Enterprise Architecture in Healthcare and Underlying Institutional Logics: a Systematic Literature Review of IS Research

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Abstract

This paper reports on a systematic literature review of empirical studies in the information systems literature focusing on Enterprise Architecture (EA) in healthcare. 30 papers were selected for extended analysis. We utilized institutional logics as a theoretical lens and focused on the logics of IT professionalism, medical professionalism and managerialism. According to this lens, we identified three foci of interests. In addition, we utilized the institutional level as an analytical dimension. The logics of IT professionals and the purpose of organizational implications of EA were dominating. Generally, there is a need for more in-depth understanding for all logics, however, the logics of managerialism and medical professionalism need particularly more attention. Moreover, there is a need for more empirical research to understand how institutional logics for similar professions may differ across institutions. Finally, few studies on EA apply theoretical lenses, and EA research is immature in sense of theoretical contributions.

Keywords: Systematic literature review, enterprise architecture, ehealth, healthcare, hospitals, institutional theory, institutional logics

Introduction

An organization's Enterprise Architecture (EA) describes in a hierarchical way its processes, the data and applications that support these processes, and all related information and communication technology arrangements (Bernard 2012). It allows addressing technologies and processes in a holistic way and mirrors managerial choices related to standardization and integration (Ross et al. 2006). EA is widely accepted as an essential mechanism for ensuring agility and consistency, compliance and efficiency (Winter and Fischer 2006) for the increasingly complex and digitalized contemporary organizations. A plethora of information systems, standards, and vendors increase the complexity and create issues related to interoperability and challenges in service provision (Hjort-Madsen 2006; Moreno et al. 2014). Healthcare organizations (HCOs) are exemplary types of organizations that face significant technological and processual complexity and can realize benefits from EA. Complexity in the domain stems from a variety of interdependencies, with many specializations with their own processes, technology, and data requirements (Gebre-Mariam and Bygstad 2016). Furthermore, new clinical methods are continuously arriving (Bygstad et al. 2015). Coping with these issues has been difficult: reportedly, healthcare lags behind other organizational domains in utilizing information technology (Gandhi 2016; Romanow et al. 2012). EA in healthcare can contribute to the more efficient use of information technology (IT) and to the better assimilation of digital capabilities for process support and service delivery.

Traditionally, information technologies and processes evolved within HCOs in a mixed approach with both large-scale top-down initiatives (e.g. related to the introduction of electronic patient record systems) and bottom-up initiatives closely linked to the information needs of specific functional areas. This allowed room for local decision making and for accommodating diverse aims of different actor groups. Managing the overall Enterprise Architecture entails establishing controls and overarching regulatory mechanisms for following plan-driven approach (Vassilakopoulou and Grisot 2013) that can create tensions with established arrangements. Healthcare is a multifaceted organizational field were multiple competing institutional logics co-exist (Currie and Guah 2007). EA is influenced by the social interdependencies and interactions among stakeholders in which it is embedded (Janssen 2012). Hence, it is critical for the multiplicity of logics to be acknowledged and catered for by EA initiatives.

This paper reports on a systematic literature review of empirical studies in the information systems literature focusing on EA in healthcare. We analyzed the studies identified aiming to trace the different institutional logics represented and to map the relevant theoretical concepts leveraged. We utilized institutional logics as a theoretical lens and focused on the logics of IT professionalism, medical professionalism and managerialism (Boonstra et al. 2017). By foregrounding the different logics in our analysis we provide a contextualized synthesis of prior research that can be valuable for making sense of reported research insights. Researchers and practitioners should know the stakeholders' role to understand why organizations with the same background and conditions obtain different outcomes of their EA programs (Dang 2017). Specifically, our review aims to answer the following research questions (RQs): *1). How are the different logics of IT professionalism, medical professionalism and managerialism addressed in prior healthcare EA research? 2) What theoretical concepts relevant to institutional aspects have informed prior healthcare EA research?* The findings of the analysis provide a comprehensive overview of prior research in the field and directions for further research with an explicit institutional lens. Thus, the principle contributions of this study are twofold. First, we provide a foundation for research development by identifying the significance of the different logics, mapping them in extant research and identifying areas for further research. Second, by systematically synthesizing a significant volume of research we offer a basis that can help researchers orient themselves within the domain and position their own work.

