

Nontraditional Course Development: The Case of the Information Systems Architecture Course

Dr. Paul J.A. van Vliet¹
Information Systems & Quantitative Analysis
University of Nebraska at Omaha
Omaha, NE, 68182, U.S.A.

Abstract

This paper describes the development of a new information systems course on the topic of information systems architectures. The process by which this course was developed and taught is interesting for two reasons. First, the course topic remains sufficiently new so that few traditional course development resources such as textbooks are available to instructors and hence other resources need to be sought out. Second, the course was developed to be taught as a distance education course, using two-way satellite-based video and the world wide web as the vehicles for communications and remote instruction. The practical experiences described in this paper may serve as a basis for other instructors on which to base their course preparation efforts.

Keywords: Innovative Course Development, Distance Education, Information Systems Architecture

1. PAPER INTRODUCTION & GOALS

When an instructor is assigned a new course to teach, he or she will commonly select and assign a text, followed by the gathering of additional research to contribute to the development of lectures and assignments. Yet sometimes a teaching assignment comes about for which the traditional preparation method is inappropriate or even impossible. This paper describes the development of just such a course: the course content was so innovative no texts existed, the instructor was to teach this course as a distance education course via two-way audio and video for the first time, and the students enrolled in the course were not in a traditional information systems curriculum. The development and teaching of this course were challenging, and from this experience some important lessons can be learned which may be valuable for other information technology instructors and faculty.

The goals of this paper, then, mirror the goals of the course development it describes: (1) to examine starting points for distance education, and (2) to examine the options available for course development when traditional texts are not (yet) available.

The distance-education portion of this paper may seem the most relevant at first: despite criticism of distance education as both a teaching method and a means of

educational efficiency (University of Illinois Faculty Seminar, 1999), faculty are increasingly asked to deliver courses via some distance education technology. The course described in this paper used two-way videoconferencing as its main communications technology and web-based communication as its secondary technology.

The course development portion of this paper is, however, just as relevant. In the past decade, we have seen the pace of technological development accelerate almost beyond our abilities to conceive of it properly. Yet for university information technology curricula to remain relevant, faculty are increasingly asked to develop and teach courses on new technologies. Often faculty need to draw on nontraditional information sources rather than traditional textbooks. This paper, then, will describe some of these sources.

Finally, this paper is written in third person singular so as to maintain a better sense of objectivity than if it were written in first person singular. However, the instructor whose actions are described in this paper is also the paper's author.

2. COURSE INITIATION & GOALS

The instructor for the course (and author of this paper) is a faculty member at a public, Midwestern university

¹ Author's e-mail address: pvvliet@unomaha.edu

which just a year earlier had seen the creation of a new College of Information Science and Technology. This new college brought together the university's Management Information Systems and Computer Science programs, which had until then been in separate colleges. The new college also planned for the development of new information technology and telecommunications-related programs. In addition, the college was given a mandate by the state legislature to develop distance education offerings.

The Dean of the college invited a number of faculty from both programs onto a committee which was to develop a course on how large organizations deal with the development, integration, and maintenance of a variety of computer systems. The concept of an organization's information technology architecture or infrastructure was central to the discussions of the committee. Based on research and experience, the committee discussed just what the concept of information systems architecture meant to them and how a course on this topic would fit into the curriculum of the academic programs of the college. The ideas brought forth by the different members of the committee resulted in a positive recommendation for the development of such a course. At this time, a preliminary list of topics to be covered in the course was agreed upon, based on a limited search of the literature. The course would for the time being be administered by the college itself, rather than by either of its two programs, but students in each program would be allowed to take it as an elective course.

Following the recommendation of the committee, near the end of the spring semester, the Dean of the college decided that a faculty member in the Management Information Systems program would likely be better able to teach the course. Consequently, the author of this paper was assigned to develop the course materials and prepare to teach it in the upcoming fall semester. In addition, as the college was gearing up to offer distance education offerings at the time, it was decided that this course would be one of the first two courses of the college to be taught as a distance education course. Reassured by the provision of summer support, the instructor set off to develop a course in a topic he had never taught before and develop it for a teaching mode he with which had no previous experience.

3. COURSE PREPARATION

Once the instructor started his search for textbooks and relevant literature in earnest, it became clear that the course outline provided by the Dean's committee hardly did the subject justice. The instructor uncovered a substantial amount of research and development on the topic of information systems architectures which provided him with fresh insights and a much more

substantial approach. Following approval by the Dean, the course outline was modified to reflect these findings.

