HELPFUL ENTERPRISE ARCHITECTURE ELEMENTS FOR ORGANIZATIONAL NETWORKS

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Healthcare organizations increasingly collaborate within networks of private and public partners. To do so, data is recorded, stored and exchanged with help of a complex landscape of information systems (IS). While IS landscapes could boost digital innovation, they also generate significant administrative burdens. Enterprise Architecture (EA) supports organizations in managing IS landscapes. However, current EA practices do not fit well on the dynamics of networks, and research on EA for networks is scarce. Therefor the research objective is to determine what EA elements help to manage an IS landscape within healthcare organizations that collaborate in a network structure. Three group sessions were conducted using a collaboration engineering approach to refine network characteristics and usefull EA elements. The findings indicate that 'network motive' and 'network governance mechanisms' are the most important network characteristics, while 'EA goals' and 'EA processes' are the most helpful for network architecture (EA for a network).

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1 Introduction

Globally, life expectancies are rising (OECD, 2025b). As a result, the number of people with two or more chronic illnesses (multimorbidity) increases (Palladino et al., 2016). To assist persons with multimorbidity, healthcare providers must work with a wide range of professions to keep providing the best possible care for the best economic value, and they need to collaborate as efficiently as possible (OECD, 2025a).

Healthcare organizations collaborate in a variety of networks, including service networks, supplier networks, and integrated healthcare networks (Gremyr et al., 2025). For this study, a network consists "of three or more legally autonomous organizations that work together to achieve not only their own goals but also a collective goal" (Provan & Kenis, 2008). In case of healthcare, members of such networks trying to collaborate to provide the best possible care might include healthcare insurers, regional and national authorities, health quality inspectors, other healthcare providers, and of course the patient and their relatives (Maris, 2022).

To collaborate, communicate, and be accountable, healthcare organizations record, store, and exchange data using a complex landscape of information systems (IS) (Maris, 2022). While the use of digital technologies is gaining traction (Sienkiewicz-Małyjurek & Zyzak, 2025) and IS landscapes can stimulate digital innovation, such as Artificial Intelligence efforts (Zahlan et al., 2023), their complexity also creates significant administrative burdens (Michel, 2017). Such as multiple registrations, time-consuming apps, continuous authentication, and standardized checklists instead of patient-centred registrations.

Enterprise Architecture (EA) helps with managing IS landscapes. Although EA has been beneficial for a diversity of enterprises, current EA products and EA processes fail to fit well on the dynamics of Network Governance (NG) contexts (Lapalme et al., 2016). In addition, research on (the usability of) EA within NG contexts is scare (Maris et al., 2023; Maris, Hoppenbrouwers, & Van Hillegersberg, 2023). Therefore, our research question focused on: *What elements of enterprise architecture help to manage an information system landscape within healthcare organizations operating within a network governance structure?*

The next section of this paper describes the research's core concepts, 'Enterprise architecture elements' and 'network governance', followed by a description of the research method in Section 3. The study's initial findings are reported in the results section. Conclusions, recommendations for future research, and limitations are discussed in the last section.

2 Theoretical perspective

2.1 Enterprise architecture elements

Originally, EA was intended to visualize the current and future state of the whole enterprise information system landscape (Kotusev, 2016). These visualizations resulted in descriptions of how to change the information system landscape from a current state to a desired state (a roadmap). Subsequently EA processes, such as change management, also became part of EA (Spewak & Tiemann, 2006) and EA research (Kotusev, 2017). Bernard (2012, p. 31) states that EA has become *"a strategy and business-driven activity that supports management planning and decision-making by providing coordinated views of an entire enterprise."*

Although many different EA frameworks and models have been used in the public sector (Ansyori et al., 2018), and specifically in healthcare (da L. Júnior et al., 2021), standard EA frameworks and models are not always successful in organizations. In most cases only a couple of elements of the EA frameworks and models that were applied fit the context instead of the whole framework or model (Kotusev, 2018). In addition, several issues had to be taken into account when applying EA for network organizations (Lapalme et al., 2016) and especially in the healthcare sector, where executives and other stakeholders have limited awareness of the existence and value of EA (Ajer & Olsen, 2018).