We have organized our paper as follows: first, we describe our theoretical and conceptual foundation. Second, we explain our research method. Third, we present the results before discussing the findings. Finally, we make some concluding remarks and outline avenues for future work.

Theoretical and Conceptual Foundation

Classification of ICT Systems in Healthcare

Information systems for clinical services or for the delivery of healthcare services can be called health information systems (HIS) (Poppe et al. 2014) while the systems for planning the services are referred to as health management information systems (HMIS) (Le Pape et al. 2017). The term that encompasses both tasks is healthcare information technologies (HIT) (Bhattacherjee et al. 2006; Bradley et al. 2012b). To categorize HIT, prior research identified clusters (groups with similar objects) after the systems' primary purpose (Bhattacherjee et al. 2006; Menachemi et al. 2006) or functionality (Paré and Sicotte 2001). The three commonly used clusters are clinical, administrative, and strategic, described as follows: "The *clinical cluster* represented applications designed to improve patient care, such as computerized physician order entry (CPOE) system, electronic medical record, and pharmacy information system. The *administrative cluster* included applications intended to streamline and improve internal data processing activities, such as patient registration system, billing system, and payroll processing system. The *strategic cluster* included applications intended to improve critical decision-making activities, such as executive information system, business intelligence system [e.g., data warehouse], and cost accounting system" (Bhattacherjee et al. 2006, p. 8). Although this classification is based only on findings from hospitals, we find that the clinical and the administrative clusters fit with our understanding of HIS, and the strategic cluster corresponds to HMIS.

Institutional Logics

Institutional theory has been used as a theoretical lens in EA only to a limited extent (Dang and Pekkola 2016). Hjort-Madsen and Pries-Heje (2009, p. 1) applies it in the public sector context, concluding that "[…] fundamental transformation to the tasks performed in government are only achieved if institutional norms and values promote transformation." The study of institutional logics is a research stream within neo institutionalism, this stream had "focused primary attention on the effects of cultural belief systems operating in the environments of organizations rather than on intraorganizational processes" (Scott 2014, p. 53). We adopt the definition of institutional logics by Friedland and Alford (2012, p. 248): "a set of material practices and symbolic constructions – which is available to organizations and individuals to elaborate". Friedland and Alford (2012) emphasize the mutual dependencies among the three levels, society, organizations, and individuals; thus, the analysis must reflect this to understand an institution. Prior research shows that multiple logics exist in HCO; furthermore the professional health care logic of clinicians can conflict with the business logic for managers (Currie and Guah 2007; van den Broek et al. 2014). The concept of institutional logics is instrumental for understanding the behaviors of different players in the healthcare context (Currie and Guah 2007).

The rationality and the world views of different stakeholders influence the design process of HIS. Heeks (2006) suggests three main and potentially conflicting rationalities steering the design process: 1) *technical rationality*, when IT professionals have the dominating role, 2) *managerial rationality*, when health managers are constrained by both the government and financial issues, and 3) *medical rationality*, when clinicians dominate the process. Previous research on institutional logics in HCOs views medical professionalism and managerialism from a business perspective as the prevailing logics steering technological development (Boonstra et al. 2017). Based on these findings, and on Heeks (2006) work, Boonstra et al. (2017) suggest adding the IT professionals' logics as a third type that is important in relation to IT governance in the hospital context. Since EA is closely connected to IT governance, we suggest that these three logics are the most essential in the EA process in HCOs. Institutional logics are the bases for action (Friedland and Alford 2012) and by understanding the logics of stakeholders, we can make better sense of prior research and experiences on healthcare EA. Dang (2017) addresses the micro level of the organization to understand the behavior related to EA activities and describes four institutional logics influencing EA programs in the public sector. Nevertheless, we find it more appropriate to use the logics from the study of Boonstra et al. (2017) when we narrow down the context to EA and healthcare.

Research Method

This study is performed as a Structured Literature Review (SLR). The research design follows the guidelines presented by Okoli and Schabram (2010) and Webster and Watson (2002). Okoli and Schabram (2010) eight-step guide includes the following: 1) purpose of the literature review, 2) protocol and training, 3) searching for the literature, 4) practical screen (screening for inclusion), 5) quality appraisal (screening for exclusion), 6) data extraction, 7) synthesis of studies (analysis), and 8) writing the review. These steps form the process of the SLR, comprising planning, selection, extraction, and execution (Okoli and Schabram 2010).

