

4-14-2014

Early Results - Including an Enterprise Architecture Course in Information Systems Curricula

George Schell

Univ of North Carolina Wilmington, SCHELLG@UNCW.EDU

Follow this and additional works at: <http://aisel.aisnet.org/sais2014>

Recommended Citation

Schell, George, "Early Results - Including an Enterprise Architecture Course in Information Systems Curricula" (2014). *SAIS 2014 Proceedings*. 35.

<http://aisel.aisnet.org/sais2014/35>

This material is brought to you by the Southern (SAIS) at AIS Electronic Library (AISEL). It has been accepted for inclusion in SAIS 2014 Proceedings by an authorized administrator of AIS Electronic Library (AISEL). For more information, please contact elibrary@aisnet.org.

Early Results – Including an Enterprise Architecture Course in Information Systems Curricula

George Schell

University of North Carolina Wilmington

SCHELLG@UNCW.EDU

ABSTRACT

The IS 2010 Curriculum Guidelines for Undergraduate Degree Programs in Information Systems (Topi et al 2010) included an enterprise architecture course that was not included in earlier curriculum guidelines. It was an ambitious course and was suggested to be a core course required of all information systems majors in business schools. This paper outlines the benefits and limitations of the enterprise architecture and also an early measure of the adoption of the course in curricula.

Keywords

Enterprise architecture, undergraduate curriculum

INTRODUCTION

The *IS 2010 Curriculum Guidelines for Undergraduate Degree Programs in Information Systems* (Topi et al 2010) includes a core course on enterprise architecture (EA). This reflects the emphasis and attention that enterprise architecture is attracting. The U.S. Congress passed the Clinger-Cohen Act in 1996 and we have the Federal Enterprise Architecture as a result. The Open Group Architectural Framework (www.opengroup.org) was first developed in 1995 and The Open Group promotes it as a prominent and reliable enterprise architecture standard. Europe has the Commission Enterprise IT Architecture Framework (European Commission Directorate General for Informatics). With the interest from governmental bodies, industry groups, and academics it is understandable that the IS 2010 guidelines include a core course on EA.

There has been debate and research to more clearly define what is meant by “enterprise architecture” and how it should impact organizations. Zachman (Zachman, 1987) wrote what is arguably the seminal article on EA premising that the increased power of information technology requires a new information systems architecture for organizations that encompasses the complexities of the entire organization and not just the stove-pipes of early information systems. The IS 2010 curriculum describes EA as focusing on organizational level issues relating to planning, architecting, designing, and implementing across functional areas with a unified systems view (paraphrased, Topi et al 2010, page 28). Enterprise architecture is always related to the business strategy and the information systems strategy. An overriding theme in the debate is that enterprise architecture is a strategic endeavor that has promise to bring a unification of strategic goals and processes all the way down to the local level.

This paper will provide early results on the inclusion of EA as a core course for business students majoring in information systems. This will shed light upon the acceptance of an enterprise architecture course by faculty. Also, an opinion will be presented about the likelihood of EA as a required course for future information systems majors.

THE IMPORTANCE OF ENTERPRISE ARCHITECTURE

The complexity of organizations and the information systems which support them drives the importance of EA. Good enterprise architecture should deliver (1) standardized data across functions and units of the organization, (2) clearly defined, common processes across functions and products, and (3) better communication amongst all members of the organization. Enterprise architecture supports conveying a clear set of strategic goals and measuring performance across a complex organization.

In global organizations, the local interpretations of a standard can surprise those who set the standards. An American seeing a Pizza Hut in Shanghai may enter the restaurant expecting to see the same menu seen in Atlanta. While the expected list of toppings is offered, the customer will notice that eel is also a featured topping. Standards should not be complete control of specifics; they should be the framework from which specifics are created to meet local needs.

It is not only standardization, efficiency, and profits that benefit from EA, corporate governance benefits as well. Accounting information systems were early targets of information assurance and control. COBIT (**C**ontrol **O**bjectives for **I**nformation and related **T**echnology) has moved from an initial focus on records management to the current COBIT vision including security/risk relationships as well as performance/cost relationships.

ISACA (formerly known as the Information Systems Audit and Control Association at www.isaca.org) released COBIT version 5 in 2012 and a specific improvement was addressing management of information technology related risk. Senior managers and corporate board members of organizations are increasingly held accountable for actions of employees far below their immediate oversight. This accountability of senior members emphasizes the importance of strong enterprise architecture that returns data that can detect when processes are not followed.

Unfortunately, the desire to use EA to develop information systems and processes that micromanage can result from the fear of being held accountable for actions of employees far below senior management. Some proponents of EA tout the ability of the architecture to bring standardization down to the most local transaction in a global organization. That is a step too far; enterprise architecture is a strategic tool.

ENTERPRISE ARCHITECTURE IS A STRATEGIC TOOL

The strata of management have been layered from top to bottom as strategic, tactical, and operational for some time. The layers relate to the policy, procedure, and execution of organizational matters – sometimes referred to as the “why, what, and how” questions. Jeanne Ross (Ross et al, 2006) and others at the MIT Sloan Center for Information Systems Research have done a very good job of explaining the disconnection often seen between business strategies and information technology (IT) and also how enterprise architecture can be used as a strategic weapon.