Maris, Hoppenbrouwers, and Van Hillegersberg (2023), partially based on Gebre-Mariam and Bygstad's (2019) work, distinguish five EA elements: EA products, EA goals, EA contractual processes, EA relational processes, and EA competencies (Figure 1). A variety of EA products, including the roadmap to the desired state, define and illustrate the information system landscape's existing and desired states. With these products, the organization hopes to achieve one or more EA goals. Most stated EA goals fit into one of two basic categories: the first focuses on business and

information technology alignment; the second focuses on the extent of flexibility and agility, which enables information management and the organization to adapt.

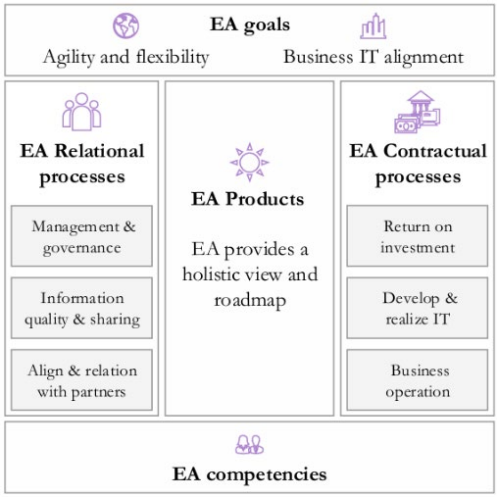

Figure 1: EA elements
Source: Authors, based on Maris, Hoppenbrouwers and Van Hillegersberg (2023)

EA contractual processes refer to information management practices, such as development, realisation, and maintenance of information technology (business operation), and its financial aspects. EA relational processes, on the other hand, have a foundation in human interaction. The emphasis is on information governance, including who is in charge of what and when, what information must be elicited and shared, what level of quality is required, and how to further align with partners and relationships. These elements can only be realized if the organization possesses the right EA competencies, which might include effective communication, considering systems and environments, and managing large groups (Lapalme, 2012).

2.2 Network governance

A network could be an institutional arrangement, a social system of collaborating individuals, a physical system of logistic partners, or more technical oriented like information and communication technology (Sienkiewicz-Małyjurek & Zyzak, 2025). In this study a network represents an institutional collaboration of three or more legally autonomous organizations (Provan & Kenis, 2008).

To effectively govern a network, Provan and Kenis (2008) introduced three network governance structures: shared governance; a network administrative organization; and lead governance. Hastings et al. (2014) distinguished six healthcare governance mechanisms based on 113 studies: (1) shared governance; (2) Magnet accreditation (Magnet® status by the American Nurses Credentialing Center); (3) professional development initiatives; (4) quality-focused initiatives; (5) reorganization of health services (e.g., moves to team-based care, private vs. public organizations); and (6) funding models. Ferlie & McGivern (2010) discuss a range of established network governance mechanisms, including the degree of network regulation (Perri et al., 2006). Maris et al. (2023) describe network characteristics based on 80 studies. They combine governance structure (lead- to shared governance) and governance regulation style (relational, trust based versus contractual based governance), to form four network governance mechanisms. Inspired by Perry et al. (2006) those mechanisms were named: Managed care network (MCN); Coordinated network (CN); Learning and informational network (LIN); and Procurement network (PN). Adding to this Maris et al. (2023) proposed five network characteristics: motive, dimensions, perspective, history, and capabilities (Figure 2).

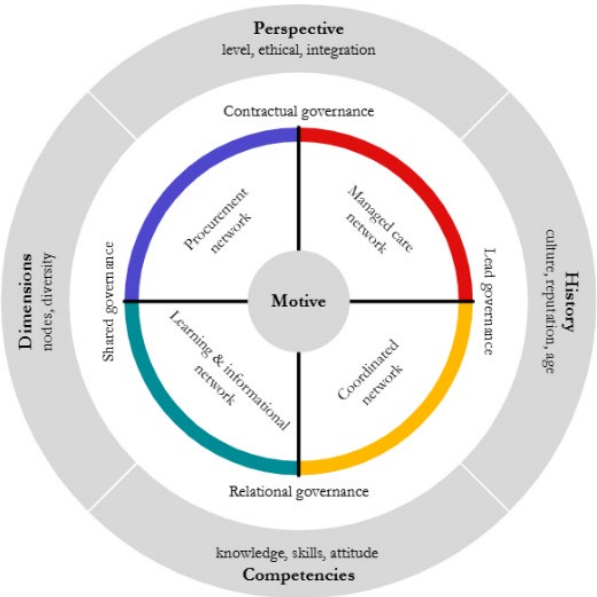

Figure 2: Network characteristics
Source: Authors, based on Maris et al. (2023) and Perri et al. (2006)