Our search for articles followed Webster and Watson (2002) recommendations: searching in databases that include leading journals, assessing selected conference proceedings, followed by backward and forward searching for the included articles. We conducted the initial search in the academic database Scopus. Next, we performed the backward search by reviewing the included articles' reference lists. We then carried out the forward search by cross-checking the included articles' citations in Google Scholar. The searches were conducted in December 2017.

To identify articles of high quality, the eight top journals in the IS field as ranked by the Association for Information Systems (AIS) was one of the search criteria. Since healthcare is tightly connected to governments, the Government Information Quarterly was also part of our initial search. Furthermore, we included the four AIS conferences as well as the Hawaii International Conference on System Sciences, which is considered an important conference among IS scholars.

To obtain a manageable number of articles (Okoli and Schabram 2010), the search string was limited to "enterprise architecture" AND ("hospital*" OR "*health*"). For further selection, we employed the inclusion and exclusion criteria presented in Table 1.

Table 1. Inclusion and exclusion criteria used for practical screening and quality appraisal.

Inclusion criteria	• Peer-reviewed studies written in English • Studies with empirical data • Studies in the EA and healthcare context
Exclusion criteria	• Studies clearly stating a context other than healthcare • Studies not relating part of the study to the healthcare context • Studies neither taking a holistic perspective nor setting their work directly or indirectly in relation to EA

Bibliographic data and abstracts from the initial search were imported to EndNote. We screened 126 articles for inclusion by reading their abstracts. In total, 70 articles qualified for the next step, involving quality appraisal. We performed the backward and forward search iteratively and in three steps. First, we identified the works cited in the included articles. Second, we conducted practical screening and finally, qualitative screening. The new articles included were inputs to the next iteration. We selected the articles in the backward and forward search based on their titles, with no criteria for publication outlets.

In the step involving quality appraisal or screening for exclusion, we browsed each article in more detail. When no new articles were identified with the backward and forward search, we reviewed the articles for quality once more before starting the coding. The total number of included articles was 30. Appendix 1 provides an overview all selected articles. Figure 1 illustrates the selection process.

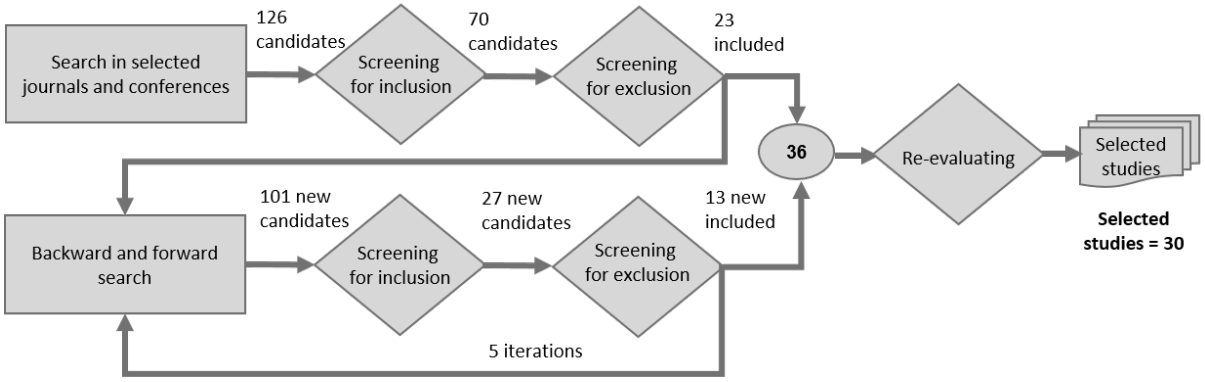

Figure 1. Selection and extraction, by number of articles

We further analyzed the articles by using the NVIVO tool, through first- and second-cycle coding (Miles et al. 2014). Chunks of text from the articles were connected to predefined themes. To answer RQ1, we coded the topics studied, each IT application under study, the research setting (including the country), the stakeholders involved, and the aim and justification of each study. We also coded the findings and used them for the quality assurance of our understanding throughout the analysis. To answer RQ2, we coded two themes: theory and research methodology.

