Association for Information Systems
AIS Electronic Library (AISeL)

AMCIS 2009 Proceedings

Americas Conference on Information Systems (AMCIS)

2009

Organization Size, IT Capabilities, and EA Perceptions: Dark Clouds on the ERP Horizon?

Brian Salmans
University of North Texas, salmansb@unt.edu

Leon Kappelman
University of North Texas, kapp@unt.edu

Robert Pavur
University of North Texas, pavur@unt.edu

Follow this and additional works at: http://aisel.aisnet.org/amcis2009

Recommended Citation
Salmans, Brian; Kappelman, Leon; and Pavur, Robert, "Organization Size, IT Capabilities, and EA Perceptions: Dark Clouds on the ERP Horizon?" (2009). *AMCIS 2009 Proceedings*. 747.
http://aisel.aisnet.org/amcis2009/747

This material is brought to you by the Americas Conference on Information Systems (AMCIS) at AIS Electronic Library (AISeL). It has been accepted for inclusion in AMCIS 2009 Proceedings by an authorized administrator of AIS Electronic Library (AISeL). For more information, please contact elibrary@aisnet.org.

Organization Size, IT Capabilities, and EA Perceptions: Dark Clouds on the ERP Horizon?

Brian Salmans
University of North Texas
salmansb@unt.edu

Leon Kappelman
University of North Texas
kapp@unt.edu

Robert Pavur
University of North Texas
pavur@unt.edu

ABSTRACT

The relationship between enterprise architecture (EA) and enterprise resource planning (ERP) systems can be a synergistic one, leading to improved organizational and IT capabilities, practices, and mission success. However, in examining this relationship, organization size must be considered since it plays an important role in influencing the success of these enterprise initiatives. This paper analyzes the responses of IT professionals to the SIM Information Management Practices Survey and discusses the relationship of organization size to the EA and ERP relationship and to IT capabilities within organizations.

Keywords: enterprise architecture, enterprise resource planning, EA, ERP, strategy, planning, requirements, organization size, capabilities, system development, Capability Maturity Model, CMM, maturity, open-source ERP, systems analysis and design, small and midsize enterprise, SME

INTRODUCTION

Discussions about the questionable value of IS and IS organizations are regularly levied in journals (e.g., Brown and Hagel, 2003; Carr, 2003; Dearden, 1966; Dearden, 1972). These discussions can foster uncertainty about the future role and viability of IS in organizations. Some organizations consider ERP implementations as a possible response to this challenge, with presumably improved functionality, less overall technical complexity, and lower total cost of ownership. For example, Sun, Yazdani, and Overend's (2005) claim that the effective use of ERP systems is a key discriminator of competitive advantage. Ngai, Law, and Wat (2008) researched ERP critical success factors and found that ERP systems provide significant improvements to operations and decision making. Luftman, Lewis, and Oldach (1993) maintain IT provides strategic value to organizations and industries when effectively and efficiently employed through the alignment of "business strategy, information technology strategy, organizational infrastructure and processes, and I/T infrastructure and processes" (p. 198).

EA can facilitate ERP implementation success (Ehie and Madsen, 2005) and alignment of IT with organizational objectives to enhance the strategic value and contribution of IS investments. Indeed, Ehie and Madsen (2005) identify EA as a critical success factor in ERP implementations. Wieringa, Blanken, Fokkinga, and Grefen (2003) stress how with large-scale systems with procured components, such as ERP systems, the alignment between business and application architectures that EA facilitates is important for implementation success. Further, Bernard (2005) describes EA as a solution to ERP shortcomings by providing integration standards for ERP modules and the "holistic planning, documentation, and decision-making support" (p. 127). "[B]usiness strategy and its linkage to information systems strategy … ultimately manifest themselves in architectural expression" (Zachman, 1987, p. 277). EA enables synergies among IS and other organization capabilities resulting in competitive advantage (King, 1995; Malhotra, 1996). "[I]t is at the architectural level where profound and sustainable competitive advantages are to be found" (King, 1995, p. 70).

The objective of this paper is to examine some of the relationships among EA, ERP, and other core IT practices like requirements determination and IS development. The important role of organization size is also considered within this context. A survey of senior IS professionals was conducted to provide data to analyze these relationships.

ENTERPRISE ARCHITECTURE

The discipline of EA has been increasingly applied in organizations in order to facilitate a disciplined enterprise-wide approach to policy, planning, decision-making, and resource development, among other objectives. A leading proponent of

EA, John Zachman (2007), defines architecture as "the set of descriptive representations about an object" (p. 1) while the Society for Information Management's Enterprise Architecture Working Group (SIMEAWG) defines EA as "the set of holistic set of descriptions about the enterprise over time" (Kappelman, 2009). EA is the "analysis and documentation of an enterprise in its current and future states from an integrated strategy, business, and technology perspective" (Bernard, 2005, p. 31). A more IT-centric definition puts EA as "the organizing logic for applications, data, and infrastructure technologies, as captured in a set of policies and technical choices, intended to enable the firm's business strategy" (Ross, 2003, p. 32).

