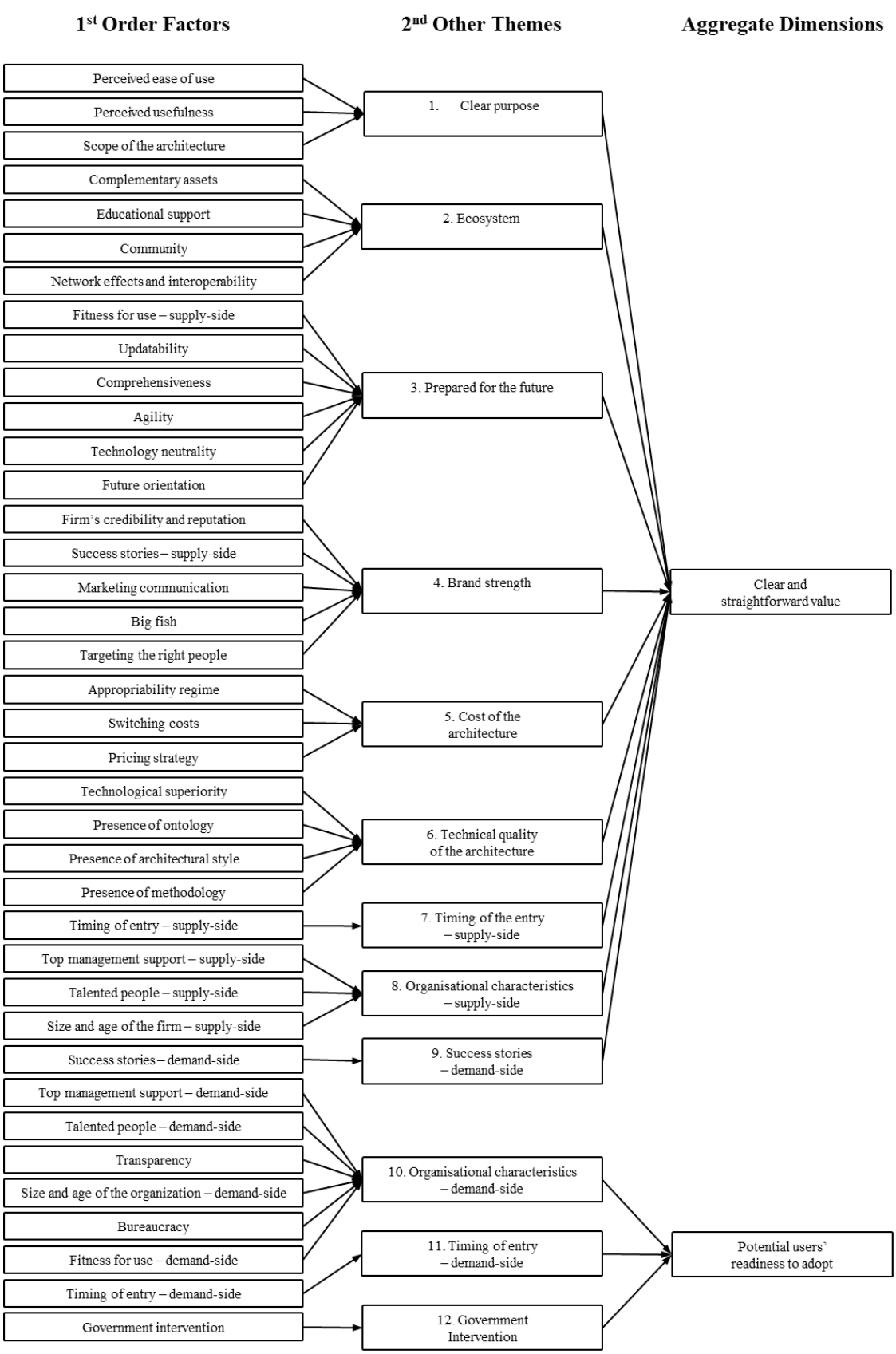
1st Order Factors
2nd Other Themes
Aggregate Dimensions
Perceived ease of use
Perceived usefulness
Scope of the architecture
Complementary assets
Educational support
Community
Network effects and interoperability
Fitness for use – supply-side
Updatability
Comprehensiveness
Agility
Technology neutrality
Future orientation
Firm's credibility and reputation
Success stories – supply-side
Marketing communication
Big fish
Targeting the right people
Appropriability regime
Switching costs
Pricing strategy
Technological superiority
Presence of ontology
Presence of architectural style
Presence of methodology
Timing of entry – supply-side
Top management support – supply-side
Talented people – supply-side
Size and age of the firm – supply-side
Success stories – demand-side
Top management support – demand-side
Talented people – demand-side
Transparency
Size and age of the organization – demand-side
Bureaucracy
Fitness for use – demand-side
Timing of entry – demand-side
Government intervention
1. Clear purpose
2. Ecosystem
3. Prepared for the future
4. Brand strength
5. Cost of the architecture
6. Technical quality of the architecture
7. Timing of the entry – supply-side
8. Organisational characteristics – supply-side
9. Success stories – demand-side
10. Organisational characteristics – demand-side
11. Timing of entry – demand-side
12. Government Intervention
Clear and straightforward value
Potential users' readiness to adopt