In the first cycle, the coding for categorizing EA research was done without predefined categories. The majority of the articles revolved around modeling and case studies describing the usage and approach to developing EA. To answer RQ1, we interpreted and developed a matrix containing the stakeholders at the different organizational levels and the interest of each study. For RQ2, our main focus was to understand the behaviors of the stakeholders in the EA process. Thus, we grouped the theories into 1) theories relevant to institutional logics, 2) other theories, and 3) concepts and other analytical lenses.

Results

The aim of this study is to get an overview of Information Systems research where EA plays a prominent role in the health care context. Therefore, we included both studies where the researchers utilize an EA perspective directly or indirectly. Figure 2 shows to what degree EA was at the focus of the articles´ scope.

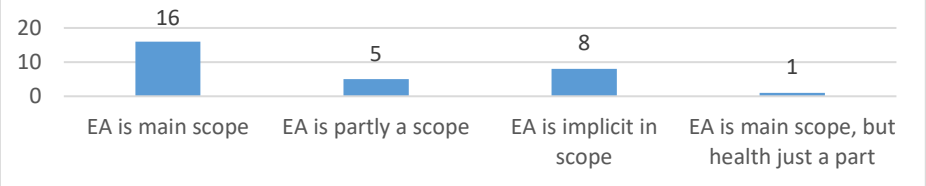

Figure 2. Scope of articles, assessed by the extent of their research interest in EA

If the publication year of the articles is considered, there is a steady stream since the change of millennium, with one to five articles per year. Regarding geographical distribution, we find five studies from Africa (Gebre-Mariam and Fruijtier 2017; Le Pape et al. 2017; Mudaly et al. 2013; Mwanyika et al. 2011; Poppe et al. 2014), eleven from Europe (Ahsan et al. 2009; Bygstad and Hanseth 2016; Bygstad et al. 2015; Gebre-Mariam and Bygstad 2016; Hjort-Madsen 2006; Olsen 2017; Pankowska 2015; Rocha and Freixo 2015; Tan and Liu 2013; Tan et al. 2013; Winter et al. 2003) while thirteen are from USA (Bradley et al. 2012a; Bradley et al. 2012b; Bradley et al. 2011; Bradley et al. 2012c; Bui 2015; Dutta and Heda 2000; King 2013; Oliveira and Nightingale 2007; Raghupathi and Umar 2008; Schooley et al. 2011; Schooley et al. 2010; Setia et al. 2009; Venkatesh et al. 2007). Surprisingly, Asia is represented by only one paper (Kaushik and Raman 2015), and Oceania is not represented at all.

RQ1. How are the different logics of IT professionalism, medical professionalism and managerialism addressed in prior healthcare EA research?

First, we present the administrative, clinical and strategic clusters of HIT which were identified in the studies (Table 2). However, we had to add a general cluster comprising studies that did not address a specific application area (which we named "general HIT"). Next, we present three main foci of interests that were prominent across the selected studies. Finally, we display the matrix comprising the institutional logics addressed, the different institutional levels, and the foci of interests (see Table 2).

Table 2. Overview of IT applications in the studies.

IT applications by cluster	#	Article no. (ref. Appendix 1)
Administrative HIT	**1**	A18
Clinical HIT	**12**	A1, A5, A7, A8, A10, A12, A1, A16, A19, A21, A24, A25
Strategic HIT	**6**	A9, A11, A13, A15, A23, A30
General HIT	**11**	A2, A3, A4, A6, A17, A20, A22, A26, A27, A28, A29

Since there were many studies in the general cluster (Table 2), we started to look for patterns by following the procedure of Miles et al. (2014). We also assessed the stakeholders involved, the research setting, and the aim and justification of each study. The following patterns emerged, and we categorized them into three groups after the topic and overall interest of the study. These categories will from now on be termed as areas of interest.

1) Interest related to IS for healthcare used for a clinical purpose to improve the quality of healthcare, such as electronic patient journal, information architecture, and logistics. They address specific HIS and contribute to the architectural design for processes or in layers.

2) Interest related to organizational implications when an EA approach is adopted, including the value of the EA, collaboration, roles, organizational structures, and IT governance.

3) Interest related to EA tools, such as EA-frameworks and modeling tools and approach.

