Enterprise Architecture Assimilation: An Institutional Perspective

Completed Research Paper

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Abstract

Enterprise architecture (EA) has long been propagated in information systems research as an approach for guiding diverse local stakeholders toward a common holistic perspective. Despite its maturation over the past decades, organizations still encounter institutional obstacles with realizing EA's intended outcomes. Literature addressing this challenge mainly understands EA as an exogenous phenomenon that needs to be brought into the organization. In the paper at hand, we aim to go one step further. We focus on EA assimilation by studying the influence of institutional pressures that make EA part of the organization's worklife and thus contribute to EA's intended outcomes. By capturing all institutional pressures through which EA may become an inherent part of the organization's worklife, we empirically confirm their influence on EA assimilation and EA outcomes. In addition, we find the engagement of local organizational stakeholders to significantly mediate the relation between institutional pressures and EA assimilation.

Keywords: Enterprise architecture (EA), EA outcomes, EA assimilation, institutional pressures, local stakeholder engagement

Introduction

It is widely acknowledged that an organization's performance depends, among other factors, on the employed information systems (IS) that support its diverse business operations (Williams and Karahanna 2013). The larger the organization and the higher the diversity of its business operations, the more likely IS development budgets and project ownerships will be allocated to local business units. While local IS ownerships foster the alignment of IS development endeavors with local business needs, they often bring about the lack of IS efficiency and IS flexibility in dealing with cross-unit synergies and integration requirements (Peterson 2004). Hence, it has become vital for organizations to take an enterprise-wide perspective beyond local IS, considering the entire set of IS and their supported business operations, i.e. to take an *enterprise architecture* (EA) perspective. Taking an EA perspective helps organizations to guide the design and evolution of their entire set of IS to assure intended outcomes of IS efficiency and IS flexibility on an enterprise-wide level (Schmidt and Buxmann 2011).

After its inception in the late 1980s (Zachman 1987) and advancements over the past decades (Simon et al. 2013), EA is still considered a maturing discipline in the IS literature. Early studies mainly promoted a set of artifacts for EA representation and management, such as EA standards, principles, plans, methods, modeling techniques, and frameworks (Boh and Yellin 2006; Richardson et al. 1990; Zachman 1987). Later studies focused on EA's situational adoption in different organizational contexts (Aier 2014; Haki et al. 2012; Schmidt and Buxmann 2011; Ylimäki and Halttunen 2006). Yet, organizations continued to encounter institutional obstacles with realizing EA's intended outcomes (Gardner et al. 2012; Löhe and Legner 2014). Notwithstanding research's contributions in recent years, existing studies preeminently focus on EA as an exogenous phenomenon that needs to be *brought into the organization*. Owing to EA's ambition of guiding local IS endeavors toward enterprise-wide objectives, we argue that EA needs to be considered as an inherent *part of the organization*, ingrained in local stakeholders' decisions and activities to unfold its intended outcomes.

Complementing prior research that focuses on *bringing EA into the organization*, the objective of this study is to explain *EA as a part of the organization*, which we refer to as *EA assimilation*. The concept of assimilation is rooted in the innovation assimilation literature; it has been used to explain the extent to which innovation is "absorbed into the worklife of the firm" and demonstrates its usefulness (Swanson and Ramiller 2004, p. 558). In order to account for assimilation, our objective is to step beyond perspectives of EA representation and adoption toward its "full institutionalization" (Fichman 2001). As institutional pressures (i.e. coercive, normative, mimetic) capture the underlying mechanisms of assimilation (Mignerat and Rivard 2009), we focus on their influence through which EA becomes part of the organization's worklife and thus contributes to its intended outcomes. We seek to answer the following research question (RQ):

RQ: What is the influence of institutional pressures on EA assimilation and outcomes?

Building on the lens of institutional theory, assimilation research, and EA literature, we derive a research model for explaining the realization of intended EA outcomes through EA assimilation in an organization. Testing our model via a partial least squares approach to structural equation modeling, we demonstrate that institutional pressures are positively related to EA assimilation. In turn, we confirm EA assimilation to be positively related to EA outcomes. We find additional explanation on the relation between institutional pressures and EA assimilation through the engagement of local organizational stakeholders, which significantly mediates this relation.

The remainder is structured as follows: first, we lay out the state of research on the main concepts comprised by our research, i.e. EA, assimilation, institutional pressures, and the engagement of local stakeholders. Second, we derive the research model and its constitutive hypotheses. Finally, we present our results and conclude by a discussion of our insights as well as their implications for prospective research.

Conceptual Foundation

Enterprise Architecture

EA refers to a holistic perspective on the organization's entire set of IS and their supported business operations, reflecting integration and standardization requirements of the organization (Ross et al. 2006). Its main intended outcomes (*EA outcomes*) are IS efficiency and IS flexibility (Lange et al. 2016): efficiency

relates to an organization's ability to support business operations with the required IS and minimized unnecessary redundancies (Schmidt and Buxmann 2011), while flexibility concerns an organization's ability to quickly adapt its IS to new or changing requirements (Tallon and Pinsonneault 2011).

Focusing on how to reach the intended EA outcomes, different research streams have emerged over the past decades. Research has started in the early 1980s with developing adequate representations of EA (*EA conceptualization*) and gained significant momentum in the late 2000s with the focus on *bringing EA into the organization* (Simon et al. 2013).

EA conceptualization. Early publications focused on the adequate representation of EA through various artifacts (Schönherr 2004). Prominent artifacts include frameworks, such as the Zachman Framework (Zachman 1987) or The Open Group Architecture Framework (The Open Group 2018), as well as modelling techniques (Jonkers et al. 2004). Since the late 2000s, research began shifting the focus from rather technical EA representations to more holistic conceptualizations that also include organizational aspects, such as business strategies or processes (Winter et al. 2014). Despite the growing and comprehensive body of sophisticated EA artifacts (e.g., models, frameworks, principles, plans), a key EA challenge remained, that is to tailor EA to fit specific organizational contexts (Peristeras and Tarabanis 2000).