Motive is central in Figure 2. All parties could strive towards a shared network motive, but also have their own motives to join the network. The four network governance mechanisms are placed directly around the motives. The other network characteristics are situated as the third layer of in Figure 2. *Dimensions* relates to the number of parties acting in the network, where diversity among the parties plays a role. *Perspectives* considers diverse vantage points for engaging the network, such as personal, organizational, and societal network perspective, or ethical perspectives (to what extent do the motives of the network participants diverge/is there overlap). *History* represents the age of a network, since the effectiveness of a network should increase the longer it has existed, and a network's reputation (external image) and culture (internal image) should grow as it matures. *Competencies* pertain to the knowledge, skills and attitudes that network participants need to organize the network and act within it.

3 Method

Social science researchers often use qualitative research techniques such as individual interviews, participant observation, and engaging groups in various ways (Plummer-D'Amato, 2008). To determine what EA elements could help to manage an IS landscape in healthcare organizations operating within a NG structure, the input and perspectives of EA practitioners with experience in network environments is seen as a necessity. By involving multiple respondents simultaneously and discuss with them literature' findings, the respondents can enrich the findings in a way that might not be possible in one-on-one interviews (Plummer-D'Amato, 2008). Frey and Fontana (1991) have distinguished four well known group session types in social science: (1) focus groups; (2) brainstorming; (3) nominal and Delphi groups; and (4) natural / formal field interview. To support these group session types, group (decision) support systems can help to be more effective and efficient than pen and paper techniques (Briggs et al., 2001; Fjermestad & Hiltz, 2000; Jaclyn Lee, 2015; van Hillegersberg & Koenen, 2016).

3.1 Group Support Systems

For this study, three group sessions were conducted using a collaborative engineering technique. Since 2001 a combination of group sessions with the support of group support systems (GSS) is known as collaboration engineering (Briggs et al.,

2003; de Vreede & Briggs, 2019). According to Briggs et al. (2001), there are three steps that must be considered in order to ensure the quality of a group session that is supported by a GSS: (1) Tool selection, (2) Configuration, and (3) Establishing the session's protocol.

There are many digital systems that can support group sessions, but only a few are used for research aims (Fjermestad & Hiltz, 2000). MeetingWizard and Spilter are two systems mentioned as GSS in more recent studies, for example Namagembe et al. (2023) and Veen and Heuts (2024). Both systems were applicable for this study, however Spilter (https://spilter.nl) came out as the best option based on continuity, functionality and user interface.

3.2 Configuration

The second step was to configure Spilter to create a pattern of interaction. The group session was set up in three rounds in order to develop common knowledge about, and verify, the theoretical findings with the participants. One concentrated on the EA elements identified in the literature. Another concentrated on the network characteristics. The third round explored possible connections between network characteristics and EA elements. The respondents were able to view their own and each other's responses at each round. The notion was that if someone was having trouble providing an example or response, that this insight could provide inspiration.

The first two rounds were constructed in three phases. To gather all potentially relevant ideas and examples about the network characteristics and EA elements, the first phase involved brainstorming with pre-designed rubrics in line with the literature's findings (synthesized in Figures 1 and 2). Additionally, a 'no category' rubric was provided to allow the respondents to make improvements on rubric level. Findings from the first phase were to be discussed and categorized with all respondents during this second phase. In the last phase, the respondents were asked to score the second phase's results (enriched and new categories) according to how the participants perceived the importance for network architecture on a 4-points Likert scale: (1) not important; (2) could be of use; (3) important; and (4) essential. In addition, (-) no opinion was provided.

The results of the first and second rounds were imported into a multiple-choice assessment, to answer this question: "Which network characteristics are connected to which EA elements?" The respondents were asked to check the boxes that, in their opinion, represented the links among the network characteristics and the EA elements.