In other words, EA helps transform IS planning and management into an integrated, enterprise-wide, strategic activity, rather than what is all too often a stove-piped, disintegrated, series of tactical planning exercises centering on specific and separate IT solutions. EA illuminates the business and IT domains, as well as the connections and relationships between them, by seeking to make explicit all the knowledge about the entire enterprise. In this manner, EA elevates the technical IT solutions to the enterprise level, striving to align the two, requiring a more thorough knowledge of the enterprise to accomplish this. Thus the subsystem architectures for a specific system implementation, process reengineering, or business decision, are done in enterprise-wide context and thus aligned and integrated with business objectives from inception. EA ensures congruency between organizational strategies, process, and IT requirements forming an inclusive IT strategy (Young, 2001). EA is increasingly embraced in order to deal with the growing complexity of organizations and to ensure organizational information systems resources are appropriately obtained and optimized in line with organizational goals (Shah and El Kourdi, 2007). EA provides a formalized way to capture and document an organization's present and desired future states and thus facilitate management of the enterprise.

Often, EA is presented in research as both a product and a process (Ross, Weill, and Robertson, 2006; van den Berg and van Steenbergen, 2006; Wegmann, 2003). Further, the view of EA as a product is also characterized in research as two aspects reflecting the dual nature of EA: one aspect that captures the broader, organization-wide processes and a second aspect that captures the aspects of EA within the IT domain such as information systems and data. Ross et al., (2006) call EA the "…high level logic for business processes and IT capabilities" (p. 48) whereas the more narrow, IT-centric EA is characterized as "IT or system architecture". Both, however, are within the discipline of EA. The combination of these two dichotomous aspects provides a holistic view that spans across the entire organizational domain.

Secondly, the process view of EA consists of the various analytical tasks and toolsets which go in to analyzing and documenting the organization (or enterprise) of interest both in its current (as is) and future (to be) state. This view of EA also captures the classic dichotomy and addresses the problem space between IT and the organization. This is frequently called the alignment problem, a problem space that EA can address (Bernard, 2005; Gregor, Hart, & Martin, 2007; van der Raadt, Hoorn, & van Vliet, 2005; Vaidyanatha, 2005; Wegmann, Balabko, Le, Regev, & Rychkova, 2005). In this view of EA, it captures the nature of the relationship between the business and IT domains, an example of which is in Henderson and Venkatraman's (1993) concept of alignment. Moreover, this classic business-IT gap, characterizations of which have been addressed in IS research such as Ives, Hamilton, and Davis' (1980) model of IS research with concentric squares of the organizational and IS environments to DeLone and McLean's (2003) measure of IS success which addressed the problem space between IS (service, system, and information quality) and the organization (net benefits or organizational impact). Of course IS researchers have frequently noted the difficulty within this problem space and in achieving this alignment, as Coughlan, Lycett, and Macredie (2005) note "…the relationship between business and IT has suffered and has failed to act synergistically" (p. 304).

In this process view, EA provides a means to align the IT artifact with organizational objectives to increase the strategic value of IS and achieve the goals of the organization. As discussed in the introduction, EA enables synergies between organizational and IS capabilities because EA facilitates holistic enterprise optimization as well as optimization at the subsystem or business unit level. EA is a method that is increasingly becoming embraced in order to deal with the growing complexity of organizations and to attempt to ensure organizational information systems resources are appropriately obtained and optimized in line with organizational goals (Shah & El Kourdi, 2007). The relationship of EA to the organization and IT domains is shown in Figure 1.

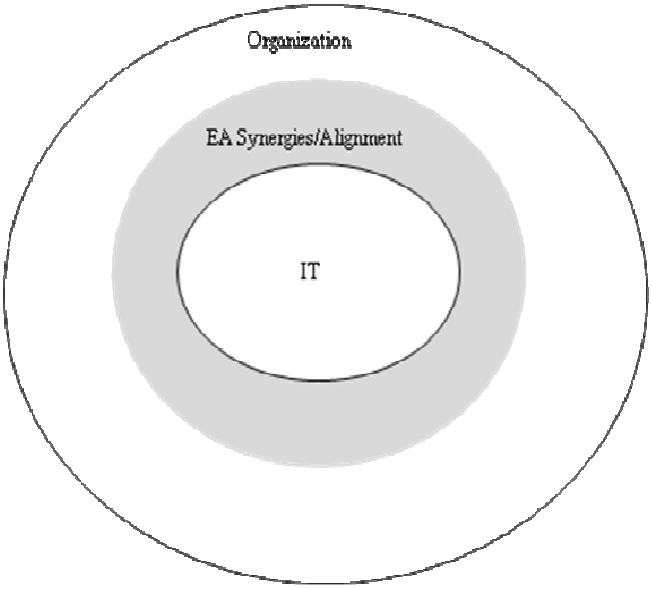


Figure 1 EA Relationships

THE SIMEAWG SURVEY

In order to better understand the state of EA practices and perceptions in organizations and EA's interactions with IT capabilities such as IS development and requirements, the SIMEAWG Information Management Practices Survey was developed. A literature review was conducted in order to establish a foundation for many of the survey questions including the EA, alignment, requirements, and maturity ones. The questions were 5-point Likert-type scales anchored with 1 "Strongly Disagree" to 5 "Strongly Agree", 3 being "Neutral". "Don't Know" type options were provided as well.