Bringing EA into the organization. Bringing EA into the organization remains a challenge for organizations due to the variety and interdependencies of IS developments as well as their affected, local stakeholders (Boh and Yellin 2006). Therefore, the responsibility for managing EA becomes usually anchored at a higher hierarchical level in organizations, i.e. at the top management level for enforcing EA compliance of local IS change and development endeavors in a top-down fashion (Richardson et al. 1990). Despite the growing maturity of EA artifacts and management approaches, organizations continue to experience institutional obstacles with realizing EA's intended outcomes (Gardner et al. 2012; Löhe and Legner 2014). To address this challenge, EA scholars have employed a variety of perspectives, such as situational adaptation (Aier et al. 2008; Haki and Legner 2013a; Ylimäki and Halttunen 2006), organizational adoption (Haki et al. 2012), organizational culture (Aier 2014; Faller et al. 2016), and organizational critical success factors (Schmidt and Buxmann 2011; Ylimäki 2006). Building on research's valuable contributions for *conceptualizing EA* and *bringing EA into the organization*, in the paper at hand, we aim to take the discourses in EA research one step further by focusing on the institutional influences that make EA *part of the organization*. Complementing prior research, we assume that EA may unfold its intended outcomes when being ingrained in local stakeholders' decisions and activities.

Making EA part of the organization. In order to explain EA as a part of the organization and its related outcomes, we focus on the assimilation of EA. The concept of assimilation has been favored in the IS literature for moving researchers' scope beyond adoption phases, helping scholars to explain the extent to which the phenomenon subject to assimilation is absorbed into the worklife of organizations (Swanson and Ramiller 2004). Consequently, we review the concept of assimilation in the following.

Assimilation

Assimilation refers to the extent, to which a new phenomenon, such as an idea, device system, or a method, demonstrates its usefulness as a part of the worklife of an organization (Swanson and Ramiller 2004). As such, the new phenomenon becomes woven into the fabric of an organization's work system, even as this work system undergoes changes over time (Swanson and Ramiller 2004). In the IS literature, assimilation has been captured through the constructs awareness, understanding, and use (Lewis et al. 2003; Liu et al. 2010; Purvis et al. 2001).

Awareness. To become an integral part of the organization's worklife, organizational stakeholders need to become aware of the new phenomenon (Armstrong and Sambamurthy 1999). Likewise, organizational stakeholders need to become aware of the new phenomenon's fit to their business (e.g., processes) and information technology (IT) environment (Armstrong and Sambamurthy 1999).

Understanding. While being aware, stakeholders often encounter significant challenges and doubts in valuing the enhancements of their work activities and decisions through the new phenomenon (Liang et al. 2004). Valuing hereby refers primarily to an understanding of costs and benefits to the organization for using the new phenomenon (Purvis et al. 2001). In order to make effective use of a new phenomenon, organizational stakeholders need to understand how to conduct (or eventually adjust) their work activities and decisions appropriately (Fichman and Kemerer 1997; Saga and Zmud 1994).

Use. Use builds on awareness and understanding, measuring how the new phenomenon spreads in the organization's work system. Hereby, the literature differentiates primarily breadth and depth of use. Breadth explains how broadly (e.g., coverage of organizational units) the new phenomenon is used (Purvis et al. 2001), while depth reflects on how extensively the new phenomenon is used (e.g., embedded in thoughts or moving even deeper into the culture of the organization) (Liang et al. 2007).

For explaining assimilation, scholars have studied the influence of institutional pressures (Mignerat and Rivard 2009). Institutional pressures capture the underlying mechanisms (e.g., rules, norms, values, assumptions, or beliefs) that make a new phenomenon part of the organizations' worklife (Dacin et al. 2002; Orlikowski and Robey 1991). Institutional pressures are highlighted by institutional theory, which has emerged as a powerful lens in IS research over the past decade (Mignerat and Rivard 2009). In the following, we review the concept of institutional pressures.

Institutional Pressures

Institutional pressures have been promoted by institutional theory as underlying mechanisms of assimilation (Mignerat and Rivard 2009). Theory conceptualizes organizations as social constructions that seek to gain legitimacy in their environment. To gain legitimacy, such as with a new phenomenon, organizations adhere to a web of institutional pressures that are prevailing in their environment (Orlikowski and Robey 1991; Scott 2013). Theory distinguishes three institutional pressures, namely *coercive*, *normative*, and *mimetic pressures* (DiMaggio and Powell 1983; Scott 2013).

Coercive pressures stem from rules and regulations that constrain organizational behavior. Ang and Cummings (1997), for example, studied the influence of federal regulations on the banking industry and found that these regulations exert substantial influence on the assimilation of IS outsourcing practices. *Normative* pressures cater an obligatory dimension into social life by shared norms, values, and standards among organizational counterparts. For instance, Liang et al. (2007) showed that industry standards provide binding norms to organizations and thus lead to an assimilation of ERP systems. *Mimetic* pressures stem from mimicking others' action or behavior that are perceived as successful. According to Tingling and Parent (2002), the assimilation of a technology results from managers mimicking other organizations—that successfully use this technology—even if contrary to objective evaluations of the technology by their own staff.

The main body of IS research uses institutional theory at the inter-organizational level of analysis, studying the influence of institutional pressures on the assimilation of a new phenomenon (e.g., novel IS outsourcing practice or ERP system) from one organization to another (Mignerat and Rivard 2009). Complementarily, a few studies have investigated assimilation at the intra-organizational level of analysis, focusing on institutional pressures that arise from entities within an organization and that thereby influence the behavior of organizational stakeholders (Liu et al. 2010). Stakeholders follow institutional pressures, such as rules, norms, values, or beliefs to gain legitimacy with the new phenomenon in their environment, making it thus part of the organization's worklife (Liu et al. 2011). For this reason, stakeholder engagement may be well-suited for explaining the relation between institutional pressures and assimilation (Lewis et al. 2003).

Engagement of Local Stakeholders

Institutional theory suggests that the behavior of organizational stakeholders is significantly influenced by their surrounding institutional arrangement, which is composed by institutional pressures (Scott 2013). As stakeholders seek to gain legitimacy in their environment, they conform to their institutional arrangement and thus follow institutional pressures to make the new phenomenon part of their worklife.