The following, then, are the various information sources used by the instructor to develop the course contents:

- **Journals.** While the topic of information systems architectures is not yet commonly discussed in the traditional IS journals, several relevant papers were found. Particularly the IBM Systems Journal – which published the seminal article by Zachman in 1987 – provides regular articles on the topic of large systems integration. Once the Zachman article was found, using “Zachman” as a keyword in literature searches turned out to be an effective method for finding follow-up articles.
- **Books.** While only a few books have been published on information systems architectures specifically (such as the volumes by Cook, 1996, and by Inmon, Zachman & Geiger, 1997), a number of texts regarding the strategic deployment of information technology – a topic which closely relates to IS architecture – was available and these texts were subsequently used to develop the course. In addition, texts on systems development methodologies were reviewed for appropriate materials.
- **Magazines.** Popular computing magazines such as Datamation and Computerworld were used to provide case examples for the course.
- **The World Wide Web.** A wealth of information on IS architectures has found a comfortable home on the web. In particular the websites by Unisys (Unisys Corporation, 2000) and the Department of Energy (United States Department of Energy, 1999) have published a wealth of relevant information.
- **Traditional IS courses.** The new course connects to traditional information systems courses in many ways. Systems development and database course materials were mined for relevancy to IS architecture. Particularly the concepts of process modeling and data modeling were useful as a basis on which to build the larger concept of IS architecture modeling. In addition, course materials for courses on corporate strategy and information systems strategies were reviewed to supplement the IS architecture course.
- **Field Experts.** Several experts on IS architectures have built webpages or websites describing their work and have included on the pages their e-mail address. Consequently contacting them became relatively easy. Fortunately most experts were quite willing to answer questions or provide additional explanations to their work. Particularly John Zachman (developer of the Zachman Framework, see Zachman, 1987, and Sowa & Zachman, 1992) and Roger Evernden (developer of the Information FrameWork, see Evernden, 1996) were quite cooperative.

- **Workplace Interviews.** To gain a sense of whether or not the concepts of IS architecture had filtered down to the workplace, interviews were conducted with several local IS specialists who worked for organizations with large and complex information system infrastructures. The first contact was a high-ranking project manager of a large bank. The second contact was the developer of educational technology and content at a large university hospital and had previously worked in systems development at the headquarters of a large railroad company. These contacts added a substantial amount of realism and heuristics to the theory obtained from other sources. A third contact was identified after the course had been taught. He was the systems architect for a large national transaction processing company. This contact evaluated the course contents and provided access to additional sources for the next time the course was to be taught.

Much of the information gathering from these sources was cumulative: a particular piece of information found in one source would lead to additional items to be obtained from other sources.

As the instructor gathered the various materials for the course, an approach to presenting the materials in a course format began to emerge. It became obvious to the instructor that in order to present a topic that was so new to the curriculum, it would first have to be placed in its proper context. Next, the basic definitions would need to be covered, followed by the components which contributed to an organization's IS architecture. This, then, resulted in a clear sequence, a story to be told. This sequence was broken up into segments which made up the individual lectures for the course. These lectures were subsequently developed individually, drawing heavily on the source materials for both theoretical concepts and practical implementations.

The following is the sequence of topics developed for the course:

1. The role of information systems in the organization, including some organizational theory basics.
2. The problems experienced by large organizations using large, complex information systems.
3. The "solution" to the problem of managing large, complex information systems structures: the introduction of the concept of IS architecture.
4. Some early approaches to "architecting" the corporate computing environment.
5. The conceptual building blocks of IS architecture, such as standardization, distribution, classification, and the recognition of multiple perspectives.
6. An overview of three IS architecture frameworks: the Zachman framework, the Information Framework, and the Data Warehousing concept.

7. The technical building blocks of IS architecture, which reviewed traditional information technologies in the role of architecture enablers.
8. A case study: a detailed examination and evaluation of the IS architecture as published by the US Department of Energy.
9. The process of developing and implementing an architecture, from the strategic initiative to the implementation and maintenance of systems.
10. The management and performance measurement of IS architecture.

4. DISTANCE EDUCATION PREPARATIONS

Parallel to the development of the course content was the preparation for teaching the course as a distance education course. The technology used for conveying the course over a distance was in place: the university belonged to a state-wide educational network which provided for two-way audio and video signals between originating and receiving sites. Given that the video signal was transmitted partially by cable and partially by satellite, a delay of approximately 3 seconds would occur for a signal to cross the state. In addition, Internet- and web-based communications would be part of the distance education experience.