A total of 2863 survey invitations were sent, with 376 quality responses. This 13 percent response rate is consistent with other surveys of the SIM membership including the annual member surveys and the SIM Y2K Working Group surveys conducted in 1996, 1997, 1998, and 1999.

CATEGORIZING EA PERCEPTIONS

An exploratory factor analysis (principal components analysis) was conducted in order to categorize the IT professionals' responses and perceptions of EA. From the results, three clear factors were derived (Table 1). The Kaiser-Meyer-Olkin measure of sampling adequacy (.920) indicates the data is adequate for factor analysis. Based on the theory discussed in the preceding paragraphs and depicted in Figure 1, item grouping, and wording of the items, the three factors were interpreted as: 1) EA-Organization, 2) EA-IT, and 3) EA-Synergies. A further discussion of these factors follows.

The EA-Organization factor is comprised of 9 items. The items within this factor reflect the potential of EA to benefit the broader organization domain and address organizational concerns. Examples of the items include: "Better collaboration within the *organization*", "More effective at meeting *business* goals", and "Standardizes *organizational* performance measures".

The EA-IT factor consists of items that specifically highlight the potential benefits of EA to specific goals and objectives of the IT department rather than to the broader organization as a whole. The items in this factor are more representative of the IT domain. Examples of the items include: "Improved utilization of *information technology*", "Faster at developing and implementing new *information systems*", and "Reduced *IT* complexity".

The final factor, EA-Synergies, reflects a group of items operationalizing the concept of EA as a facilitator of improved connections between the broader organization and IT, facilitating the alignment or synergies between the two. Examples of the items include: "*aligning business objectives with information technology investments*", "as a tool for *aligning* business objectives with IT initiatives", and "as a tool for planning". This factor appears to be relatively independent of a particular respondent's view as to whether the scope of EA is just IT or whether, as the name suggests, EA is about the whole enterprise.

Table 1 Factor Analysis EA Perceptions

	Component		
Survey Items	1	2	3
Improved comm within org	.781	.064	.250
Improved comm between org and IT dept	.779	.064	.241
Better collaboration within org	.766	.273	.018
Improves trust in the org	.704	.388	.003
Improved org comm & info sharing	.697	.159	.238
Reduces org stovepipes	.623	.272	.117
Standardizes org performance measures	.562	.342	-.051
More effective at meeting org goals	.559	.328	.325
Assists with org governance	.531	.370	.144
Improves IS security	.172	.688	.133
Fasters at developing/implementing IS'	.181	.686	.047
Reduced IT complexity	.095	.669	.050
More effective use of IT resources	.251	.648	.177
Improved interoperability among IS	.179	.644	.229
Improved utilization of IT	.230	.635	.380
Improved ROI from IT spending	.253	.595	.210
More responsive to change	.343	.506	.259
Tool for planning	-.007	.215	.783
Tool for decision making	.141	.224	.715
Tool to provide blueprint of org	-.090	.322	.596
Aligning org objectives with IT investments	.398	.044	.595
Tool for aligning org objectives and IT	.390	-.066	.587
Facilitates systematic change in org	.226	.185	.507
Total variance explained	36.163	8.896	7.825

Instrumentation for the EA perception questions listed in Table 1 as well as requirements capabilities were based on existing EA maturity models and derived from previous research studies and practitioner expertise from the SIMEAWG. The notion that requirements capabilities would provide insights into EA capabilities was based on the belief that within the context of IT professionals and IT organizations, requirements analysis and design capabilities and practices are the foundations of EA capabilities and practices. In other words, although IT historically has conducted requirements activities in the context of a particular system development project, EA is basically the expansion of that activity so that it is conducted in the context of the entire enterprise. "EA is requirements on steroids" opines Professor of IT and SIMEAWG Chair Leon Kappelman. Others also contend that EA can be used in the development of information systems and to facilitate communications about IS requirements (Chen and Pozgay, 2002; Finkelstein, 2004).

Additionally, to capture the capabilities of the respondents' organizations' IS development processes, 12 items were derived from the Software Engineering Institute's Capability Maturity Model. These had been used in a previous survey by Kappelman (1997) regarding the Y2K problem and Y2K solution strategies.

EXAMINING THE ROLE OF ORGANIZATION SIZE

The aforementioned factor analysis and subsequent factor groupings, along with a few key demographic results, were then used in an attempt to further understand the context of these EA perceptions in organizations. The role and influence of organization size is a focal structural variable of this research paper. Organization size is often the structural variable studied (Mabert, Soni, and Venkataramanan, 2003). Generally, organization size is defined either by number of employees or by revenue streams (Mabert et al., 2003). The demographic variables used in this research were: number of employees in the organization and in IT, the IT department budget, and organization revenue or budget.