3.3 Session's protocol

To set up the session's protocol, three conditions must be satisfied to conduct a GSS session successfully (Briggs et al., 2003): (A) conceptual reduction; (B) facilitation skills; and (C) building blocks.

3.1.1 Conceptual reduction

When it comes to keeping the protocol and tool's usability as simple as possible, the respondents have been guided through the process of using the Spilter tool. They were informed about the goal, and set-up of the session, the use of the Spilter tool during the session from the time they were invited until the final results were shared, as well as the core concepts of the rounds.

3.1.2 Facilitation skills

It is hard to simultaneously combine GSS experience and presenter skills (Briggs et al., 2003). Therefore, two people facilitated the meetings to handle any potential technical issues and maintain a clean procedure. The researcher only introduced the theoretical notions to minimize the potential for confirmation bias. The other individual, who did not conduct the research and began with the same conceptual knowledge as the respondents, facilitated the discussions and categorizations.

3.1.3 Building blocks

The Spilter tool works with a library of reusable items for idea generation, clustering, scoring, appointing and rigorous research. With help of a Spilter specialist a selection of those items was used to set up the rounds, guaranteeing the use of standard items and minimizing the time expended for the session.

The networks of danw.nl, knvi.nl, and LinkedIn were used to select and get in touch with the participants. The selection criteria for participants required experience as an enterprise architect or information manager in a network setting, preferably in the healthcare sector. A test session with four volunteers was conducted in January 2026 to perfect the setup's validity. Adjustments were made based on the responders' feedback and the experiences of the facilitators. In February, the first group session was conducted with university researchers in the field of EA, network governance and/or healthcare. Two more group sessions were held in March. All spoken content shared in these sessions was recorded using the Spilter tool and a notebook. A report was created following each session and returned to respondents for verification. The results presented in this article are based on these reports.

4 Results

A total of 17 respondents from 14 organizations across the Netherlands participated in the three group sessions (Table 1). The first group (#1. University researchers) included a total of four researchers. The second (#2 Practitioners) and third (#3 Practitioners) groups consisted of six and seven EA practitioners with organizational network experience, respectively. All respondents had knowledge of or experience with the healthcare sector.

Table 1: Respondents

Group:	# respondents	Average work experience
#1. University researchers	4	6 years (0 - 10 years)
#2. Practitioners	6	11 years (2 - 25 years)
#3. Practitioners	7	7 years (3 - 12 years)

Knowledge of EA for networks	Insufficient	Reasonable	Sufficient	Expert
#1. University researchers	1	1	2	0
#2. Practitioners	0	0	4	2
#3. Practitioners	0	2	4	1

Governance mechanism[1]:	MCN	CN	LIN	PN
#1. University researchers	1		3	
#2. Practitioners	3.5		2	0.5
#3. Practitioners	2.5	1	1	1.5

Source: Authors

[1] (MCN) Managed care network, (CN) Coordinated network, (LIN) Learning and informational network, and (PN) Procurement network

The participants indicated how well they understood EA for networks, network characteristics, and EA elements. The first group gave their level of knowledge with the relevant topics a fair to sufficient rating. Some respondents of the second and third group indicated that they were experts. All respondents were requested to think of a network based on their personal experiences to collect relevant thoughts and examples about the network characteristics and EA elements. The sector to which this network had to belong was not restricted in advance. Based on the respondent's descriptions, the networks were classified as one of the four network governance mechanisms of Maris et al. (2023). All participants were able to use the six network characteristics and five EA elements to define their networks and corresponding EA, no new EA element was proposed in any of the sessions. An extra network characteristic was only added by the third group.