Figure 4 Gioia framework applied to ERAs

Table 5 shows points per theme, starting with the most important. We discuss the first two: *clear purpose* and *ecosystem.*

Theme	Points
1. Clear purpose	13
2. Ecosystem	8
3. Prepared for the future	6
4. Brand strength	6
12. Government intervention	5
5. Cost of the architecture	4
10. Organisational characteristics – demand-side	3
7. Timing of entry – supply-side	3
6. Technical quality of the architecture	2
9. Success stories – demand side	2
8. Organisational characteristics – supply-side	2
11. Timing of entry – demand-side	1

Table 5 Points per theme

Theme 1: *Clear purpose* highlights the importance of transmitting the added value of the RA to the end-user clearly and comprehensively and includes the following factors: perceived ease of use, perceived usefulness, and scope of the architecture. Perceived ease of use relates to the clarity and straightforwardness of the RA. Both business and technical people should be able to understand it. Perceived usefulness refers to the value of the RA itself, which must be transmitted and measurable. Scope of the architecture relates to the RA's focus, which directly influences its overall purpose and usability and must be precise, according to many interviewees.

Theme 2: *Ecosystem* deals with elements and stakeholders surrounding the RA. It includes the following factors: complementary assets, educational support, community, and network effects & interoperability. Complementary assets, particularly mentioned by respondents in the private sector, include the tools (i.e. software) and services surrounding an architecture and increasing its overall value. Educational support includes the services and training aimed at helping people understand and use the RA. Community, similar to "installed base of users" in the literature on standards battles, increases the value of the RA as it provides insights and feedback and peer-to-peer support. Community is especially important because the bigger its size, the greater the level of peer support, and therefore the greater the value. Networks effects convey the idea that the greater the number of users of a reference architecture, the greater its value due to higher interoperability.

5. Discussion

1.1. Overview of the state of the sector

Before focusing on the factors that play a role for an RA to gain dominance, we first discuss the EA market. As previously mentioned, the EA market is divided into three levels:

1. EA metamodels: general ERAs with a high level of abstraction, such as TOGAF.
2. Specific ERAs focused on a niche or market segment.
3. EAs: Architectures developed for a specific company or organisation.

Interestingly, ISO management systems standards have a similar level structure:

1. ISO Harmonised Approach for Management System Standards: the common and unified structure and core requirements for all management system standards (ISO, 2022, Annex SL)
2. Specific standards for a systematic approach to a certain management area, such as ISO 9001 for quality management systems and ISO 14001 for environmental management systems. These standards may compete with other standards (Wierckx, 2010);
3. Specific manuals: handbooks describing the management system of a specific organisation, such as an ISO 9001 quality management system.

Rather than competing, metamodels and specific ERAs complement each other. Metamodels often provide inputs for a diverse set of ERAs and the means to describe such an architecture. The dominant metamodel TOGAF acts as a common source and complementor for several specific ERAs. At the metamodel level, the competition has been settled, TOGAF has become the de-facto standard (Kotusev, 2018).