In this regard, the engagement of local stakeholders plays an important role. Local stakeholders follow institutional pressures that are exerted by global (e.g., top management) and other local stakeholders, exploring if and how the new phenomenon fits or enhances their individual decisions and activities (Liu et al. 2010; 2011). This leads stakeholders to develop a greater awareness as well as a greater shared understanding of the phenomenon's value and benefit to the organization (Lewis et al. 2003). Consequently, stakeholders also understand how to adjust their specific work processes through the use of the new phenomenon appropriately (Chatterjee et al. 2002). Furthermore, stakeholders propagate knowledge, belief, and commitment, which support the breadth and depth of use of the phenomenon in their worklife (Liu et al. 2010). Following the existing IS institutional and IS assimilation research (Liang et al. 2007; Mignerat and Rivard

2009), we conclude the engagement of local stakeholders as a mediator on the relation between institutional pressures and assimilation, helping to better explain this relation.

Hypotheses Derivation

In order to study EA assimilation and its related EA outcomes, our research model considers the role of institutional pressures and the engagement of local stakeholders (Figure 1). For deriving hypotheses, we present the research model at a higher level of abstraction (Chin 1998; Lohmöller 1989). We differentiate four higher-order constructs to derive our hypotheses. The eight lower-order constructs are based on our conceptual foundation and reflect the higher-order constructs (Wilson and Henseler 2007).
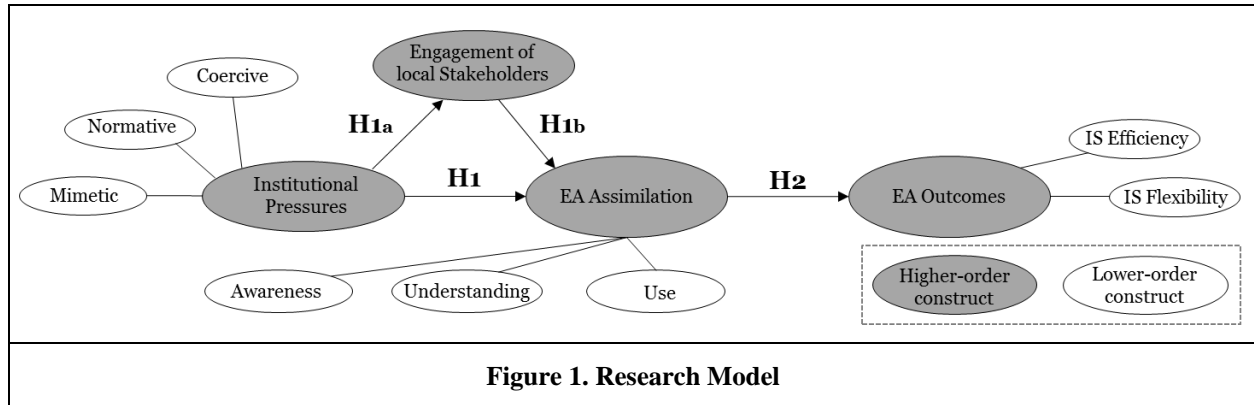

Figure 1. Research Model

We expect institutional pressures (reflected by coercive, normative, and mimetic pressures) to be positively related to EA assimilation (reflected by awareness, understanding, and use). The engagement of local stakeholders is expected to mediate the relation between institutional pressures and EA assimilation. Finally, EA assimilation is expected to be positively related to EA outcomes (reflected by IS efficiency and IS flexibility).

Enterprise Architecture Assimilation

In the EA context, coercive pressures are reflected primarily in architecture artifacts, such as plans, models, procedures, frameworks, standards, and principles (Aier et al. 2011; Haki and Legner 2013b; Richardson et al. 1990). Furthermore, boards and governance committees represent means to exercise architecture artifacts, to propagate EA value, as well as to enforce and sanction EA use (Boh and Yellin 2006; Boh et al. 2003; Lange et al. 2016; Schmidt and Buxmann 2011).

Normative pressures occur in the form of norms, values, and expectations. When not grounded in norms and values of the organizational work environment, it is unlikely that EA will develop a shared understanding of its value and benefits for the organization (Aier 2014). Consequently, EA is likely to lack recognition (Faller et al. 2016; van Steenbergen 2011) and will thus remain only partially used (Niemi 2007; Op't Land and Proper 2007). Similarly, it is necessary that EA meets stakeholders' expectations. When deployed in line with stakeholders' expectations, EA will receive greater acceptance, and therefore, remains more broadly and extensively used in decisions and work activities (Tamm et al. 2011; Weiss et al. 2013).

Mimetic pressures are reflected in observation, communication, and imitation. These pressures are shown to foster an enhanced understanding of EA value as well as ultimately a greater EA use (Foorthuis et al. 2016; Foorthuis et al. 2010). On the one side, communication leads to a larger exchange of EA knowledge, experiences, learnings, and best practices (Abraham et al. 2015; Lankhorst 2005; van Steenbergen and Brinkkemper 2009). On the other side, EA and its value propagate through stakeholders who observe and imitate their counterparts that are perceived as successful or legitimate when using EA (Brosius et al. 2016; Weiss et al. 2013). By considering coercive, normative, and mimetic pressures, we assume that institutional pressures are positively related to EA assimilation:

H1: Institutional pressures are positively related to EA assimilation.

The engagement of local stakeholders helps to better explain the relation between institutional pressures and assimilation (Mignerat and Rivard 2009). In the EA context, local stakeholders refer to representatives

of IT projects, involving personnel from the IT (e.g., software engineers) and business (e.g., business analysts) side (Boh and Yellin 2006). Furthermore, pressures reflect an institutional arrangement in the EA context, in which local stakeholders follow a web of EA rules, principles, norms, values, beliefs, and best practices that are propagated by top management, senior enterprise architects, or other local stakeholders (Aier 2014; Boh and Yellin 2006; Brosius et al. 2016). Thereby, local stakeholders contribute to a greater awareness, understanding, and use of EA in their environment by being aware of enterprise-wide goals, understanding their value, as well as using them in their day-to-day decision-making (Boh and Yellin 2006; Boh et al. 2003; Tamm et al. 2011; Weiss et al. 2013). For this reason, we assume that the engagement of local stakeholders mediates the relation between institutional pressures and EA assimilation. We reflect this mediation via the following two hypotheses:

H1$_a$: Institutional pressures are positively related to the engagement of local stakeholders.