In order to more fully explore the dependence and interrelationships between these demographic variables and perceptions of EA, IS development capabilities, requirements capabilities, combinations of these variables and their interactions were examined: 1. IT budget and organization revenue, and 2. IT budget and organizational size. By using this method, three

different aspects of organization size were incorporated to provide more detailed insight into the interactions of these. In this study, IT budget included all money spent providing IT and services, to include people, communications, hardware, software, maintenance, outsourcing contracts, and any other directly-related items. To analyze the role of the structural variables, ANOVA tests with the combinations of the demographic variables as independent variables and perceptions of EA (in the form of the three factors of EA), IS development capabilities, and requirements capabilities as the dependent variable were performed.

RELATIONSHIP OF ORGANIZATION AND IT SIZE TO ISD AND REQUIREMENT CAPABILITIES

Table 2 shows the relationships among the IS development (ISD) capabilities and organization size variables. The six size categories were determined by combining two categories of IT budget with three categories of organization revenue. The IT budget size categories are indicated by the first digit (either a 1 or a 2) and represent the two categories of 1 small (IT budget under $9.9 million) and 2 large (IT budget greater than $10 million). The second digit (a 1, 2, or 3) is indicative of the three revenue categories of 1 small (revenue under $500 million), 2 medium (revenue between $501 million and $4.9 billion), and 3 large (revenue greater than $5 billion). When looking at the respondents' organizations' IS development capabilities in Table 2, there are significant differences between the means of those whose IT budget is smaller and those whose IT budget is larger and the size (measured by organization budget or revenue) is in the middle or larger. Also, even when the IT budget is larger, a significant difference in means is indicated between the middle range and larger organization size. It is noteworthy that in every case a significant difference is found, a large (3) organization revenue is involved.

Table 2 ANOVA DV: ISD Capabilities IVs: Combination of IT Budget and Organization Revenue

	IV: Combo of IT Budget/Org Revenue (I)	IV2: Combo of IT Budget/Org Revenue (J)	Mean Difference (I-J)	Std. Error	Sig. (p-value)
LSD	**Small (1)/Small (1)**	Small (1)/Medium (2)	-.11647	.12926	.368
		Small (1)/Large (3)	-.35131	.18089	.053
		Large (2)/Small (1)	-.04841	.15611	.757
		Large (2)/Medium (2)	.04220	.10598	.691
		Large (2)/Large (3)	**-.27615(*)**	.11360	.016
	Small (1)/Large (3)	Small (1)/Small (1)	.35131	.18089	.053
		Small (1)/Medium (2)	.23483	.20088	.243
		Large (2)/Small (1)	.30290	.21913	.168
		Large (2)/Medium (2)	**.39350(*)**	.18676	.036
		Large (2)/Large (3)	.07516	.19118	.694
	Large (2)/Medium (2)	Small (1)/Small (1)	-.04220	.10598	.691
		Small (1)/Medium (2)	-.15867	.13735	.249
		Small (1)/Large (3)	**-.39350(*)**	.18676	.036
		Large (2)/Small (1)	-.09061	.16287	.578
		Large (2)/Large (3)	**-.31834(*)**	.12272	.010

* The mean difference is significant at the .05 level.

This observation is similar when examining requirements practices (Table 3). Again, ANOVA multiple comparison results indicate a significant difference in means of the combination of variables when the IT budget and organization revenue is small and when the IT budget and organization revenue are both large. Even when IT budget is larger and the organization revenue is in the middle range, there is a significant difference with the combination of a larger IT budget and larger organization revenue. In every case a significant difference is found a large organization revenue (3) is involved.

Table 3 ANOVA DV: Requirements Practices; IVs: Combination of IT Budget and Organization Revenue

	IV: Combo of IT Budget/Org Revenue (I)	IV[2]: Combo of IT Budget/Org Revenue (J)	Mean Difference (I-J)	Std. Error	Sig. (p-value)
LSD	**Small (1)/Small (1)**	Small (1)/Medium (2)	-.12120	.10407	.245
		Small (1)/Large (3)	-.15883	.14909	.287
		Large (2)/Small (1)	.03624	.12569	.773
		Large (2)/Medium (2)	.03603	.08533	.673
		Large (2)/Large (3)	**-.18052(*)**	.09146	.049
	Large (2)/Medium (2)	Small (1)/Small (1)	-.03603	.08533	.673
		Small (1)/Medium (2)	-.15723	.11058	.156
		Small (1)/Large (3)	-.19486	.15370	.206
		Large (2)/Small (1)	.00020	.13113	.999
		Large (2)/Large (3)	**-.21655(*)**	.09881	.029

* The mean difference is significant at the .05 level.