At the level of ERAs, there is no dominant one. Several ERAs have been launched and have obtained a certain market share. Thus, in terms of Suarez' (2004) phases, Phase 3 Creating the Market has been completed and ERAs are in Phase 4: Creating the mass market. But how do these ERAs compete? First, it turns out there are two battle fields: the public domain and the private domain. In the public domain in several EU member states, the EU ERA (EIRA/EIF) competes with the country's national ERA. These member states already have an installed base of users of their national ERA. Migration towards EIRA/EIF would bring high switching costs. Therefore, this situation is likely to remain for the time being. If EIRA/EIF had been initiated much earlier, the implementation of the single digital gateway (SDG) regulation adopted in 2018[9] would not have been so difficult and more standardisation would have been achieved. The SDG regulation now requires member states to provide information for cross-border users on how EU rules are applied in member states and on available assistance services. This includes procedures such as claiming a pension, registering a car, and applying for a roof structure on a family home. This situation confirms the importance of timing of entry (supply side) of an RA. The national ERAs do not compete with each other – in that sense each national market is separate. But how will the battle between the EU ERA and that of the member states unfold? A possibility is that ERAs continue to co-exist and gradually become more and more similar. Another possibility would be for the EC to impose its ERA through a regulation or directive, with the forthcoming EC proposal "Interoperable Europe Act"[10]. The private market shows more competition, namely between ERAs stemming from different consultancy firms. It is unclear whether a company will choose an ERA first and then seeks support from a related consultancy firm, or whether it will choose the consultancy firm first and then gets the related RA without any preference for that architecture. We did not ask this in our interviews. Wierckx

[9] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018R1724&from=EN

[10] https://joinup.ec.europa.eu/collection/interoperable-europe/news/official-expert-recommendations-new-interoperability-policy (see p. 4,17)

(2010) shows that consultancy firms play an important and often decisive role in the choice of a standard for quality management systems, despite the huge market share of ISO 9001. The importance of this role is confirmed by Leiby (2018). He argues that consultants tend to recommend a new (as opposed to established) management control system when management prestige is high and recommend an established MSC when prestige is moderate. The former mechanism decreases the chance of dominance of a single management system model. As a result, lasting diversity is expected in the private market.

Second, these ERAs are very different from each other because they target specific niches. This factor is related to "distinct features in product niches and consumer communities" in the literature on standards battles. When competing designs have different characteristics, they offer other advantages and attract different market segments, leading each design to have its installed base without competing in the mass market (De Vries, De Ruijter, & Argam, 2011). Therefore, private ERAs are not expected to enter the public market and vice versa and thus not become alternatives to each other. In the fourth phase "Decisive battle" of the dominant design emergence process (Suarez, 2004), the presence of distinct features prevents them from passing to the next phase. Based on a study on the case of high-density optical discs (HDODs) (Den Uijl & De Vries, 2013a), Den Uijl (2015) inserted another phase, "winning the mass market". In the case of ERAs this additional phase does not apply, as niches in the context of reference architectures already constitute mature markets. Therefore, no ERA will gain dominance as most ERAs focus on specific niches. Consequently, between public versus private ERA's no attempts for alignment are expected and diversity will remain.

1.2. Most important factors

Figure 5 presents a conceptual model for ERA dominance. It shows how the themes and factors influence each other and the adoption of the reference architecture. Apart from looking at the number of points granted to each theme, we took a more qualitative approach and evaluated how each theme impacted the possibility of adopting the reference architecture. The numbers refer to Figure 4.