H1$_b$: The engagement of local stakeholders is positively related to EA assimilation, reflecting a mediation of the relation between institutional pressures and EA assimilation.

Enterprise Architecture Outcomes

Assimilation is captured by awareness, understanding, and use. In the EA context, most studies take a concerted view on EA outcomes, measuring both IS efficiency and IS flexibility (e.g., Brosius et al. 2016; Lange et al. 2016; Schmidt and Buxmann 2011). In this regard, EA awareness, understanding, and use have been demonstrated to contribute to EA outcomes. For instance, awareness and understanding of EA are studied by Lange et al. (2016). They found both to be positively related to EA outcomes. Brosius et al. (2016) confirmed a positive relation between cooperative learning and EA outcomes. They investigated cooperative learning among stakeholders who share knowledge and learn about the EA function, its intended value, as well as its benefits for the organization. Finally, Boh and Yellin (2006) focused on EA use, finding it positively related to EA outcomes. They understood use in terms of breadth (i.e. the number of key stakeholders using and conforming to EA) and depth (i.e. the extent to which EA standards are formally defined for different purposes). These findings lead us to assume that EA assimilation overall is positively related to EA outcomes:

H2: EA assimilation is positively related to EA outcomes.

Research Method

Construct Operationalization

To operationalize the constituent constructs of our research model, we adapt existing measurement items from the IS institutional, IS assimilation, and EA literature.

Institutional pressures are measured through 17 items. For all three pressures, we followed Liang et al. (2007) as an orientation. Due to different contexts (ERP assimilation on the inter-organizational level versus EA assimilation on the intra-organizational level), items could not be replicated. Instead, we translated Liang et al.'s (2007) construct operationalization into the EA context by using quantitative EA studies (Schmidt and Buxmann 2011; Weiss et al. 2013) to adapt the measurement items. We thereby modified the object of analysis, the entities exerting institutional pressures, as well as the level of analysis. We employed five items to measure coercive, six items to measure normative, and six items to measure mimetic pressures. For coercive pressures, we particularly consider the role of EA governance and artifacts (Schmidt and Buxmann 2011). For normative pressures, we differentiate the (peer) influence of IS project teams as well as project sponsors (regarding beliefs, support, and expectations) (Weiss et al. 2013). For mimetic pressures, we include the influence of perceived success and benefits among and within IS project teams as well as their project sponsors (Weiss et al. 2013).

EA assimilation is measured by 12 items. Assimilation is reflected in the institutional IS literature as awareness, understanding, and use. For awareness and understanding, we adopt four items each from Lange et al. (2016). For use, we followed Liang et al.'s (2007) differentiation of breadth and depth of use, translating both into the EA context by using Lange et al.'s (2016) quantitative EA study to adapt the measurement items.

Engagement of local stakeholders is measured via five items. Following the EA literature, we adapt EA stakeholder items from Schmidt and Buxmann (2011).

EA outcomes are measured through both enterprise-wide IS efficiency (five items) and IS flexibility (seven items). As these two variables are pre-dominantly promoted by the EA literature, we adopt all items from Schmidt and Buxmann (2011) (see also Brosius et al. 2016; Lange et al. 2016).

We constitute a total of 46 items and measure them on a 5-point Likert scale. All constructs of our research model are measured in the reflective (rather than formative) mode.

Data Collection

The data collection took place between November 2017 and March 2018 by the means of a paper-based questionnaire as well as an online survey. In early November 2017, we conducted a pilot test in a workshop with 16 senior EA experts, aimed at probing face and content validity. For face validity, we tested the clarity, wording, and understandability of the formulated measurements items. In turn, for content validity, we ensured constructs' conceptual domain content, reflected by their measurement items. While all our constructs and their respective items are theory-driven and adapted from existing studies (see also construct operationalization), we evaluated in a discussion with the workshop participants the content captured by our measurement items. This helped us refining the final formulation of some of the measurement items, especially those reflecting institutional pressures, for data collection.

The paper-based questionnaire was distributed at three EA practitioner seminars in late November 2017. With 116 responses, we met an average response rate of 81%. Furthermore, we launched an online survey from December 2017 until March 2018, covering exactly the same items. We sent out the survey to 60 EA practitioners and collected 40 responses, having a response rate of 67%. While all paper-based surveys were filled out sufficiently (covering at least 50% of the measurement items excluding demographic questions), the online survey led to a reduced number of 18 responses due to 22 insufficient responses. In total, we collected 134 responses by the paper-based questionnaire and the online survey for further analysis. Missing values were treated by mean replacement (Hair Jr. et al. 2014).

In both the paper-based questionnaire and the online survey, we included six additional questions to ensure that our sample comprises a broad and sufficiently diverse participation, having respondents from different industries and organizations as well as with different functional and professional backgrounds.

The affiliated organizations of our respondents belong to various industries, namely financial services (20.2%), public administration (15.1%), information and communication (15.1%), manufacturing (12.6%), transport and logistics (10.9%), insurance (7.6%), utilities (5.9%), health care (5.9%), education (3.4%), as well as commerce/trade (3.4%). The represented organizations had an architecture function in place for an average of 8.97 years. Furthermore, the organizations had on average 21,051 employees, 2,810 of which (13.35%) belong to the IT function.

In total, 88.03% of the respondents reported to be affiliated primarily to IT units, 11.97% to business units. 77.12% indicated to work in a formal architect role. In their respective organizations, 12.2% reported to work on the local level (e.g., solution architect, project employee), 36.59% on the cross-unit level (e.g., domain architect, unit leader), and 51.22% to work on the enterprise-wide level (e.g., enterprise architect, executive management). On average, respondents worked for 8.67 years in their respective organization.

Data Analysis

For analyzing the collected data, we transformed the research model into a structural equation model (SEM), using a partial least square (PLS) approach to test our model. Compared to other linear regression models, the PLS-SEM approach allowed us to cope with the large number of measurement items reflecting (rather than forming) our constructs (Gefen et al. 2011). Compared to other covariance-based approaches, a PLS-SEM approach has soft distributional assumptions and modest sample size requirements (Chin 2010; Hair Jr. et al. 2014). We performed our analysis using the PLS implementation in SmartPLS, version 2.0.M3 (Ringle et al. 2005).