In our analysis, the research setting is related to the type of organization that each study addresses, for example, hospitals as single organizations or the inter-organizational level, such as nations. The categories used are international, national, district (region, state, and county), or a single HCO. However, a single HCO can be a large organization consisting of many sub-organizations, such as the Veterans Health Administration. Nevertheless, single organizations have an intra-organizational nature, while the rest are characterized by an inter-organizational nature. By taking into account the cross-analysis of stakeholders, interests, and research settings, we assessed the institutional logics that each study addresses and developed the matrix presented in Table 3. Note that some articles are present in several cells. The numbers in the matrix refer to the articles included in the review based on the coding that appears in Appendix 1. In the following paragraphs, we explain the matrix and how the studies are distributed according to the dimensions applied.

Table 3. Overview of interests and institutional logics addressed in each study.

		Single Organization Level			**District, Regional or other Inter-organizational Level**			**National Level**	**International Level**
		IT logic	**Medical logic**	**Managerial logic**	**IT logic**	**Medical logic**	**Managerial logic**	**No distinct logics**	**No distinct logics**
Research Interest	**Healthcare IS for clinical purposes**	A1	A1	A1, A18	A13, A24, A25, A29	A24	A29	A21	A21
	Organizational Aspects	A2, A3, A4, A5, A12, A26			A6, A7, A8, A10, A13, A14, A19, A25, A29		A7, A9, A13, A29	A21, A11, A12, A13 A15, A16	A21
	EA Tools	A22, A23, A27, A30	A27		A20, A28	A28		A17	

Interest 1. Studies related to healthcare IS for clinical purposes

For single organizations, A1 developed a framework aiming to control patient's locations. This research addresses the needs of managers and clinicians. By addressing the managers' need for cost containments and better use of qualified health personnel, A18 provides an EA approach to integrating inventory management in hospitals and offers empirical evidence of perceived benefits.

At the inter-organizational level, a design of a high-level core diagram is helpful in linking technology to the core processes (A13); as such, it addresses the IT professionals' logics. Paper A25 describes multi-organizational time-critical service requirements to design systems, hence, we assign this study to the IT professionals' logics. Paper A24 is about the development of an emergency medical service system so we assigned it to bot the IT and medical logics.

Both national and international levels are addressed in A21 which is about strengthening the national HIS in Ghana, and creating a regional HIS for the West African Health Organization. This study not only addresses the IT professionals' logics but also provides a rich description of the implications of organizational structures that is useful for managers.

Interest 2. Studies related to organizational implications when an EA approach is adopted

This category is most frequently addressed, that is, in 21 studies. To support single organizations, there are five surveys that evaluate EA (A2, A3, A4, A5, and A26), and one study describes challenges related to recommendations from the national level (A12).

In the inter-organizational setting, the IT professionals' logics is addressed in nine studies. Coordination and alignment of work processes across different organizations and at different levels constitute a central issue (A7, A8, A10, A14, A19, and A25). Despite the challenges in architecting ICT solutions and in IT governance, EA programs can be successful (A6, A13, and A29). A29 also addresses the managers' logics by showing the principles and organizational implications for success. A7 and A13 address both IT professionals and managers. While A13 discusses political and strategic implications, A7 discusses higher-level managers´ utilization of a strategic analytical tool and identifies tensions arising in the architecture and governance process. The management logics is addressed in A9, outlining business processes and architecture requirements for managing care.

At the national and the international levels, the studies address miscellaneous institutional logics. A11 describes the evolution of a national large-scale HIS and its organizational implications, and A12 presents results from studies focusing on the reasons and implications for the national adoption of an EA program. Furthermore, A13, A15, and A16 describe the architectural approaches used in national EA programs. Finally, one of the studies addresses challenges for obtaining international collaboration at the architectural level to improve decision making for the managers (A21).

Interest 3. Studies related to EA tools

A22 explores the potential of the model-driven architecture (MDA) in a single organization and supports the IT professionals' logics. A22 describes the guidelines, and proposes that MDA has the potential to overcome challenges such as vendor dependency, interoperability, portability and scalability. A23 studies quality management (QM) systems and contributes to an information architecture for QM support, which was implemented with positive effects in the Hospital Unit under study. A30 describes the requirements for hospital IS, and a modeling tool to meet these requirements is designed. Tools to improve the architects' work support the IT professionals' logics.

Two studies focus on tools for improving the quality of HIS for IT professionals and clinicians (A27 and A28). In A27, a model is developed in a UK hospital, and in A28, the researchers highlight how the model can be utilized in pervasive healthcare across organizations. In a study focusing on modeling (A20), the Architecture Model of Healthcare Presumption provides an overview of all stakeholders involved in the EA development process across organizations. The model is valuable for architects at distinct levels in terms of business functions and application infrastructure.