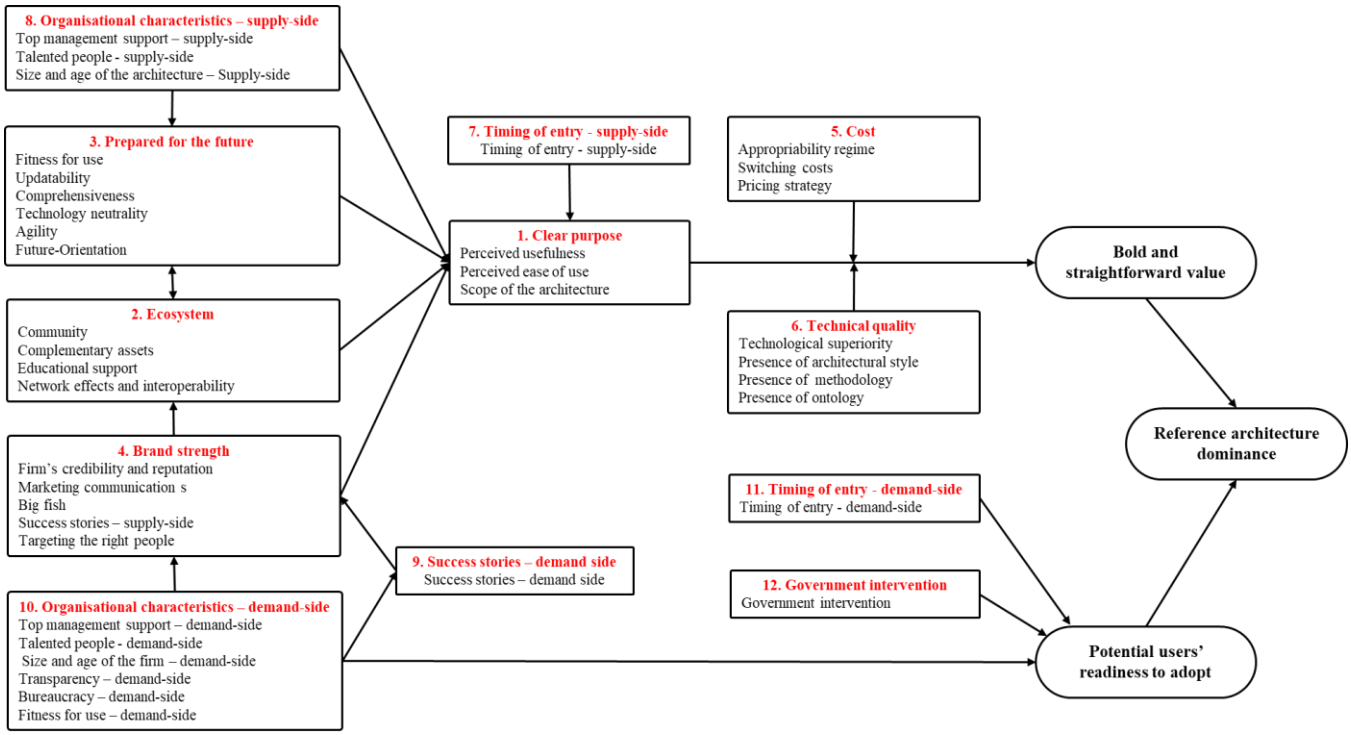

Figure 5 Conceptual model for ERA dominance

We arrived at two aggregate dimensions: 'Bold and straightforward value' and 'Potential users' readiness to adopt'.

'**Bold and straightforward value'** highlights the importance of having a clear ERA with concrete value. It is the most important dimension because most factors contribute to it. Two themes (*Clear purpose* and *Technical quality*) directly contribute to it. On the one hand, *Clear purpose* has more impact because it includes the factors mentioned most and because many other themes, such as *Ecosystem* and *Prepared for the future*, influence it. Remarkably, technical quality has less impact because no other themes contribute to it, as the model shows, no other theme is connected to it. From standards battles literature we know that technical qualities are not decisive but they aren't unimportant either (Van de Kaa, Van Heck, Van den Ende, De Vries & Rezaei, 2014). So this rating is counterintuitive, we would expect it to be more relevant, also in a medium to longer run perspective. The literature on standards battles provides factors that influence *clear purpose*, but this impact on dominance is thus indirect and therefore less important in the field of ERAs. Respondents from the public sector highlighted *perceived usefulness* and *ease of use*. This comes with no surprise as these respondents mentioned that public administrations often lack the right talent and expertise and often do not employ an in-house architect. Muller (2020) and Greefhorst (2015) identified *understandability* and *business value* as important quality criteria for the factors of reference architectures. Although *perceived usefulness* and *perceived ease of use* represent central factors in understanding the adoption of a reference model, both convey broad and general concepts, which may not have clear, practical value. This reasoning is reflected in the conceptual model: many themes influence *clear purpose*. One may argue that rather than being the most important

theme, the factors constituting this theme are the most general ones that most interviewees can mention spontaneously.