We evaluated the stability of the estimates by the bootstrapping resampling procedure with 5,000 resamples. Based on the resampling, significance levels were determined by the (two-tailed) *t*-value.

Results

Measurement Model and Validity Tests

Following the evaluation procedure by Hair Jr. et al. (2014), we assessed our measurement model for *indicator reliability*, *construct reliability*, *convergent validity*, and *discriminant validity*. Furthermore, we measured the model's *predictive accuracy, predictive validity*, and the *common method bias*.

Indicator reliability specifies the extent to which a measurement item's variance can be explained by the underlying construct. Usually, a factor loading of larger than 0.7 qualifies as reliable. From our model, eleven items were removed due to a loading of below 0.7, which simultaneously led to an increase of the convergent validity of their respective constructs (see Appendix A).

Construct reliability indicates whether items measure their construct adequately. It can be assessed via the composite reliability (CR) or Cronbach's alpha (CA), whereas for both criteria the values should exceed 0.6. In our case, both values lie far above the critical threshold with the lowest CR being 0.83 and the lowest CA being 0.7, thus indicating construct reliability (see Appendix B).

Convergent validity specifies to which extent a construct is explained by its measurement items and not by error. Typically, convergent validity is evaluated with the Average Variance Extracted (AVE) measure, favoring a value of at least 0.5, which indicates the explanation of a construct's variance of at least 50% by its constituent items. Except for the construct institutional pressures, all other constructs show a value higher than 0.5. After excluding four items on institutional pressures in the previous indicator reliability test (due to a factor loading of below 0.7), the AVE value rose slightly, however, remained finally at 0.44. According to Fornell and Larcker (1981), a value below 0.5 may still be acceptable under the condition that the CR value of this construct is higher than 0.6. Given the fact that for institutional pressures the CR shows a value of 0.91, this construct was not deleted from the model (see Appendix B).

Discriminant validity deals with the dissimilarity of constructs within a research model, which is especially necessary for the test of higher-order models (Gefen and Straub 2005; Hair Jr. et al. 2014), such as in our case. For testing the discriminant validity, we applied the Fornell-Larcker criterion, comparing the square roots of a construct's AVE with the other constructs' correlations. As the square root of each construct's AVE was greater than the highest correlation with any other construct, we found discriminant validity established (see Appendix C). Notably, in the case of higher-order models, the discriminant validity criterion does neither apply for comparisons between higher-order and lower-order constructs, nor between lower-order constructs (Hair Jr. et al. 2014).

A more sensitive approach for testing discriminant validity is the heterotrait-monotrait (HTMT) ratio of correlations (Henseler et al. 2015). The HTMT ratio reflects on the average item correlations across constructs relative to the item correlations within the same construct. A ratio below the value of 0.9 (HTMT .90) is acceptable for avoiding potential lack of discriminant validity. Testing for the HTMT ratio in our research model, we found discriminant validity thoroughly established (see Appendix D).

Predictive accuracy is measured via the determination coefficient R^2, reflecting the share of an endogenous construct's variance explained by its constituent exogenous construct(s). Our resulted R^2 values explain 22% of stakeholder engagement, 50% of assimilation, and 21% of EA outcomes (Appendix B).

Predictive validity shows how well the empirical data can be reconstructed by using our model and PLS parameters. We tested for predictive validity by the non-parametric Stone-Geisser test (Geisser 1974; Stone 1974), using a blindfolding procedure with an omission distance of 7 (Hair Jr. et al. 2014). The resulting Q^2 values were all larger than zero, proofing established predictive validity (Appendix B).

Finally, we included *common method bias* as a supplemental analysis for PLS-SEM (Ringle et al. 2012) by conducting Harman's single-factor test. The test led to 36.21% of the variance explained, indicating that no single factor accounted for the majority of covariance among the measures (Podsakoff et al. 2003).

Testing of Hypotheses

As we ensured the validity and reliability of our measurement model, in the following, we provide our final structured equation model (Figure 2) to test our predefined hypotheses. The numbers next to the arrows

and lines reflect the path coefficients as well as their corresponding significance level. The significance levels (***: a < 0.01; **: a < 0.05; *: a < 0.1) were based on two-tailed t-tests, calculated by a bootstrap procedure in SmartPLS with 5,000 samples (Hair Jr. et al. 2014). All constructs are shown with their corresponding determination coefficient (R^2). Building on this model, we present the tests of hypotheses in the following.
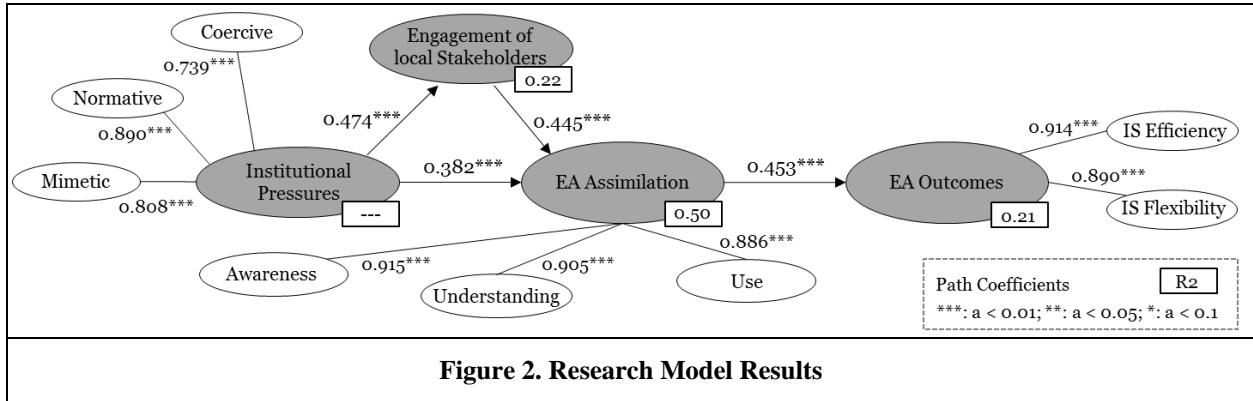

Figure 2. Research Model Results

Table 5 provides our tested hypotheses. Regarding institutional pressures and EA assimilation, we found a positive and significant relation, which supports H1. We also found a positive and significant relation between EA assimilation and EA outcomes, thus supporting H2.