The first substantial preparation occurred when the instructor enrolled in a week-long distance education workshop at a local community college. This community college had built up a substantial experience with one-way televised distance education and offered workshops on developing an effective on-screen presence. Six people participated in the workshop which was facilitated by two instructors. Each day, the participants would first discuss an aspect of distance education, such as the various methods for interacting with students, ways for distributing and collecting assignments, etc. The participants would then each "teach" a prepared session, with some of the participants observing in the same room (acting as the local, in-class students) and the other participants observing the session on a television screen in a separate room (acting as the remote, distance-education students). The "remote" students would be able to communicate with the instructor via a telephone connection only as this was the method used by the community college. Following each session, the participants would evaluate the performance of the "instructor," both on effectiveness of conveying material and on interaction with all of the students. Each teaching session was also videotaped so that later each participant could view and evaluate his or her own performance. The benefits of this training were invaluable. It taught that communicating with in-class students is different from interacting with remote students. It also allowed each participant to become accustomed to the concept of speaking to a camera when addressing the remote students.

The second distance education aspect which required attention was the room from which the course would originate. A room built and equipped for this purpose was available on the campus, but the computing equipment in the room had not been updated for many years. The college invested in a new computer for this room and integrated it with the room's distance education infrastructure. The instructor then familiarized himself with the technology which allowed him to "send" to the remote sites one of four images: the instructor, the local students, the computer screen, and a document camera mounted right above the instructor's desk. It would be up to the instructor to switch the images, requiring him or her to be constantly aware of which image was being sent to the remote sites. Fortunately this was one aspect that was included in the training during the distance education workshop.

The third aspect of the distance education portion of the course was the use of the Internet and the World Wide Web. While the use of electronic mail on the Internet was a given, the instructor decided to substantially use the Web by building an extensive website for the course. While this was still a relatively innovative practice at the time, in recent years the use of the Internet as a vehicle for distance education has substantially increased. (Institute for Higher Education Policy, 2000) This website included pages for the following purposes:

- A Welcome Page which appeared when entering the site. This page introduced the course and its distance education nature to visitors. It also had an area for class announcements which the students were encouraged to visit regularly.
- A Syllabus Page which contained the full syllabus for the course.
- A Students Page which for each student contained a photograph, a short biographical and professional description, contact information including a work phone number and an e-mail address, and – if appropriate – a link to a personal homepage.
- An Instructor Page which listed professional and contact information for the main instructor and for the class coordinator at the receiving site of the course.
- A Resources Page which contained online resources for each week of the class. These resources would include a downloadable lecture file (in Microsoft Powerpoint or Adobe PDF format), links to websites containing information related to the lecture, and assignment texts. These resources were organized by the week, so that the students could easily locate the most current class resources.
- While the class was being taught, one additional page was added which contained documents, images, and notes from the students as they worked on the course term project. The students would send these materials to the instructor who would post them on the web as a means of information exchange for the students.

A short note on distance education using the World Wide Web is appropriate here. In the few years since this course was taught, the number of Web-based course offerings from universities worldwide has increased substantially, as has the number of available development tools (e.g. BlackBoard's CourseInfo.). Research is still underway regarding effective course development, teaching methodologies, and faculty-student interaction using the Web. (Institute for Higher Education Policy, 2000)

The final preparation for the distance education aspect of the course was to coordinate the teaching efforts with the coordinator at the receiving site. This coordinator assisted the students with course registration, would be in charge of the audio and video equipment at the receiving site, and would provide handouts for students when they were unavailable from the web and had to be mailed or faxed instead. This coordinator quickly became vital to the continuity and eventual success of the course. A mid-summer visit to the receiving site resulted in a personal acquaintance and subsequent good working relationship between the instructor and the remote coordinator.

5. TEACHING THE COURSE

This course was first taught in the fall semester of 1997. Enrolled were four students at the remote location and only one student at the originating site. None of the students were enrolled in a traditional management information systems degree program. All students saw the course advertised and thought it might provide a good addition to their professional careers.