In one of the studies, a general EA framework supporting the national level is developed. The framework provides a systematic architected rational approach (SARA) and aims to design and implement HIS on a national level. Moreover, the authors present how SARA adopts parts of TOGAF and some modifications from other frameworks (A17).

RQ2. What theoretical concepts relevant to institutional aspects have informed prior healthcare EA research?

Analyzing the theoretical lenses in the studies is not straightforward because the term theory is used in a broad sense in some studies included in this SLR. The definition of theory is discussed in many disciplines and in IS as well (Gregor 2006; Orlikowski and Iacono 2001; Walsham 1995). We adopt Gregors's (2006, pp. 616,614) view that a theory "aim[s] to describe, explain, and enhance [the] understanding of the world and, in some cases, to provide predictions of what will happen in the future and to give a basis for intervention and action. ...Thus, the word theory will be used here rather broadly to encompass what might be termed elsewhere conjectures, models, frameworks, or body of knowledge."

In total, we find 18 articles stating the use of a theory in their studies; some employ more than one. Since these studies' research interests are EA, healthcare, and institutional logics, we group our findings into three categories: 1) theories relevant to institutional logics, 2) other theories, and 3) concepts and

other analytical lenses. Due to space limitations, further results and discussions are restricted to category 1. Under this category, we map the following theories and concepts (the numbers in the matrix refer to the articles included in the review; see Appendix 1): power and politics (A2), tensions (A7), complexity theory (A8), coordination theory (A10 and A14), actor-network theory (A11), institutional theory (A12), stakeholder theory (A20), and intrinsic motivation concepts (A24).

A2 uses the power and politics perspective in analyzing the efficiency of IT governance. The study finds it important that the CIO should have more power to be an important player when top management teams prepare goals for new ICT initiatives. Hospitals without sufficient involvement of the CIO, where the CEO and non-IT members of top management teams have the strongest voices, tend to have less optimal IT governance, leading to lower overall performance.

A7 uses tension as a theoretical lens to prepare a framework that shows the conflicting forces related to IT governance and IT architecture decisions. Time, scale, and agency are the three main tensions. The complexity theory is used by A8. The study finds that organizational complexity decreases in the shift from IT silos to standardized software; there are fewer user groups to involve. The coordination theory is used by A14 to analyze the differences in the operation model for e-prescription, transferring from a paper-based to a computer-based network. The study finds that healthcare policymakers leading the change do not pay enough attention to the network members' view on the workflow, probably leading to reluctance to the adoption process. A10 uses the coordination theory to explain the increased organizational coordination efforts needed in a large ICT project aiming for conformity, due to a complex organization and a highly specialized workforce with numerous interdependencies. Consequently, it is important to consider how the EA influences the organizations.

The actor-network theory is used by A11 to explain how an outsourcing company turns makes itself into an obligatory passage point in the development and implementation of a large-scale HIS, thus hindering a more effective and coordinated national HIS. A12 uses institutional theory to capture the dynamic interaction between individual agencies in government. An important finding is that taking into account how institutional structures are arranged in multilevel organizations is imperative for enabling the development of interoperable services. We understand that the different institutional logics have severe consequences for architectural decisions. A20 uses the stakeholder theory to emphasize EA stakeholders' activities, their motivations, goals, constraints and values. Finally, paper A24 uses the concept of intrinsic motivation from the socio-psychological theory. The researchers find that for both pre-hospital and hospital personnel, there is an intrinsic motivation to help people and the design of systems should support this intrinsic motivation.

Discussion

Enterprise architecture is an approach, a method, and a process used to handle complexity related to IS for large organizations. This implies that EA as a research discipline is also complex and takes many directions; it is more like a jellyfish than an octopus. Several EA studies take a holistic perspective on EA and discuss several core topics for this concept such as integration, standardization and interoperability. These studies explain how organizations can achieve the main goals of EA by focusing on different EA approaches, maturity, frameworks and EA management. However, in this SLR we contribute by foregrounding the institutional aspects that are represented in prior EA research. For this purpose, we analyzed and categorized 30 empirical papers into a matrix (Table 3) according to institutional logics, foci of interests and institutional levels (international, national, region, inter-and intra-organizational).