Between institutional pressures and the engagement of local stakeholders as well as between the engagement of local stakeholders and EA assimilation, we found positive and significant relations, thus supporting H1a and H1b. While both H1a and H1b reflect the important role of local stakeholder engagement, they also suggest a mediation effect on the relation between institutional pressures and EA assimilation.

In order to analyze whether the engagement of local stakeholders mediates the relation between institutional pressures and EA assimilation, we performed the Sobel test. We therewith tested whether the relation between institutional pressures (independent variable) and EA assimilation (dependent variable) is significantly reduced after the inclusion of the variable Engagement of Local Stakeholders. To perform the Sobel test, we used an online calculator, measuring the significance of the mediation by two-tailed probability values (Soper 2018). The test returned a two-tailed probability value of 3.804 (***: a < 0.01), thus supporting the mediation of stakeholder engagement on the relation between institutional pressures and EA assimilation as being significant.

Table 5. Test of Hypotheses				
Hypothesis	Path description	Path coefficient and significance	*t*-value (two-tailed)	Result
H1	Institutional Pressures → EA Assimilation	0.382***	4.778	Supported
H1a	Institutional Pressures → Engagement of local Stakeholders	0.474***	5.656	Supported
H1b	Engagement of local Stakeholders → EA Assimilation	0.445***	5.141	Supported
H2	EA Assimilation → EA Outcomes	0.453***	4.882	Supported

Discussion and Conclusion

As organizations continue to experience institutional obstacles with realizing the intended EA outcomes, we undertook this research to investigate EA assimilation, focusing on the influence of institutional pressures that make EA part of the organization's worklife. To provide an institutional account for EA assimilation, we argued that EA assimilation can be explained by institutional pressures through which EA becomes

part of the organization's worklife. To this end, building on institutional theory, assimilation research, and the EA literature, we derived and empirically demonstrated the influence of institutional pressures on EA assimilation. We found EA assimilation to be positively related to EA outcomes. We also provided further analysis on the relation between institutional pressures and EA assimilation through the mediating role of the engagement of local stakeholders, which eventually provided a more elaborate explanation on how institional pressures affect EA assimilation.

The use of institutional pressures helped us to look beyond isolated institutional mechanisms, such as coercive principles or standards, which are dominant in the EA literature (Boh and Yellin 2006; Richardson et al. 1990). Instead, we captured a concerted view on all institutional pressures that collectively explain EA assimilation in the organization. In combination, institutional pressures provide a microcosm of mutually interactive and interdependent rules, norms, values, and beliefs that make EA part of an organization's worklife and thus guide decisions and activities of local stakeholders toward EA outcomes. Next to predominantly promoted coercive pressures, we highlight the importance and role of normative and mimetic pressures in EA assimilation. In effect, building on the seminal notion of assimilation, we argue that EA assimilation can only be explained when normative and mimetic pressures are also considered. While acknowledging the role of coercive pressures, we demonstrate that EA can become part of an organization's worklife when being deployed in line with the organization's norms, values, and expectations (normative pressures). In addition, when expected outcomes of EA become somewhat visible in the organization, mimetic pressures force stakeholders to imitate organizational counterparts (e.g., peers) who benefited from EA. This mimicking behavior of organizational stakeholders leverages EA assimilation throughout the organization. Consequently, EA outcomes also depend on mimetic pressures that lead organizational stakeholders to become aware, understand, and use EA.

The engagement of local stakeholders, in turn, helped us to better explain the relation between institutional pressures and assimilation. In effect, local stakeholders adhere to institutional pressures that are propagated through top management, enterprise architects, as well as other local stakeholders. In this regard, local stakeholders use and conform to EA in order to avoid sanctions, a conclusion that has mainly been captured through the influence of coercive pressures (Scott 2013). Furthermore, EA becomes part of the organization's worklife when stakeholders perceive EA in line with organizational norms, values, and expectations (see also Aier 2014). This conclusion largely stems from the influence of normative pressures (Scott 2013). Finally, when local stakeholders perceive their organizational counterparts (e.g., stakeholders from other local projects or organizational units) as successful in their IS endeavors due to EA, they model themselves on those organizational counterparts and start complying with EA (see also Brosius et al. 2016). This conclusion, at last, is based on the influence of mimetic pressures (Scott 2013).

Limitations

The realization of EA outcomes depends on the conceptualization of EA (e.g., adopted artifacts, extent of formalization, hierarchical level of exertion) (Aier et al. 2011). While focusing on EA assimilation, we do not consider the diversity of its conceptualizations. More generally, EA may be conceptualized in different levels of abstraction or detail, sophistication or simplification (Labusch and Winter 2013; Lankhorst 2005). This shapes the extent to which EA becomes understood and/or used by targeted stakeholders, especially by non-architects as well as by stakeholders outside the IT function (Gardner et al. 2012; Ross and Quaadgras 2012). In this vein, also EA outcomes depend on the conceptualization of EA. Hence, we motivate future EA assimilation research to consider more differentiated the conceptualizations of EA and how they relate or moderate EA assimilation as well as EA outcomes.

To explain the realization of EA outcomes, we studied the influence of institutional pressures on EA assimilation at the intra-organizational level of analysis. Consequently, we focused on entities within the organization, from which coercive (e.g., governance committees), normative (e.g., values among project sponsors), and mimetic (e.g., visible benefits of projects) pressures arise. However, we cannot claim to have controlled for all the pressures arising from outside the organization (e.g., regulatory requirements), which may have had an influence on our measurement of institutional pressures and EA assimilation within the organization. Future research can be advised to take this limitation into account when conducting institutional analyses at the intra-organizational level of analysis.