Table 2: Value of network characteristics and EA elements for network architecture[2]

Network characteristics	Motive	NG mechanism	Funding streams	Competencies	Perspective	History	Dimension
#1. University researchers	3,75	3,25	-	2,75	3,00	2,75	2,00
#2. Practitioners	3,83	3,67	-	3,00	2,33	2,83	2,33
#3. Practitioners	4,00	3,57	3,29	3,14	3,00	2,43	3,14
Total average	**3,88**	**3,53**	3,29	3,00	2,76	2,65	2,59
Standard deviation	0,33	0,51	0,76	0,87	0,97	0,79	0,94

EA elements	EA goals	EA relational processes	EA competencies	EA products	EA contractual processes
#1. University researchers	4,00	3,00	2,50	2,75	3,00
#2. Practitioners	3,33	3,67	3,33	3,00	2,50
#3. Practitioners	3,71	3,29	3,43	3,57	2,71
Total average	**3,65**	**3,35**	3,18	3,18	2,71
Standard deviation	0,61	0,79	0,88	0,88	0,69

Source: Authors

[2] Scores are averages on a scale of 1 to 4: (1) not important, (2) could be of use, (3) important, and (4) essential.

At the end of the first and second rounds, participants were asked to each score how they perceived the importance of network characteristics and EA elements for network architecture (Table 2).

Their scores collectively rated network motive and NG mechanisms as the most important network characteristics for network architecture, while EA goals and EA relational processes were rated as the most important EA elements. By the end of the second round the group of respondents had developed common knowledge about the EA elements and network characteristics. With that, they were able to identify whether or not there might be a link between the two (Table 3).

Table 3: Links between Network characteristics and EA elements[3]

	NG mechanism	Motive	Perspective	Competencies	Dimension	History	Funding streams
EA relational processes	**82%**	59%	53%	41%	53%	71%	29%
EA goals	59%	**88%**	71%	41%	35%	35%	29%
EA competencies	47%	47%	41%	**88%**	47%	29%	0%
EA contractual processes	**76%**	41%	35%	29%	41%	29%	86%
EA products	41%	41%	41%	41%	35%	41%	43%

Source: Authors

The links between NG mechanisms and EA processes, motive and EA goals, and network competencies and EA competencies are mentioned the most by the respondents. It became evident which EA elements could be of use in a network environment by combining the value of network characteristics and EA elements with the link score (Table 4). The scores are calculated by multiplying the link score by the average of the network characteristics score and the EA elements score.

The findings demonstrate that the NG mechanisms are best linked with EA processes (relational processes, 2,83; contractual processes, 2,38). Furthermore, the strongest link is between network motives and EA goals, with a score of 3,32 out of 4, and EA competencies link the most with network competencies with a score of

[3] Scores represent the percentage of respondents that identified the combination.

2,72 out of 4. Additionally, there seems to be a strong link between financial flows and EA contractual processes, however, only the third group scored this additional network characteristic. As a result, the reported funding streams' numbers are based on the number of respondents in that group.

Table 4: Combination of value and links

	NG mechanism	Motive	Competencies	Perspective	Dimension	History	Funding streams
EA relational processes	**2,83**	2,13	1,31	1,62	1,57	2,12	0,95
EA goals	2,11	**3,32**	1,37	2,26	1,10	1,11	0,99
EA competencies	1,58	1,66	**2,72**	1,22	1,36	0,86	0,00
EA products	1,38	**1,45**	1,27	1,22	1,02	1,20	1,38
EA contractual processes	**2,38**	1,36	0,84	0,97	1,09	0,79	2,57

Source: Authors

5 Conclusion

The research aim was to determine what EA elements help to manage an IS landscape within healthcare organizations operating within a network governance structure. To refine the characteristics of an organizational network and to link them to usefull EA elements, a group session based on a collaboration engineering approach was designed and tested. In addition, three sessions were conducted.

The findings indicate that network governance mechanisms and network motive are the most important network characteristics for setting up EA within networks, while EA goals and EA processes, particularly relational processes, are the most helpful in a network context. These empirically grounded findings suggest that healthcare managers and enterprise architects should focus on how EA processes within networks are organized in line with the network motive and EA goals, instead of designing and building EA products.

These results help to consider why EA products and EA processes might not fit well with the dynamics of NG contexts, even though they do not provide clarity on potential differences in the emphasis on EA elements per governance

mechanism. Because a network's governance mechanism will likely evolve over time, clarity on this subject could help to position EA as an adaptive governance instrument, rather than a static design method for improving inter-organizational collaboration, which should enhance digital innovation capabilities across public healthcare networks. More generally, this promises to be key aspect of public management in the future. Therefore, we recommend further research on the EA elements primarily associated with each governance mechanism.

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