None of the students were traditional management information systems students. Consequently, the instructor was challenged to convey the rather sophisticated contents of the course without having the benefit of building on prerequisite courses in such topics as data modeling, process modeling, and systems development. The instructor did inject a short review of data and process modeling into the course early on to provide the students with some basic concepts and techniques. The remainder of the course content, however, was not altered. Rather, the instructor decided to explore the theory of information systems architecture by having the students use examples and anecdotes from their respective workplaces to clarify the architecture concepts. After some practice, this worked rather well.

The students took quite quickly to the distance education aspect of the course. Both the originating and receiving classrooms were equipped with "push-to-talk" microphones which allowed students to talk. After a short practice session during the first class session – in which the students introduced themselves – the use of the microphones presented no problem. The students also quickly grew accustomed to the signal delay. At first the delay between the posing of a question and the

remote student's initiation of a response – which lasted approximately 6 to 10 seconds when viewed from the originating site – was rather awkward. After a few class sessions these pauses became more natural and the class settled in a more relaxed rhythm as a result. The exchange of classroom materials via the web and via the remote coordinator occurred quite smoothly. The only distance education-related mishaps occurred when at times the satellite connection to the remote site was down for a few minutes. Fortunately a local technician and the remote coordinator were usually quick to troubleshoot such problems.

A frequently cited drawback of distance education is that the remote students often do not feel part of the class. (Gottschalk, 1995) To minimize this drawback it is generally recommended to specifically call on the remote students and increase their interaction with the instructor and the local students. Given the reliance of the instructor on the students to contribute workplace experiences to the class material and given the wealth of such experiences, this posed little problem in this particular course. The five students interacted comfortably and professionally.

6. THE REMOTE VISIT

Midway through the semester, the opportunity arose for the instructor to visit the remote site. Plans were made so that the instructor visited the site on a class day. During the day, he visited each of the four remote students at their workplace. During these visits, the students were asked about their experiences in the course, about their perceived distance education needs from a management information systems or computer science program, and the local educational offerings. These visits would later prove highly valuable to the further development of the distance education offerings by the college. The instructor also visited with the remote coordinator and with the staff of the receiving site (a regional educational and extension center).

In the evening, the week's class session was taught from the remote site. This session went quite smoothly and turned out to be an eye-opener for the student at the local site who suddenly had to adopt the role of a remote student.

The value of a visit like this can not be underestimated. It provided a better relationship with the remote students. It also demonstrated to them that they were considered a valuable portion of the course and of the distance education program. As a result, this visit made them good future advocates of the college's distance education offerings. The visit also solidified the working relationship with the staff at the receiving site and provided the instructor with a better idea of the technical infrastructure and layout of the receiving class.

7. EXAMS AND PROJECTS IN A DISTANCE EDUCATION ENVIRONMENT

Distance education should not be an impediment to the administration of traditional assignments and exams. Software exists that allows even the secure administration of a multiple-choice exam to remote students. Other reasons may exist, such as the contents or goals of a particular course, for an instructor to decide to innovate when it comes to the development of assignment and exams.

For the purposes of this course, multiple choice exams were not deemed appropriate. Instead, the two exams in this course were case-based take-home exams which the students received and submitted via electronic mail. Each exam started with a case description of a fictional company undergoing a particular change or dealing with a particular challenge related to information systems architecture. The case was followed by several questions, each of which required the students to answer a portion of the case problem from the perspective of one of the topics or lectures covered in the class. This approach required the students to think through a practical problem and apply the theory covered in the class to a real-world situation. The quality of the responses on this type of exam was so good that the instructor has since used it in other courses that are not taught as distance-education courses.

The term project for the course provided the students with an interesting challenge. They were to identify a real-world organization for which they were to develop the logical design of an intranet. This intranet would then be described using the perspective and characteristic dimensions of the Zachman framework. (Zachman, 1987, and Sowa & Zachman, 1992) The students quickly decided on the county office which employed one of the remote students as their target organization. This choice provided the students with an organization which had already identified the need for an infrastructure to connect its various information systems and in addition allowed the students access to all the information they needed to complete the project. All five students from both locations collaborated, often using electronic mail and the telephone to communicate. In addition, the instructor was recruited into the project to post diagrams and documents on the class website so that the students could more easily collaborate on these documents.

It became obvious early in the semester that all students needed a good, reliable connection to the Internet to complete the course assignments and to communicate with the instructor. The learning center at which the course was received and televised to the remote students did not have a computer lab facility. To enable the remote students to interact with the instructor and the local student and to do their assignments, the learning center arranged with a nearby community college for the students to be able to use its computer lab. This

arrangement became important for the students to be able to complete the course, as not all of them had a personal computer and Internet access available to use at home or at work.