Finally, our research approach does not allow for longitudinal analyses. For EA awareness, understanding, and use, our study caters only a snapshot of assimilation. On the contrary, assimilation has been described

as a continuous and enduring process that rises from initial awareness to the development of a shared understanding, and finally to use (Liang et al. 2004; Mignerat and Rivard 2009). While organizational stakeholders fluctuate, also work environments undergo several changes over time and therefore impose awareness, understanding, and use as a recursive process (Fichman 2000; Purvis et al. 2001). Also, the realization of EA outcomes is a continuous process that develops over time (Haki and Legner 2013a; Ross 2004). While our design provides a conceptual base for dynamic analyses, we motivate a longitudinal perspective for future research to better explain EA assimilation as well as the realization of EA outcomes over time.

Implications

Our findings provide several implications. The first is a theoretical implication on the use of institutional theory as a research lens. To date, the main body of IS research uses institutional theory at the inter-organizational level of analysis, studying how the assimilation of a new phenomenon occurs from one organization to another (Mignerat and Rivard 2009). Our study complements prior research by empirically demonstrating the influence of pressures on assimilation arising from entities within the organization, i.e. at the intra-organizational level. Building on our approach, we motivate future research to use institutional theory on new entities of analysis within the organization for explaining assimilation and the influence of institutional pressures (see also calls from Dacin et al. 2002; Greenwood and Hinings 1996; Greenwood et al. 2008; Pache and Santos 2013). While this may open an avenue for certainly more than one new level of analysis within the organization (e.g., the local actor, group, domain, or department level), it may also motivate researchers to study the relations between different entities and levels within an organization for assimilation as well as the influence of institutional pressures.

Furthermore, our findings offer implications for prospective EA research. In order to foster assimilation, future research may focus on how to make effective use of institutional pressures for making EA part of the organization. While prior research has mainly focused on coercive pressures, such as EA principles and control means (Simon et al. 2013), our study captures also normative and mimetic pressures, through which shared conceptions of EA can be made and consequently how EA becomes part of the organization's worklife. To this end, future research may focus on the design of artifacts related to normative and mimetic pressures (e.g., materializations that support to externalize and share EA success stories or best practices) and respective interventions (e.g., formal or informal meetings to negotiate stakeholders' EA expectations, norms, values, or beliefs) to foster and purposefully guide EA assimilation.

In addition to the use of institutional pressures for making EA part of the organization, we also motivate future research to shed light more explicitly on stakeholders' responses toward institutional pressures. While our study follows the common assumption of stakeholders responding to institutional pressures in favor rather than against assimilation, stakeholder responses could also weaken or even inhibit the influence of institutional pressures on assimilation (Mignerat and Rivard 2009; Scott 2013). From an institutional perspective, such responses may be discovered in personal motives and the behavior of affected stakeholders, yielding responses of compromise, avoidance, defiance, or manipulation (Oliver 1991). Thus, we call future research to consider the influence of institutional pressures on EA assimilation with regards to the response of affected stakeholders (see also Aier and Weiss 2012).

Equally important as for EA research are our implications for EA practice. More generally, organizations are shaped by coercive, normative, and mimetic pressures that are prevailing in their institutional environment (Scott 2013). Institutional pressures (such as existing rules, norms, values, or beliefs) may foster, weaken, or even inhibit managerial attempts to foster EA assimilation and thus the realization of EA outcomes. Consequently, EA management needs to understand how efforts to foster EA assimilation (such as conceptualized artifacts or management methods) may interact with the pervasive influence of institutional pressures (see also Lewis et al. 2003; Purvis et al. 2001). EA management may develop, for instance, appropriate assimilation strategies that involve the joint adaption of existing institutional pressures and EA (artifacts/management methods) in order to contribute to the realization of EA outcomes.

In addition, EA management needs to consider the engagement of targeted stakeholders toward EA assimilation. Their influence on assimilation rises as stakeholders develop an understanding of how EA outcomes may fit or enhance their respective decisions and activities. In consequence, they develop and orient their individual work activities toward EA outcomes, by which they make EA part of their worklife. While the main body of EA research promotes to enforce and control compliance with EA targets (e.g., Boh and Yellin 2006; Richardson et al. 1990), we motivate EA management to be less concerned with enforcing

or controlling rather than empowering and supporting stakeholders to achieve EA's intended outcomes on their own. This may be realized, for example, by granting more autonomy as well as more decision-making authority to local stakeholders. While the intended outcomes may not be attained and become visible instantaneously, EA management should rather be considered as an emerging, long-term effort that requires time in order to unfold its contributions to EA outcomes (Haki and Legner 2013a; Ross 2004).

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Appendix A: Measurement Scales

Table 1. Measurement Items included in the Final Model				
Construct		**Measurement item**	**Ld.**	*t*-**val.**
Coercive Pressures	Coe1	IT boards or governance committees enforce the adoption of enterprise-wide objectives.	0.82	22.51
	Coe2	There are well-defined procedures through which enterprise-wide objectives are enforced.	0.79	17.71
	Coe3	Local IT design decisions that violate enterprise-wide objectives are tracked and sanctioned consistently.	0.76	12.27
Normative Pressures	Nor1	Local IT project teams believe in the value of enterprise-wide objectives.	0.72	12.50
	Nor2	Local IT project teams actively promote the consideration of enterprise-wide objectives.	0.84	28.54
	Nor3	Local IT project teams expect the consideration of enterprise-wide objectives.	0.74	11.86
	Nor4	Project sponsors believe in the value of enterprise-wide objectives.	0.78	14.44
	Nor5	Project sponsors actively promote the consideration of enterprise-wide objectives.	0.79	19.28
	Nor6	Project sponsors expect the consideration of enterprise-wide objectives.	0.73	13.39