These results indicate that when assessing core, fundamentally important IT practices and capabilities in organizations (such as requirements and IS development), the size of an organization (measured by organization revenue or budget) may have an influential role. At the least, size does seem to indicate a likelihood of differences in capabilities. The notion of organization size having an important relationship within core IT capabilities and practices has been supported, as previously discussed, in prior research (e.g., Johnson and Brodman, 1999; Mabert et al., 2003; Pino, Garcia, and Piattini, 2008; Richardson and von Wangenheim, 2007).

RELATIONSHIP OF ORGANIZATION AND IT SIZE TO EA PERCEPTIONS

The next important question was to examine if this same trend or phenomena is similar or applies when looking at these same organizations' perceptions of EA. Does organization size affect these perceptions, or at the least are they related? An ANOVA multiple comparison procedure was run on the same combination variables and the EA-IT factor of the EA items as described in Table 1. The EA-IT factor was chosen because this factor involves the aspect of potential benefits of EA to specific goals and objectives of the IT department, not necessarily to the broader organization. It is more of an IT-centric context. In this way it is deemed most similar to the other factors examined in this research, ISD and requirement capabilities. Moreover, this approach was consistent with the fact that nearly 2/3rds of respondents indicated that to them EA was about IT and not the enterprise at all.

Results of the ANOVA multiple comparison procedure (Table 4) indicate a significant difference in means between the combination of a larger IT budget and smaller organization revenue with that of a larger IT budget and middle/larger organization revenue. One plausible explanation of the difference in means is that in cases where the environmental context in which both the IT budget and organization revenue are larger, it represents a more conducive environment in order for EA to benefit IT the most. If the IT budget is small, it does not affect the perception of EA facilitating IT objectives. However with a larger IT budget, in order for EA to support and benefit IT initiatives, this finding indicates organizational revenue must also be larger. With a smaller IT budget, no matter the overall organization revenue, it does not make a difference regarding the ability of EA to facilitate IT objectives. It is also possible, particularly given the early stage of most EA practices, that the larger IT budget in some of these cases is associated with higher IT investments at this particular time which are benefitting from EA activities, and/or that investments in EA are resulting in actual improvements in general IT activities. In this relationship, in every case a significant difference is found, a middle (2) or large (3) organization revenue is involved.

Table 4 ANOVA DV: EA-IT; IVs: Combination of IT Budget and Organization Revenue

	Combo of IT Budget/Org Revenue (I)	Combo of IT Budget/Org Revenue (J)	Mean Difference (I-J)	Std. Error	Sig. (p value)
LSD	**Large(2)/Small (1)**	Small (1)/Small (1)	-.18217	.12200	.136
		Small (1)/Medium (2)	-.16758	.13947	.230
		Small (1)/Large (3)	-.26291	.17084	.125
		Large (2)/Medium (2)	**-.28183(*)**	.12698	.027
		Large (2)/Large (3)	**-.30564(*)**	.13092	.020

* The mean difference is significant at the .05 level.

In some prior research regarding the appropriate levels of the IT budget in relation to the organization's overall revenue, a higher level of IT budget may be considered to be actually detrimental to the organization and can be considered a state of disorder. Indeed, in a presentation by Strassmann (2005), he maintains complexity and costs rise in an environment without the structure and order that EA potentially brings. However, the findings of our study may provide support indicating larger IT budget in relation to organizational revenue may need to be larger in order for EA to effect improvements in organizations, at least for improvements in IT departments' goals and objectives.

Therefore, organization size may have an influential role regarding EA initiatives in organizations. As previously discussed this may indicate a similarity between EA and other initiatives or projects that bring more structure and formalization to organizational processes (along with increased overhead and at least temporarily higher investment levels). So in the same way that investments are required in software process improvement (SPI) programs like Software Engineering Institute's Capability Maturity Model Integration (CMMI) in order to realize the benefits of such practices, EA requires some additional investment and overhead in order to achieve its rewards.

Some research even asserts that such SPI efforts are only applicable to larger organizations because of the resources required that make implementation of a SPI program too difficult for smaller organizations or that small organizations (which may be working primarily on smaller IS projects) have no need for the structured techniques advocated by SPI programs (Johnson and Brodman, 1999; Pino, Garcia, and Piattini, 2008; Richardson and von Wangenheim, 2007; Staples et al., 2007). Staples et al. (2007) conducted an exploratory research study into this question. Their research indicated several reasons why organizations do not proceed with an initiative like the CMMI. One important reason was organizational size. Smaller organizations believed their small size impeded the adoption of the CMMI.

Perhaps a similar line of reasoning is relevant for EA initiatives as well. Unlike this research, negative perceptions about EA do not seem to be the reason for the difference in means. When looking at the means of the 20 survey questions about perceptions of potential benefits of EA, all 20 scored favorably on the 5-point Likert scales (the smallest mean is 3.49 for question 20o that EA "improves trust"). Moreover in the case of CMMI and EA, a partial adoption of carefully chosen specific EA or CMMI practices (as in the 20% that could result in 80% of the benefits) could likely be warranted and even occurring under the radar of some studies.