8. THE OUTCOME

The semester was completed successfully and the students collaboratively presented their term project during the final class session. The instructor's involvement with the course did not end at this time, though. The reactions to the teaching of this class continued over the subsequent year and can be separated into reactions to the distance education effort and reactions to the development of the course contents.

The student reaction to the distance education delivery was generally positive. While they acknowledge in a post-course survey the limitations of instructor-student communications in the distance education setting, they were quite positive about the actual efforts made. It was clear to the instructor that the remote students possessed a high level of self-determination which made them enroll in the distance education course in the first place. This mindset subsequently allowed them to overcome the limitations of distance education to obtain as much from the course as possible.

The term project received a substantial amount of follow-up: the remote student who had originally proposed the design of an intranet for the county office made a presentation of this design to his superiors. This design was very positively received and steps were taken to gradually implement this design. This development resulted in additional goodwill for the college's distance education effort by government and business organizations at the remote site.

The distance education efforts were also recognized by several unexpected sources. The course website contained so many worthwhile resources that instructors from other universities as well as two consultants contacted the instructor about it. One of the consultants who found the online information systems architecture materials worthwhile was a systems developer working for the South African government; further evidence of the global nature of the Internet.

The course contents as developed by the instructor were subsequently reviewed by two knowledgeable resources. The first was a systems architect working for a large national transaction processing company. He found the course contents worthwhile and suggested several other resources available mostly to industry. The second resource was an organization called The Information Architects' Cooperative (TiAC, see The Information Architects' Cooperative, 1999), which is comprised of information systems architects from some of the world's largest companies. The instructor presented an overview of the course during this organization's semi-annual meeting. The reviews of this presentation were

generally positive, and once again additional resources were provided for the instructor. Following these reviews, the instructor felt confident about the quality of the course contents, but also realized that the new resources provided by the reviewers would substantially improve and hence change the course contents were it to be taught again.

9. CONCLUSION: LESSONS LEARNED & RECOMMENDATIONS

Teaching is a profession in which the instructor continuously seeks to improve his or her skills, methods, and knowledge. The development and teaching of this particular course provided the instructor with a substantial learning experience which resonated throughout all of his subsequent teaching efforts.

Given the first goal of this paper and based on his experience, the instructor has the following recommendations for instructors starting a distance education course:

- Even seasoned instructors benefit from distance education training to become more effective at communicating with remote students.
- Familiarize yourself with the distance education technologies early so that you have time to develop and flesh out teaching methods and ideas.
- The opportunity provided by the move to distance education should be used to attempt some innovative approaches to teaching.
- Ensure that the university or college provides sufficient resources as teaching a distance education course tends to be more time-consuming than a regular course. These resources may include training and practice, release time, additional software products, or a graduate assistant.
- Distance education is greatly enhanced by the communications facilities offered by the Internet and the World Wide Web for both teacher-to-student and student-to-student communications.
- Motivated students tend to adapt quite readily to a distance education environment. It is the instructor's responsibility, however, to ensure that all students are continuously engaged by the course.
- If the opportunity exists, the instructor should visit the remote students or the distance education receiving site to enhance teacher-student relationships.

Given the second goal of this paper, the following are recommendations for teaching a highly innovative course in the information technology field:

- Use non-traditional sources such as magazines, websites, experts, and corporate documents as these tend to be more current than texts and journals. Often these sources lack theoretical foundations,

requiring the instructor to distill these from the materials.

- The course outline should not be “frozen” too early in the course development process. Rather, flexibility should be maintained so that the course contents can adapt quickly to newly uncovered information. Eventually the person with the greatest expertise in the topic, rather than a traditional curriculum committee, should make the course outline decisions, especially the first time the course is to be taught.
- Provide hooks into existing courses, either by referring to their theoretical concepts or showing their application. These connections establish the place of the course in the overall curriculum, providing students with a better frame of reference.
- Allow students to shape the direction of the course: have them bring in examples from their workplace and use these workplaces as a setting for projects.

While a tremendous amount of work, the development of this course was perceived by the instructor as quite invigorating. In a relatively short time period, he expanded his knowledge of the field of information systems and substantially broadened his teaching skills. Opportunities such as these are rare and should be taken advantage of when they present themselves.