Venkatesh et al (Venkatesh et al, 2007) make a strong case that an organization with a mature enterprise architecture finds strategic advantage through IT. Enhancing efficiencies and eliminating waste are both valuable characteristics of enterprise architecture but strategic advantage is the most important element. The first catalyst they cite for evolving EA maturity is formulating a clear strategic vision that leads to commitment among top managers in the organization (Venkatesh et al, 2007, page 87).

Another reason for strategic vision in EA is the importance of global organizations. While technology standards are generally in place for businesses with global operations, process standardization and/or data standardization may not be in place (Kettering et al, 2010). Achieving Bartlett and Ghoshal’s (Bartlett and Ghosal, 1998) global approach requires highly standardized processes and data. But it is important to remember that standardization in the core processes and business functions should support sufficient flexibility to respond to local markets (Kettering et al, 2010, page 960).

Strict centralization that dictates the precise interaction between the organization and the customer may not be tolerated by management in the disparate locations of global operations. Managers need to be allowed to assert their judgment and expertise, to bend the rules of the process when necessary to achieve the organization’s goals. Part of management is discretion and adaptation based upon the information presented to a manager. Common business goals supported by enterprise architecture for information technology can support local judgment at the same time enterprise data is collected and enterprise processes are followed.

THE LIMIT TO ENTERPRISE ARCHITECTURE

It can be argued that the power of computers has outpaced the architectures by which information systems are designed. Moore’s Law yields impressive leaps in processing power that are hard to match with new theories in information systems architecture. Even though there have been elegant approaches to designing information systems we are still haunted by Cobb’s observation (Cobb, 2004) – “We know why projects fail, we know how to prevent their failure – so why do they still fail?”

In the case of enterprise architecture, we invite failure when we rely upon overly ambitious control of minute details, especially for global organizations. A Google search of “enterprise architecture failure” brings over 4,000,000 “hits.” Sessions (Sessions, 2006) observes that EA failures can occur when an organization has “...the false notion that creating an enterprise architecture means developing a detailed blueprint of the entire organization.” Agility and adaptation to new customer demand is best accomplished by the innovation of the local manager. Zachman (Zachman, 1987) used an example of building a house when describing his vision for enterprise architecture. Maybe that vision should be expanded to encompass building codes.

When systems are very complex those managers closest to the complexity may be best equipped to solve the problem. A centralized approach to the solution of complex, dispersed problems may not adequately accommodate the intricacies required to successfully solve a local problem. At the same time, the laissez faire flight from centralization expressed by Read (Read, 1958) [and explained in Milton Friedman's video "Power of the Market – The Pencil" which can be viewed at www.youtube.com/watch?v=R5Gppi-O3a8] ignores the contributions of centralization to bring standardization and efficiencies to a market. The answer for enterprise architecture lies between extreme laissez faire and extreme centralization.

A LACK OF ADOPTION

The benefits of enterprise architecture, especially to help achieve organizational goals across diverse and complex functions, bolster the argument that enterprise architecture should be included in the curriculum for information systems students. Yet the enterprise architecture core course for information systems majors described in the IS 2010 curriculum guidelines (Topi et al 2010) does not exist in the undergraduate curricula of the top 25 undergraduate business schools as ranked by Businessweek for 2013 (<http://www.businessweek.com/reports/business-schools/best-undergraduate-business-schools-2013>). Even though Bentley was one of the top 25 schools listed and Bentley's William Schiano was a major contributor to the EA course material in the IS 2010 standards, Bentley does not offer an undergraduate course in EA.

Part of the IS 2010 description of the enterprise architecture course is

“Students learn frameworks and strategies for infrastructure management, system administration, data/information architecture, content management, distributed computing, middleware, legacy system integration, system consolidation, software selection, total cost of ownership calculation, IT investment analysis, and emerging technologies.” (Topi et al 2010, page 43)

It is an ambitious list of topics. It can be argued that undergraduate students will not have enough prerequisite knowledge to adequately understand these topics and especially as their interplay.

In addition to the 25 schools listed in Business, an additional 50 schools were randomly chosen from AACSB accredited schools that offered an undergraduate degree in information systems or a closely related field. Out of the 75 schools reviewed only two schools had a course on enterprise architecture. The University of Alabama offers EA as a second analysis and design class in its curriculum. Arizona State University requires an accounting enterprise process course. A list of the 75 reviewed schools is in Table 1.

CONCLUSION

Enterprise architecture is and will continue to be a strategic endeavor. The reason is simple; EA is the best effort to date to truly align the information technology with business needs. The full benefit of information technology and systems cannot be reached when they are sub-optimized supporting stove-piped business functions and processes. The efficiencies of standardization – processes and data – combined with a well communicated, unifying vision are strategic matters.

Enterprise architecture is especially important to global business. Organizations that require high levels of standardized, efficient processes as well as great adaptability at the local level – categorized as “transnational” by Bartlett and Ghoshal (Bartlett and Ghoshal, 1998) – can greatly benefit from enterprise architecture. The benefits of enterprise architecture may be disappointing to an organization until its EA is mature, but achieving EA maturity provides a strategic weapon to the organization.