Ecosystem is the theme with the second most points and directly impacts *clear purpose*. This theme comprises five factors: *complementary assets*, *educational support*, *community*, *network effects*, *interoperability* and the factors that make the reference architecture easier to understand and more valuable. *Complementary assets* represent separate tools and services increasing the value of the architecture. They have been mentioned especially by private sector respondents, who claim that organisations need reusable tools to make the understanding and use of the RA easier. For example, one of the statements through which "adoIT" (https://www.boc-group.com/en/adoit/), one of the tools mentioned by interviewees, is promoted online is "Designed to Make Your Challenges Easy". *Complementary assets* may be slightly connected with "Technology support infrastructure" from TOE. *Educational support* is a factor not found in the literature, it stems from our interviews. This support is essential to make the architecture clearer, representing why it has been included in this theme. For example, one of TOGAF's claimed competitive advantages are its educational services. Other factors in the theme (*complementary assets*, the *presence of a community*, and *network effects*) stem from the literature on standards battles. Furthermore, the presence of a strong *community* allows users to benefit from peer-to-peer support and best practices. The importance of a strong *community* was identified by Greefhorst (2015). Respondents from TOGAF and the public sector emphasised the importance of *network effects and interoperability*: these are central to the value of an architecture as the higher the interoperability achieved within an architecture network, the higher the value that user organisations can derive from the architecture itself.

This highlights that achieving interoperability is paramount in essentially two different situations: when different organisations are part of a common reality, and in the case of metamodels with a high level of abstraction. Indeed, specific ERAs (i.e., those focused on a niche or market segment) do not have to focus on interoperability because they often refer to metamodels such as TOGAF that already focus on topics to achieve interoperability. Although this theme scored lower, it is not less important. It has a very bold practical value, and it may have been mentioned fewer times only because it is less general and more difficult to express.

The third most important theme is to be *prepared for the future* and the importance of being close to users to address their needs more adequately. This theme focuses on the *fitness of use*, *updatability*, *comprehensiveness*, *technology neutrality*, *agility*, and *future orientation*. The most important factor, *fitness for use*, originates from the literature on standards battles. It entails the importance of understanding customers and taking their needs into account to improve value. The factor is linked to *perceived usefulness* and *ease of use*. By understanding customers' needs and considering their feedback, the value and understandability of the architecture can be improved. Greefhorst (2015) also identified the importance of *fitness for use* for reference architectures. The same reasoning can also be applied to *updatability* and *comprehensiveness*, which were considered important by respondents in the public sector, who highlighted the lack of in-house expertise. Similarly, technology neutrality conveys the importance of being open to all technology standards, and thus of being usable by all potential users, regardless of the specific kind of technology they own. Finally, *agility* and *future orientation* underlie the importance of always including latest and developing to meet future needs. Interestingly, all the

factors in this theme focus on making the reference architecture easier and more usable for the end-user and on being prepared for the future.

'**Potential users' readiness to adopt'** underlies the awareness and preparation of an organisation to successfully understand the potential of a reference architecture and adopt it. Government interventions directly contribute to this aggregate dimension as current regulations and possible interventions may motivate or hinder users from adopting a reference architecture. Indeed, governments may promote or mandate the use of a specific architecture over another or regulate the use of a specific technology the reference architecture deals with. Furthermore, they may introduce laws regulating the use of technologies, urging an organisation to adopt a reference architecture to learn how to deal with these news rules, thus increasing their readiness to adopt a reference architecture.

Similarly, organisational characteristics, such as top management support and bureaucracy, allow an organisation to understand the potential of a reference architecture and get ready to adopt it. Timing of entry at the demand-side also impacts the user organisation readiness to adopt a reference architecture. Indeed, any organisation at the user-side invests in and benefits from the use of a reference architecture in different ways according to the time in its lifespan in which it is introduced, affecting its overall motivation to adopt it and therefore its readiness.

Overall, the conceptual model shows that the TAM factors, *perceived ease* of use and *perceived usefulness*, are the most applicable ones in the field of ERAs. As figure 5 shows, factors identified by literature on standards battles found only indirect applicability in RAs, because they mainly play a practical role in contributing to the fulfilment of a clear goal, central to achieving RA dominance, but not directly associated with it. Table 6 shows the twelve factors from the literature on standards battles and their ranking. Table 4 and Appendix 1 together show that most of the factors mentioned by interviewees point at the dominance of a single standard. However, this relates to dominance within two main niche markets: the public and the private one. Factors for the emergence of multiple standards were not mentioned, apart from two factors that may promote both single and multiple standards: *network effects and interoperability*, and *regime of appropriability*. These two factors are not in the top ten ranking, see Table 6. The *appropriability regime* is not very important in this field because the content of ERA is usually open and free. *Network effects and interoperability* are relevant, despite not being mentioned often. This was rather surprising as Greefhorst (2015) highlighted the importance of an ERA to enable interoperability among various domains.