Mimetic Pressures	Mim1	The competitive work conditions within local IT project teams require the adoption of enterprise-wide objectives.	0.83	21.55
	Mim2	The competitive work environment around local IT project teams requires the adoption of enterprise-wide objectives.	0.84	20.42
	Mim3	Success of local IT projects that adopt enterprise-wide objectives is visible to others.	0.84	27.58
	Mim4	Benefits of local IT projects that adopt enterprise-wide objectives are visible to others.	0.85	27.64
Engagement of local Stakeholders	Lse1	Local IT project representatives participate in negotiating a common vision of target architectures.	0.80	14.10
	Lse2	Local IT project representatives participate in negotiating a strategy for the use of target architectures.	0.88	28.67
	Lse3	Local IT project representatives participate in establishing processes to monitor the conformity of their design decisions to architecture artifacts (e.g., target architectures, rules, procedures, standards, principles).	0.83	21.22
	Lse4	Local IT project representatives participate in developing architecture artifacts (e.g., target architectures, rules, procedures, standards, principles).	0.82	17.86
Awareness	Awa1	Local IT project teams are aware of the importance of considering enterprise-wide objectives in their design decisions.	0.71	12.35
	Awa2	Local IT project teams are aware of architecture artifacts (e.g., target architectures, rules, procedures, standards, principles).	0.84	26.58
	Awa3	Local IT project teams are trained to consider enterprise-wide objectives in their design decisions.	0.84	25.99
	Awa4	Local IT project teams are trained to apply architecture artifacts (e.g., target architectures, rules, procedures, standards, principles).	0.84	26.82
Understanding	Und1	Local IT project teams have a common understanding of enterprise-wide objectives.	0.74	13.57
	Und2	Local IT project teams have a common understanding of architecture artifacts (e.g., target architectures, rules, procedures, standards, principles).	0.86	30.90
	Und3	Local IT project teams understand how to consider enterprise-wide objectives in their design decisions.	0.77	11.94
	Und4	Local IT project teams understand how to consider architecture artifacts (e.g., target architectures, rules, procedures, standards, principles).	0.82	21.73
Use	Use1	Enterprise-wide objectives are reflected in the objectives of local IT project teams.	0.81	16.11
	Use2	Enterprise-wide objectives are reflected in local IT design decisions.	0.85	22.10
	Use3	Enterprise-wide objectives are routinized in tasks and activities of local IT project teams.	0.86	28.25
	Use4	Architecture artifacts (e.g., target architectures, rules, procedures, standards, principles) are routinely applied in local IT design decisions.	0.77	16.92
IS Efficiency	Ise1	The IT systems of our organization are rather consolidated.	0.90	48.45
	Ise2	The IT systems of our organization have only little redundancies.	0.88	33.39
	Ise3	IT system components are rather standardized in our organization.	0.80	17.01
IS Flexibility	Isf1	A common view on our customer is available to any authorized user in our organization.	0.85	26.72
	Isf2	Interfaces are transparent and allow simple access to most applications.	0.77	13.31

	Isf3	The development of new applications is facilitated by existing, reusable application components.	0.80	14.51

Appendix B: Construct Statistics

<table>
<tr><th colspan="8">Table 2. Overview of Constructs</th></tr>
<tr><th>Order</th><th>Construct</th><th>Construct-ID</th><th>CR</th><th>CA</th><th>AVE</th><th>R²</th><th>Q²</th></tr>
<tr><td>Lower</td><td>Coercive Pressures</td><td>Coe</td><td>0.83</td><td>0.70</td><td>0.62</td><td>0.55</td><td>0.33</td></tr>
<tr><td>Lower</td><td>Normative Pressures</td><td>Nor</td><td>0.90</td><td>0.86</td><td>0.59</td><td>0.79</td><td>0.47</td></tr>
<tr><td>Lower</td><td>Mimetic Pressures</td><td>Mim</td><td>0.91</td><td>0.86</td><td>0.71</td><td>0.65</td><td>0.47</td></tr>
<tr><td>Lower</td><td>Awareness</td><td>Awa</td><td>0.88</td><td>0.82</td><td>0.65</td><td>0.84</td><td>0.55</td></tr>
<tr><td>Lower</td><td>Understanding</td><td>Und</td><td>0.87</td><td>0.81</td><td>0.63</td><td>0.82</td><td>0.52</td></tr>
<tr><td>Lower</td><td>Use</td><td>Use</td><td>0.89</td><td>0.84</td><td>0.67</td><td>0.78</td><td>0.51</td></tr>
<tr><td>Lower</td><td>IS Efficiency</td><td>Ise</td><td>0.90</td><td>0.83</td><td>0.74</td><td>0.83</td><td>0.63</td></tr>
<tr><td>Lower</td><td>IS Flexibility</td><td>Isf</td><td>0.85</td><td>0.73</td><td>0.65</td><td>0.79</td><td>0.51</td></tr>
<tr><td>Higher</td><td>Institutional Pressures</td><td>Inp</td><td>0.91</td><td>0.9</td><td>0.44</td><td>---</td><td>---</td></tr>
<tr><td>Higher</td><td>Engagement of local Stakeholders</td><td>Lse</td><td>0.90</td><td>0.85</td><td>0.69</td><td>0.22</td><td>0.14</td></tr>
<tr><td>Higher</td><td>EA Assimilation</td><td>Asi</td><td>0.93</td><td>0.92</td><td>0.53</td><td>0.50</td><td>0.25</td></tr>
<tr><td>Higher</td><td>EA Outcomes</td><td>Eao</td><td>0.89</td><td>0.85</td><td>0.57</td><td>0.21</td><td>0.11</td></tr>
</table>

Appendix C: Constructs Correlations

<table>
<tr><th colspan="5">Table 3. Constructs Correlations</th></tr>
<tr><th>$\sqrt{AVE}$</th><th>Inp</th><th>Lse</th><th>Asi</th><th>Eao</th></tr>
<tr><td>Inp</td><td>*0.66*</td><td></td><td></td><td></td></tr>
<tr><td>Lse</td><td>0.47</td><td>*0.83*</td><td></td><td></td></tr>
<tr><td>Asi</td><td>0.59</td><td>0.63</td><td>*0.73*</td><td></td></tr>
<tr><td>Eao</td><td>0.36</td><td>0.32</td><td>0.45</td><td>*0.75*</td></tr>
</table>

Appendix D: Heterotrait-Monotrait Ratio

<table>
<tr><th colspan="5">Table 4. Heterotrait-Monotrait Ratio</th></tr>
<tr><th></th><th>Inp</th><th>Lse</th><th>Asi</th><th>Eao</th></tr>
<tr><td>Inp</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Lse</td><td>0.54</td><td></td><td></td><td></td></tr>
<tr><td>Asi</td><td>0.65</td><td>0.71</td><td></td><td></td></tr>
<tr><td>Eao</td><td>0.51</td><td>0.38</td><td>0.51</td><td></td></tr>
</table>