The arguments for an enterprise architecture course in undergraduate information systems degree are strong. But the reality is clearly that business schools have rejected EA as a required course for information systems majors. More than 25 years after its proposal by Zachman (Zachman, 1987) and four years after inclusion in the curriculum guidelines for undergraduate information systems programs we find EA courses are virtually non-existent.

We can only speculate about the reasons for a lack of EA adoption without surveying faculty members involved in curriculum decisions. What can be said from reviewing catalog/bulletin contents of the schools in Table 1 is that the systems development life cycle, unified modeling language, use case, and methodologies for rapid application development dominate the systems analysis course content.

Agile application frameworks for projects, such as SCRUM (www.scrum.org), thrive and are largely performed outside of enterprise architecture. The methodologies may be reconciled at a later time. Agile frameworks may be accommodated within EA at a future date. But until such a time comes when the expediency of frameworks that quickly produce results are

allowed to flourish while comprehensive architecture such as EA are available, EA is unlikely to be the required architecture course required of information systems students.

Businessweek Schools Judged the Top 25 in 2013	Randomly Selected AACSB Accredited Schools With Information Systems Majors	
<ul style="list-style-type: none"> • Univ of Notre Dame • Univ of Virginia • Cornell Univ • Washington University, St. Louis • University of Pennsylvania • Boston College • Emory Univ • Univ of Michigan- Ann Arbor • Univ of Texas - Austin • Univ of North Carolina - Chapel Hill • Univ of California, Berkeley • Brigham Young Univ • Indiana Univ • New York Univ • Villanova • Georgetown Univ • Univ of Richmond • Wake Forest Univ • Massachusetts Institute of Technology • Bentley Univ • Univ of Illinois - Urbana-Champaign • Miami Univ • Boston Univ • Carnegie Mellon • Northeastern Univ 	<ul style="list-style-type: none"> • Univ of Alabama • Arizona State Univ • Univ of Arkansas • Cal State Long Beach • San Diego State • Univ of Colorado - Denver • Fairfield Univ • Florida State Univ • Univ of Florida • Univ of South Florida • Georgia State Univ • Univ of Georgia • Bradley University • Ball State Univ • Butler Univ • Iowa State Univ • Univ of Northern Iowa • Univ of Kansas • Murray State Univ • Louisiana State Univ • Towson Univ • Univ of Maryland • Central Michigan Univ • Saint Cloud State Univ • Wayne State Univ 	<ul style="list-style-type: none"> • Univ of Minnesota • Mississippi State Univ • Univ of Mississippi • Univ of Nevada - Reno • Fairleigh Dickinson Univ • Rutgers Univ • Univ of New Mexico • Hofstra Univ • Fairleigh Dickinson Univ • State Univ of NY - Buffalo • Appalachian State Univ • East Carolina Univ • Univ of North Carolina - Wilmington • Univ of North Carolina - Greensboro • Univ of North Carolina - Charlotte • Ohio State Univ • Univ of Dayton • Oklahoma State Univ • Univ of Oklahoma • Oregon State Univ • Penn State Univ • Temple Univ • Baylor Univ • Purdue Univ • Indiana Univ

Table 1. 75 Schools Reviewed for a Required Enterprise Architecture Course

REFERENCES

1. Bartlett, C. and Ghoshal, S. (1998) *Managing Across Borders: The Transnational Solution*. Harvard Business School Press.
2. Cobb, M. (2004) Treasury Board of Canada Secretariat. CHAOS University, The Standish Group International, Inc. 2004. The quote is also known as “Cobb’s Paradox.”
3. Kettinger, W., Marchand, D, and Davis, J. (2010) Designing Enterprise IT Architectures to Optimize Flexibility and Standardization in Global Business, *MIS Quarterly Executive* 9, 2, 95-113.

4. Read, L. (1958) I, Pencil: My Family Tree as Told to Leonard E. Read. Essays on Liberty, Volume VI, *The Freeman*, December 1958.
5. Ross, J., Weill, P., and Robertson, D. (2006) Enterprise Architecture as Strategy: Creating a Foundation for Business Execution, *Harvard Business School Press*.
6. Sessions, R. (2006) A Better Path to Enterprise Architectures. msdn.microsoft.com/en-us/library/aa479371.aspx, Microsoft Developer Network, April.
7. Topi, H., Valacich, J.S., Wright, R. T., Kaiser, K. M., Nunamaker, J. F., Sipior, J. C., and deVreed, G. J. (2010) IS 2010 Curriculum Guidelines for Undergraduate Degree Programs in Information Systems, *Association for Computing Machinery and Association for Information Systems*.
8. Venkatesh, V., Bala, H., Venkatraman, and Bates, J. (2007) Enterprise Architecture Maturity: The Story of the Veterans Health Administration, *MIS Quarterly Executive* 6, 2, 79-90.
9. Zachman, J.A. (1987) A Framework for Information Systems Architecture. *IBM Systems Journal* 26, 3, 276-292.