In the vertical dimension of our matrix (Table 3), we make a distinction of organizational levels, as well as the different institutional logics. The reason for the first aspect is that the organizational level under investigation is important, and jurisdictional borders can identify the levels because "[…] activities and meanings occurring at one level are often linked to and activate activities and meanings at other levels" (Scott 2014, p. 105). The reason for the second aspect is that the institutional logics for the different professional disciplines in an organization stems from the individual education and work experience and the organization's culture (Boonstra et al. 2017). Thus, we expect that the institutional logics for the same profession in two cooperative organizations can differ.

Enterprise architecture planning is important for achieving the goals outlined in an organization's strategy (Jusuf and Kurnia 2017; Schmidt and Buxmann 2011). However, there can be conflicting goals due to multiple levels within HCOs. Therefore, we argue for the need to make the distinction between levels. This rhymes with prior research that has identified relevant tensions in IT governance in hospital setting (Boonstra et al. 2017; Bygstad and Hanseth 2016). Furthermore, the national level also matters as government's requirements, for example, on how to achieve interoperability (Hjort-Madsen 2006) can influence EA. Finally, the international level also needs attention. For instance, there are situations where it is important to build systems to monitor and to prevent the spread of diseases, such as the Ebola outbreak in West Africa (Poppe et al. 2014).

The first finding in our analysis is that two-thirds of the studies revolve around interests related to organizational implications when an EA approach is adopted, and the studies mainly address the IT professionals' logics. In these studies, IT professionalism represents a strong institutional logic which can be beneficial for the CIOs and the enterprise architects in discussions with their superiors arguing for strategic ICT investments and necessary organizational adaptations.

The second finding is that we could have expected to find more studies addressing the managerial profession since one of the main factors for succeeding with EA is top management support (Lee et al. 2016; Venkatesh et al. 2007; Ylimäki 2006). Enterprise architecture has contributed to the beneficial digital transformation of HCOs (Bradley et al. 2011; Bui 2015; Gebre-Mariam and Bygstad 2016; Kaushik and Raman 2015; Venkatesh et al. 2007); however, some studies have discussed the challenges of getting business value from EA (Bui 2015; Gebre-Mariam and Bygstad 2016). For the top managers and clinicians, the prospect of a positive outcome can be crucial for their approval of and participation in projects (Chakravarti and Varma 2008; Drews and Schirmer 2014). The evaluation of EA is a topic in Bradley's research (Bradley et al. 2012a; Bradley et al. 2012b; Bradley et al. 2011), but few other studies address effectiveness in the health context. Bradley's research comprises US hospitals, and they have other political guidelines compared with the cases in European and low-income and middle-income nations. Context is important since both public sector organizations and HCOs have other incentives than the private sector that strives for economic success (Fountain 2004).

Third, it seems that the logic of medical professionalism is scantily addressed (only in four studies); however, the aim of improved healthcare quality is the rationale for most of the studies in this review.

As part of the IS community, EA studies "are designed to predict outcomes [of changes in IS] as a way to test theories and models or to provide explanations of outcomes in order to generate theoretically informed insights into organizational behaviors" (Chiasson et al. 2007, p. 90). Emphasizing organizational and sociotechnical issues, Chiasson et al. (2007) believe that IS research can contribute to advancement in the knowledge base for medical informatics. We therefore provide an overview of the theories used in EA and health care context relevant to institutional logics as an input to the theory marketplace for the IS community. The fourth finding is that 12 of the 30 studies neither use theories or concepts nor build on specific research streams or fields. We also find inconsistencies in the use of the terms theory and concept (e.g., theory of EA, EA concept). We have grouped the theories into three categories, where we review theories relevant to institutional logics in more depth. Here we found 9 studies using 8 different theories (two with coordination theory). In the next paragraph, we discuss how these theories indirectly shows that more attention is needed to the different professional logics.

The IT professional's logic is addressed by Bradley and colleagues that used the power and politic perspective to show that the CIOs degree of power influence the efficiency of IT governance (Bradley et al. 2012a). Tension is used as theoretical lens by Bygstad and Hanseth (2016) through the tension of time, scale and agency. In addition, we see that the same profession can have different logics at different organizational levels. Both complexity (Bygstad et al. 2015) and coordination (Gebre-Mariam and Bygstad 2016; King 2013) theory is used to show the implications and adjustment of efforts needed related to managing the complexity in inter-organizational settings. Institutional theory explains that institutional structures in inter-organizational setting are important for the outcome of EA initiatives (Hjort-Madsen 2006), and stakeholder theory is a helpful lens to identify the different logics (Pankowska 2015).