10. REFERENCES – A SHORT ANNOTATED BIBLIOGRAPHY

Distance Education at a Crossroads

Gottschalk, T. (1995). Strategies for Learning at a Distance. Online Resource. Available from <http://www.uidaho.edu/evo/dist9.html>

This page – which is part of a larger website called “Distance Education at a Glance” – profiles the distance education student and mentions the increased difficulty in developing student-teacher rapport.

Institute for Higher Education Policy. (2000). Quality on the Line – Benchmarks for Success in Internet-Based Distance Education. Online Resource. Available from <http://www.ihep.com/quality.pdf>

This report evaluates 24 benchmarks – arranged in seven categories – which help guide universities towards quality distance education when specifically using the Internet.

United States Distance Learning Association. (2000). Website. Online Resource. Available from <http://www.usdla.org/>

The USDLA is a nonprofit organization which promotes distance learning through a national presence and through local chapters.

University of Illinois Faculty Seminar. (1999). Teaching at an Internet Distance: the Pedagogy of Online Teaching and Learning. The Report of a 1998-1999 University of Illinois Faculty Seminar. Online Resource. Available from <http://www.vpaa.uillinois.edu/tid/report/>

This report describes the outcome of a yearlong effort to investigate what makes good teaching in a distance education setting. Its conclusions are (1) that high quality distance education teaching is possible provided instructors use new approaches and maintain a good relationship with all students, and (2) that the amount of time, effort, and resources required to do this are likely to make distance education an expensive effort, rather than a source of additional income for universities.

Young, J.R. (2000). Faculty Report at U. of Illinois Casts Skeptical Eye on Distance Education. Chronicle of Higher Education. Vol. 46, Issue 19.

This article follows up on the University of Illinois faculty report. University administrators mention that some of the pedagogical recommendations from this report have been or will soon be implemented to enhance distance education efforts.

Information Systems Architecture Essentials

Cook, M.A. (1996). Building Enterprise Information Architectures. Prentice Hall PTR, Upper Saddle River, NJ.

This book takes an enterprise approach to the development of information systems architectures, rather than a technical approach. Consequently it covers only the non-technical perspectives of the Zachman framework.

Evernden, R. (1996). The Information Framework. IBM Systems Journal, 35(1): 37-68.

This paper describes a framework for the development and management of corporate information. While the author now acknowledges it as aged, the framework does provide a good dissection of the nature of and functions of information. It also introduces the valuable concept of “methodology chains” which are to connect the various systems development techniques used in systems analysis and design.

Inmon, W.H., J.A. Zachman, & J.G. Geiger. (1997). Data Stores, Data Warehousing, and the Zachman Framework. McGraw-Hill, New York, NY.

This book integrates the Zachman framework and Inmon's approach to data warehousing. Through architecture, the place of a data warehouse in the organization is clarified. This book also builds on the Zachman framework with the development of a process-approach towards information systems architecture development.

Rechtin, E. & M.W. Maier. (1997). The Art of Systems Architecting. CRC Press, Boca Raton, FL.

This book, while not focusing on information systems architectures per se, provides a good overview of the architecting of complex and interconnected systems. It has a good theoretical basis and a set of well-written examples.

The Information Architects' Cooperative (1999). Website. Online Resource. Available at <http://www.infoed.com/Open/activity.html>

The Information Architects' Cooperative is a small, international, professional organization of information systems architects. The organizations' goal is to exchange information and experience through semi-annual meetings, the exchange of papers, and its online presence.

Unisys Corporation. (2000). Architecting for Business: An Executive Overview. White Paper/Online Resource. Available from <http://www.corp.unisys.com/>

These webpages describe the Unisys approach to developing an organization's information systems architecture. The amount of valuable information provided publicly here is substantial.

United States Department of Energy. (1999). Information Architecture. Online Resource. Available from <http://cio.doe.gov/iap/>

A great example of a large information systems architecture project done well and given the amount of information available, a valuable case for classroom use.

Zachman, J.A. (1987). A Framework for Information Systems Architecture. IBM Systems Journal, 26(3): 276-292.

Sowa, J.F. & J.A. Zachman. (1992). Extending and Formalizing the Framework for Information Systems Architecture. IBM Systems Journal, 31(3): 590-616.

Two essential papers on information systems architecture. The first lays out Zachman's definition of information systems architecture, the different perspectives on the architecture – as derived from traditional architecture of buildings – and the key abstractions of the framework (data, function, and network). The second article extends the abstractions (people, time, and motivation) and attempts to construct a modeling convention for all perspectives and abstractions of the framework.