THE RELATIONSHIP OF ORGANIZATION AND IT SIZE TO IT PRACTICES, CAPABILITIES, AND PERCEPTIONS

Another noteworthy observation is that as organization size increases, the organizations' practices and capabilities improve as well. For example when considering ISD capabilities (Table 5), the means of the two combination variables with the larger organization revenue also possess the two highest means, 3.9494 and 3.8742 (reflecting the highest ISD capabilities for the population), for this factor.

Table 5 Means of ISD Capabilities

Combo of IT Budget/Org Revenue	N	Mean	Std. Deviation
Small (1)/Small (1)	118	3.5981	.77713
Small (1)/Medium (2)	44	3.7145	.74321
Small (1)/Large (3)	**19**	3.9494	.77969
Large (2)/Small (1)	27	3.6465	.84337
Large (2)/Medium (2)	80	3.5559	.67278
Large (2)/Large (3)	**64**	3.8742	.63840
Total	352	3.6759	.73801

In a similar manner, this same trend of organizational practices getting better (as measured by higher ISD and higher requirements capabilities) as organization size increases is seen in the means of the same two combination variables within the context of the measure of requirements capabilities (Table 6). Once again, the two highest means are the ones with the two larger organization revenue variables (3.5111 and 3.5328).

Table 6 Means of Requirements Capabilities

Combo of IT Budget/Org Revenue	N	Mean	Std. Deviation
Small (1)/Small (1)	118	3.3523	.60464
Small (1)/Medium (2)	44	3.4735	.57727
Small (1)/Large (3)	**18**	**3.5111**	.65360
Large (2)/Small (1)	27	3.3160	.50724
Large (2)/Medium (2)	80	3.3163	.61133
Large (2)/Large (3)	**64**	**3.5328**	.55179
Total	351	3.3975	.59129

Finally, within the factor of EA perceptions (Table 7), using the EA-IT factor from Table 1 again, all the combination variables with the middle and larger organization revenue and larger IT budget possess larger means (4.0781 and 4.1019 respectively) than the total mean for the factor (4.0124). It is important to note that the combination variables with the middle and larger organization revenue and larger IT budget were also significantly different than the combination variable of a larger IT budget but a smaller organization revenue.

Table 7 Means of EA-IT Factor

Combo of IT Budget/Org Revenue	N	Mean	Std. Deviation
Small (1)/Small (1)	115	3.9785	.61018
Small (1)/Medium (2)	44	3.9639	.65219
Small (1)/Large (3)	19	4.0592	.56422
Large (2)/Small (1)	27	3.7963	.58850
Large (2)/Medium (2)	**80**	**4.0781**	.50838
Large (2)/Large (3)	**64**	**4.1019**	.50001
Total	349	4.0124	.57244

AN EARLY WARNING SIGN FOR SMALL AND MIDSIZE ENTEPRISES (SMEs) AND ERPs?

In a study of ERP implementations Mabert, et al. (2003) found organizations that are different in size tend to follow different ERP implementation paths. The differences revolved around the motivation of implementing an ERP system, the different systems pursued, implementation strategies, and the level of customization desired on the basic ERP system. Overall, different outcomes and payback were realized between organizations of different size.

The findings here may provide warnings concerning ERP system adoption. Considerations of organization size, and the tendencies revealed in this research toward weaker fundamental IT capabilities in smaller organizations (as seen in Tables 5-7), may be of increasing importance considering the recent trend of SMEs increasingly planning to or actually implementing ERP systems (van Everdingen, van Hillegersberg and Waarts, 2000; Mabert et al., 2003; Sun, Yazdani and Overend, 2005). Moreover, such risks are potentially exacerbated by many new entrants into the ERP market including dozens of so-called "open-source" ERPs.

These warnings are even more ominous when one considers the impact open-source ERP systems may have on SMEs. A cursory search finds over 20 open-source ERP solutions. Gartner Group's *ERP Hype Cycle* (2007) indicates open-source ERP systems ascending the "peak of inflated expectations" and another 5-10 years until market readiness and mainstream adoption, yet also recommends that SMEs consider open-source ERP systems (Woods, 2008). However, as indicated in this research paper (specifically in Tables 5-7), SMEs tend to be weaker on IS development and requirements capabilities. Thus when confronted with the choice of an open-source ERP system, the arguably lower upfront costs (and being somewhat neglected by the larger, more established ERP vendors) may entice those organizations that may be most at risk for failed

implementations. Such risks are exacerbated since SMEs may also lack the strong project management and analysis and design (i.e., EA) capabilities that are important in ERP implementations.

The relationship between EA and ERP has been identified in research regarding critical success factors of ERP implementations. For instance, Ehie and Madsen's (2005) research into the critical success factors of ERP implementation led to their suggestion of a 5-stage ERP implementation process. The authors placed EA at the top of their ERP implementation process, maintaining that initiation of EA should precede any ERP implementation and that EA drive the motivation for ERP implementations (Ehie and Madsen, 2005). Similarly, Ngai, Law, and Wat (2008) stressed that the alignment of ERP and organization processes is instrumental for ERP success. That is, this alignment is facilitated by an EA, since such alignment is a result of EA (Bernard, 2005; Gregor et al., 2005; Vaidyanatha, 2005). Thus, EA and ERP are in a symbiotic relationship (the former being the design the latter the implementation). Just as organizations would benefit from understanding the role and influence of organization size on the success of ERP implementations, so too, would organizations benefit from an increased understanding of the relationship of organization size and better practices (such as ISD and requirements capabilities as well as higher EA perceptions).