Ranking	Factor
3	Fitness for use – supply-side
4	Complementary assets
8	Community – installed base of users
10	Firm's credibility and reputation
12	Network effects and interoperability
13	Marketing communications
14	Appropriability regime
15	Technology superiority
16	Big fish

18	Government intervention
22	Switching costs
30	Pricing strategy

Table 6 Factors from standards battles in the overall rank

Although all these factors apply and provide a force towards the dominance of a single model, this is not what happened in the market. Apparently, factors pointing at the coexistence of different standards were more important. Out of these, only *distinct features* in product niches and consumer communities was identified. This factor emphasises the fact that the ERAs we investigated can be grouped in two distinct value propositions and target segments, preventing them from forming a single unique market. The first consists of ERAs from the private sector that have been developed by consultancy firms. The second category comprises ERAs (in our case studies NORA and EIRA). The private ones do compete. As mentioned before: the companies might have chosen the consultancy firm first, and then get their ERA, after which switching cost cause the firm to stick to their initial choice. This would then be the factor 'Application drives the design' mentioned by De Vries, de Ruijter and Argam (2011). In the public sector, geographical niche markets do apply: at country level. At that level, timing of entry is decisive: the countries that had implemented a national ERA before EIF/EIRA became available, tend to stick to their choice because of high switching cost.

The disadvantages of having different ERAs next to each other are softened because key elements of are essentially alike, such as architecture principles, business capability models, and architecture governance frameworks. Take for example, a principle on public services from EIF (from the European Commission) and NORA (from the Netherlands, one of the member states). EIF principle 6 "User-centricity" vs NORA principle AP19 "User perspective as base". Because there is an installed base derived from NORA in the Netherlands, migrating to the EIF counterpart would cost much effort, whereas its benefits are limited. The same is true for other EU member states with a large installed base built on their own national ERA.

Factors from the Technology Organisation Environment framework are less applicable to the field of ERAs. By focusing on describing how user companies set up and implement technological innovations, the TOE framework presents factors that are outside the scope and control of any company creating and managing an RA, and these factors probably do not differ per ERA and do not influence the preference for a certain architecture. Table 7 shows the four TOE factors and their overall ranking.

Position in the overall rank	**Name of the factor**
17	Top management support- demand-side – Organisational context
18	Government intervention – External context
21	Talented people- demand-side – Organisational context
23	Age and size of organisation – demand-side – Organisational context

Table 7 Factors from the TOE framework in the overall ranking

Even the highest-ranking factors from the standards battles literature do not appear to be the most important ones. However, they are still relevant as they play a practical role by contributing to pursuing a clear purpose: they help understand the reference architecture by increasing RA's understandability and business value and provide practical suggestions on achieving greater customer experience. Although the factors from the literature on the TAM are the most important ones, they are very general and may represent a "mantra" to follow to improve overall customer experience with the RA.

2. Scientific Contribution

This study contributes to the literature on standards battles and academic knowledge about RAs. First, it contributes to the literature on standards battles because it provides a unique overview of all the factors identified by research, including the description, effect, impact during each phase, and elucidations on their concrete meaning (see Appendix 1). Moreover, this is the most complete list of factors for multiple standards. Second, we contribute to this literature by applying it to a new field: ERAs. This is a field without a clear winner. There are more of these, but these get hardly any attention in the literature: apparently, winning is more appealing to scientific researchers. Third, this paper is unique in combining standards battles literature with literature on TAM and TOE. In particular, the TAM literature adds to the standards battles literature by emphasising that perceived ease of use and perceived usefulness influence user decisions most. From an ERA point of view, this paper provides an overview of the state of the market, highlighting how competition occurs and identifying the most important factors for ERA acceptance. It clarifies their importance through a ranking and a conceptual model, showing the interrelatedness between factors.

3. Managerial implications

From a practical perspective, companies involved in standards battles can (1) use the paper by Suarez (2004) to position their technology in the phases of development, (2) read Den Uijl (2015) to understand the phase of winning the mass market, (3) use the paper by de Vries et al. (2011) to understand situations without a clear winner, and (4) use Appendix 1 of our study to see which factors may apply and if these point in the direction of one winner or of multiple designs next to each other. Den Uijl (2015) shows that they then have to distinguish between factors that can be influenced and those that should be taken for granted though they need to understand them to predict their chances in the battle.