Conclusion and Implications for Future Research

This review has focused on empirical research conducted on EA within healthcare. We have identified and analyzed 30 journal and conference papers to identify the institutional logics that has been addressed, and the theoretical lenses used, relevant to the institutional aspect. The research design has followed guidelines of Okoli and Schabram (2010), and we assessed the foci of interests in the selected studies, the clusters of IT applications which were highlighted, and the stakeholders involved. We found three areas of interests; 1) interest related to IS for healthcare used for a clinical purpose, 2) interest related to organizational implications when an EA approach is adopted, and 3) interest related to EA tools. We used predefined institutional logics for the healthcare context: managerial logic, medical professionalism, and IT professionalism (Boonstra et al. 2017).

Our analysis has identified research gaps that are consequential for future research. Our findings demonstrate that research on EA within healthcare is scarce in the IS community. We have proven that EA research revolves around several issues in the same study because of the broad scope of EA. This can be disadvantageous and there is a need for addressing specific EA topics through in-depth studies. To be able to influence the institutionalization process of EA, which means holistic thinking and a large degree of collaboration among the stakeholders, we have identified three institutional logics that need more exploration and improved understanding in future research. Additionally, we have emphasized the importance of addressing these logics at various organizational levels, and not as lateral groups. This insight has implications for both researchers and practitioners in the field.

Since it is a challenge to describe the value of EA, researchers can address the managerial professionalism logics with more research revolving around evaluation and measurement to facilitate the explanation of the EA benefits and value for HCOs. This recommendation is in the line with calls for further research related to EA evaluation (Andersen and Carugati 2014; Rasti et al. 2015). Another knowledge gap we observe is because of the strong impact of clinicians (Bradley et al. 2012c; Currie and Guah 2007) there should be more knowledge about how to urge clinicians to adopt the holistic view that pervasive healthcare demands.

Because of the importance of healthcare for society, it is crucial to sort out the institutional levels and the corresponding institutional logics. By understanding the logics, practitioners will be able to address the needs of each logics and add a piece of the puzzle to bring healthcare closer to other industries in terms of digital maturity. However, we have observed that other theoretical lenses are fruitful in gaining an understanding of the processes toward pervasive healthcare. Further research can explore other complementary theories in the context of EA and health care context to help the healthcare domain take advantage of ICT at the same levels as other industries.

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Appendix 1: Overview of the selected articles

#	Article reference	Scope
A1	Ahsan et al. (2009)	partly EA
A2	Bradley et al. (2012a)	implicitly EA
A3	Bradley et al. (2012b)	mainly EA
A4	Bradley et al. (2011)	mainly EA
A5	Bradley et al. (2012c)	mainly EA
A6	Bui (2015)	mainly EA part health
A7	Bygstad and Hanseth (2016)	partly EA
A8	Bygstad et al. (2015)	implicitly EA
A9	Dutta and Heda (2000)	partly EA
A10	Gebre-Mariam and Bygstad (2016)	mainly EA
A11	Gebre-Mariam and Fruijtier (2017)	mainly EA
A12	Hjort-Madsen (2006)	mainly EA
A13	Kaushik and Raman (2015)	mainly EA
A14	King (2013)	mainly EA
A15	Le Pape et al. (2017)	mainly EA
A16	Mudaly et al. (2013)	mainly EA
A17	Mwanyika et al. (2011)	mainly EA
A18	Oliveira and Nightingale (2007)	mainly EA
A19	Olsen (2017)	mainly EA
A20	Pankowska (2015)	mainly EA
A21	Poppe et al. (2014)	partly EA
A22	Raghupathi and Umar (2008)	implicitly EA
A23	Rocha and Freixo (2015)	implicitly EA
A24	Schooley et al. (2011)	implicitly EA
A25	Schooley et al. (2010)	implicitly EA
A26	Setia et al. (2009)	mainly EA
A27	Tan et al. (2013)	implicitly EA
A28	Tan and Liu (2013)	partly EA
A29	Venkatesh et al. (2007)	mainly EA
A30	Winter et al. (2003)	implicitly EA