In examining organization environments most conducive to EA initiatives, an understanding of the role of organizational leadership is imperative. The influential role of leadership in project success is well documented (e.g., Kappelman, McKeeman and Zhang, 2006; Nelson, 2007). So too, in EA, leadership buy-in and ownership is essential to successful EA programs. By gaining insight into the environments that facilitate more positively developed perceptions of EA, organizations considering embarking on an EA initiative can attempt to optimize the environment for success. Leadership buy-in is also achieved and maintained by actual success. An EA evangelizing effort even before EA implementation begins is important. This preparation of the environment for EA is important to best position the organization for EA and continued leadership support as well as to manage expectations. EA advocates should strive to define and set the organization conditions necessary to most likely attain EA success. In the final analysis, it is practices that matter, not size. It just happens that at the present time, on average, larger size is associated with better practices.

LIMITATIONS AND FUTURE RESEARCH

The SIMEAWG Information Management Practices Survey, which this research paper is based on, was initially created to study perceptions of EA and the state of EA and other IT practices in organizations and provide opportunities for further study of the EA phenomena in organizations. In this research organization size was examined by the technique of combining several structural demographic variables from among a large pool available (IT budget, number of employees, and organization revenue/budget) versus using discrete values and ratios. Thus other analyses are possible with these data (e.g., utilization of number of employees) and future studies could collect non-categorical data.

This research paper provides a view of IS professionals' perceptions of EA within their organizations and industries and an increased understanding of the influence of the contextual factor of organization size on IT practices and EA as well. As organization size also is an important variable in ERP implementations, as well as the alignment or fit of the organization to the ERP/IT systems, the symbiotic relationship of EA and ERP is one that demands further research. The discussion of the interplay between EA and ERP in this research paper initially indicates another aspect of the value of EA to organizations. However, more research is needed to increase the understanding of the role of EA in meeting organizational requirements and missions. Finally, a categorization of EA perceptions by IS professionals is also offered by this research paper to provide important "launch point" variables and understanding for future research that endeavors to examine EA influences on the organization and IT departments.

CONCLUSION

As organizations increasingly rely on pre-packaged enterprise solutions like ERPs, they are also adopting standards for processes and data which may or may not be a good fit with their organization as a whole. Moreover, these standardized solutions may tempt organizational and IT leadership into reducing their understanding of their own organizations, instead relying increasingly on assumptions about how the enterprise actually works. It is important for IT and organizational leadership to not overly rely on technical solutions, but ensure the foundation is set to provide value, meet organization objectives, and facilitate the success of IT projects such as ERP system implementations. This foundational layer can be provided by EA, which can facilitate the alignment between organizational and IT strategy, consistency of leadership and goals throughout an organization, and provide greater knowledge of organizational processes and practices in order to understand the goodness of fit between the architecture embedded in an off-the-shelf application and the actual architecture of a particular organization. Strategy provides the destination, EA provides the map, good practice takes you there. Success requires all three.