This research is also useful for organisations creating an ERA or stimulating its use. Indeed, by informing them about the state of the market and competition, this paper allows them to better position their new architecture in the market. The paper may also be useful for standard-setting bodies. For example, ISO(/IEC) has developed a reference architecture for the Internet of Things (ISO & IEC, 2018), big data (ISO, 2020), and health informatics (ISO, 2021), and this research can be used to advance the market position of these reference architectures. This highlights that this research may be applicable in domains other than enterprise (reference) architectures.

Users of reference architectures can also benefit from this research. First, it helps organisations in their decision-making process by providing an overview of the sector. Second, by boosting the acceptance of RAs, they will be able to enjoy greater interoperability and network effects. RAs are important for communications interfaces, including the specifications of APIs. These enhance the interoperability between systems. Some ERAs prescribe certain compatibility standards, especially those from the public sector, whereas the ones form the private sector typically leave this to the users of the ERAs (those who design EAs). And when ERAs are revised these address changes in social, market and technical domains[11]. Users of reference architectures may use this study to persuade others to use their preferred reference architecture. Finally, this paper may help potential users to make informed choices when selecting RAs by using the identified factors as selection criteria.

4. Limitations and future research

Involving a heterogenous group of interviewees, with professionals from various groups, roles, and sectors, it was difficult to guarantee an even split among the groups: i.e. eight respondents from the private and eleven from the public sector. This might have caused bias in the ranking calculations in our empirical findings. However, this study seeks to find causalities rather than quantitative evidence, so this should not be too much of an issue. We had a diverse set of 19 interviewees, and we triangulated with the literature on TAM, TOE, enterprise and reference architectures, and standards battles.

In terms of future research, we suggest replicating this study and examining other public and private RAs and those in various geographical areas. For example, it could investigate RAs in one specific country, (i.e. one of the EU member states, Singapore, Japan, or South Korea) or big country comprising smaller independent geographical areas, such as the USA or the PRC). Replication for niche-level RAs would be interesting, e.g. for the Internet of Things, big data, or health informatics.

In addition, future research could focus on the decision-making process for RAs in public and private companies. It would be interesting to understand how the process and the decision-making is managed, who is in the lead, and who takes decisions according to what criteria. Once this is clear, core decision-makers might be targeted in subsequent quantitative research using surveys among implementors.

5. Conclusion

This study sets out to answer the following research question: *What are the most relevant factors that affect the adoption of an RA?* Many factors from the literature on standards battles show that, sooner or later, a single architecture will win the battle due to network effects. However, factors contributing to multiple standards and factors from TAM seem to be more important. Nevertheless, the literature on standards battles helps us to understand the competition between RAs: the most relevant factor is distinct features in product niches and consumer communities, promoting the coexistence of multiple models. Due to different value

[11] https://joinup.ec.europa.eu/collection/european-interoperability-reference-architecture-eira/about

propositions and target customer segments, many models do not even compete, thus favouring the creation of many niche markets. However, many factors from standards battles also promote the dominance of a single ERA. Customer experience from using a RA can boost market acceptance. Factors from standards battles allow perceived ease of use and perceived usefulness to happen, thereby enhancing customer experience. The conceptual model emphasises this by directly connecting factors from standards battles with clear purpose (TAM factors) and underlining their direct impact. Among the most important factors from the literature on standards battles, fitness for use, complementary assets, community, and network effects and interoperability directly increase the understandability and value of an RA, thus triggering its adoption. Furthermore, TAM factors, which highlight the importance of the understandability and business value of an RA can be considered a "mantra", an overarching mission, to always ensure a great customer experience, boosting the adoption of the model. However, due to their high level of abstraction, these factors do not constitute any practical suggestions.

Organisations that create, sell, or promote ERAs can take advantage of this study by strategically positioning their architecture in the market. For example, they could avoid designing a reference metamodel, as TOGAF already represents the de-facto standard, and instead focus on an unexplored niche. Furthermore, they can exploit the factors from standards battles that found applicability in this field (e.g. complementary assets and fitness for use) to clearly express the content and value of their ERA. To do so, they could benefit from the table in Appendix 1, which provides detailed description and explanation of the factors for the market acceptance of a standard. The table is instrumental in understanding how to implement each factor tactically. For example, organisations may start involving users in creating and updating the content of an architecture. Public sector organisations may benefit from this research by investing in educational services. Private sector organisations may be more interested in focusing on complementary assets, such as EAs management tools and branding.

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