REFERENCES

1. Bernard, S. A. (2005). *An Introduction to Enterprise Architecture*. Bloomington, IN: AuthorHouse.
2. Brown, J., and Hagel, J. (2003), Letters to the editor: Does IT matter?, *Harvard Business Review*, 81, 6, 109-112.
3. Carr, N. (2003), IT doesn't matter, *Harvard Business Review*, 81, 5, 41-50.
4. Chen, P., and Pozgay, A. (2002) Architecture practice: A fundamental discipline for information systems, *Australasian Conference on Information Systems (ACIS)*, 1-12.
5. Coughlan, F., Lycett, M., and Macredie, R. (2005) Understanding the business-IT relationship, *International Journal of Information Management*, 25, 303-319.
6. Dearden, J. (1966) The myth of real-time management information, *Harvard Business Review*, 68, 123-133.
7. Dearden, J. (1972) MIS is a mirage, *Harvard Business Review*, 50, 1, 90-99.
8. DeLone, W., and McLean, W., (2003) The DeLone and McLean model of information systems success: A ten-year update, *Journal of Management Information Systems,* 19 (4), 9-36.
9. Ehie, I., and Madsen, M. (2005) Identifying critical issues in ERP implementation, *Computers in Industry,* 56, 545-557.
10. Finkelstein, C. (2004). System Development Strategies for 21st Century Enterprises, *The Data Administration Newsletter,* 1-9.
11. Gartner Group (2007) ERP Hype Cycle, *Gartner Research, G00149810*, 1-65.
12. Gregor, S., Hart, D., and Martin, N. (2007) Enterprise architectures: enablers of business strategy and IS/IT alignment in government, *Information Technology and People*, 20, 2, 96-120.
13. Henderson, J. C., and Venkatraman, N. (1993). Strategic alignment: Leveraging information technology for transforming organizations, *IBM Systems Journal, 32, 1, 4-16.*
14. Ives, B., Hamilton, S., and Davis, G. (1980) A framework for research in computer-based management information systems, *Management Science*, 26 (9), 910-934.
15. Johnson, D., and Brodman, J. *(19*97) Tailoring the CMM for small businesses, small organizations, and small projects, *IEEE Software Process Newsletter,*
16. Kappelman, L., (1997), *Year 2000 Problem: Strategies and Solutions from the Fortune 100*, Boston: International Thomson Computer Press.
17. Kappelman, L., McKeeman, R., and Zhang, L. (2006) Early warning signs of IT project failure: The dominant dozen, *Information Systems Management*, 23, 4, 31-36.
18. Kappelman, L. (2007) Enterprise Architecture: Not Just Another Management Fad, *Align Journal*, 24-27.
19. Kappelman, L. (2009) *The SIM Guide to Enterprise Architecture: Creating the Information Age Enterprise*, Leon Kappelman, Editor, Auerbach: New York, forthcoming.
20. King, W. R. (1995). Creating a strategic capabilities architecture, *Information Systems Management, 12,* 1, 67-69.
21. Luftman, J. N., Lewis, P. R., and Oldach, S. H. (1993). Transforming the enterprise: The alignment of business and information technology strategies, *IBM Systems Journal,* 32*,* 1, 198-221.
22. Mabert, V., Soni, and Venkatraramanan, M. (2003) The impact of organization size on ERP implementations in the US manufacturing sector, *Omega, The International Journal of Management Science*, 31, 235-246.
23. Malhotra, Y. (1996). *Enterprise architecture: An overview* [WWW document], BRINT Institute. URL http://www.kmbook.com/enterarch.htm
24. Nelson, R. (2007) IT project management: Infamous failures, classic mistakes, and best practices, *MIS Quarterly Executive*, 6, 2, 67-78.

25. Ngai, E., Law, C., and Wat, F. (2008) Examining the critical success factors in the adoption of enterprise resource planning, *Computers in Industry*, 59, 548-564.

26. Pino, F., Garcia, F., and Piattini, M. (2008) Software process improvement in small and medium software enterprises, *Software Quality Journal,* 16, 2, 237-261.

27. Richardson, I., and von Wangenheim, C. (2007) Guest editors' introduction: Why are small software organizations different?, *IEEE Software, 24, 18-22.*

28. Ross, J. W., Peter, W., & Robertson, D. (2006). *Enterprise architecture as strategy*: Harvard Business School Press.

29. Ross, J (2003) Creating a strategic IT architecture competency: learning in stages, *MISQ Executive,* 2, 1, 1-18.

30. Shah, H. and El Kourdi, M. (2007), Frameworks for enterprise architecture, *IT Pro-IEEE Computer Society*, 36-42.

31. Staples, M., Niazi, M., Jeffery, R., Abrahams, A., Byatt, P., and Murphy, R. (2007). An exploratory study of why organizations do not adopt CMMI, *The Journal of Systems & Software, 80,*6, 883-895.

32. Strassman, P. (2005) *The structure of IT spending as measure of organizational disorder*, presentation at Stevens Institute of Technology.

33. Sun, A., Yazdani, A., and Overend, J. (2005) Achievement assessment for ERP system implementations based on critical success factors, *International Journal of Production Economics,* 2, 18, 189-203.

34. Vaidyanathan, S. (2005). Enterprise architecture in the context of organizational strategy, *BPTrends, 11*, 1-9.

35. van Everdingen, Y., van Hillegersberg, J., and Waarts, E. (2000) ERP Adoption by European midsize companies, *Communications of the ACM*, 43, 4, 27-31.

36. van der Raadt, B., Hoorn, J., and van Vliet, H. (2005). Alignment and maturity are siblings in architecture assessment. *Advanced Information Systems Engineering: 17th International Conference, CAiSE 2005, Porto, Portugal, 25-42*.

37. Wegmann, A., Balabko, P., Lê, L. S., Regev, G., and Rychkova, I. (2005). A Method and Tool for Business-IT Alignment in Enterprise Architecture, *17th CAiSE Forum, Porto, Portugal, 121-145.*

38. Wieringa, R., Blanken, H. Fokkinga, M. and Grefen, P. (2003) Aligning application architecture to the business context, *Advanced Information Systems Engineering,* 1028-1029.

39. Woods, J. (2008). Open source in ERP, 2008, *Gartner Research, No. G00156331*, 1-8.

40. Young, C. (2001). The unexpected case for enterprise IT architectures, *Gartner Research, No. SPA-12-7101*, 44-53.

41. Zachman, J. (1987) A framework for information systems architecture, *IBM Systems Journal*, 26, 3, 276-292.

42. Zachman, J. (2007). *Enterprise Architecture Standards V2.01*, http://zachmaninternational.com/2/Standards.asp.