CIS8090 Enterprise Architectures

Wrap Up

Reviewing the Course
Cognitive Map of 8090

IS Architectures as Strategy

EA Frameworks
(TOGAF, FEA, Zachman, Lightweight)

Work Systems Models
S. Alter, “Work System Method”

IS architectural components and development
Mid-Range Modeling

ERP as instantiation of Architectures

Architectural Modeling options
There Are Four Operating Models 
or Organizing Logics

<table>
<thead>
<tr>
<th>Business Process Integration</th>
<th>Coordination</th>
<th>Unification</th>
</tr>
</thead>
</table>
| High                         | - Unique business units with a need to know each other’s transactions
|                              | - **Examples:** Merrill Lynch GPC, PepsiAmericas, MetLife
|                              | - **Key IT capability:** access to shared data, through standard technology interfaces
| Low                          | - Independent business units with different customers and expertise
|                              | - **Examples:** Johnson & Johnson, GE, ING
|                              | - **Key IT capability:** provide economies of scale without limiting independence

<table>
<thead>
<tr>
<th>Business Process Standardization</th>
<th>Low</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replication</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| - Independent but similar business units
| - **Examples:** Marriott, CEMEX, ING DIRECT
| - **Key IT capability:** provide standard infrastructure and application components for global efficiencies

Companies gradually mature enterprise architecture and build out their platforms.

<table>
<thead>
<tr>
<th>Business Silos</th>
<th>Standardized Technology</th>
<th>Optimized Core</th>
<th>Business Modularity</th>
</tr>
</thead>
<tbody>
<tr>
<td>25%</td>
<td>46%</td>
<td>27%</td>
<td>2%</td>
</tr>
</tbody>
</table>

Locally Optimal Business Solutions

Enterprise-Wide Technology Standards

Standard Interfaces and Business Componentization

Standardized Enterprise Processes/Data

Business Agility


Percentage of firms in each stage is updated based on a 2007 survey of 1508 IT executives.
Getting from ‘as-is’ to ideal state

- **Operating Model**: Defines integration and standardization requirements
  - Core Business processes
  - IT infrastructure

- **Enterprise Architecture**: Establishes priorities
- **Strategic Initiative**: Defines strategic limits
- **Engagement Model**: Defines core capabilities
- **Foundation for Execution**: Updates and evolves architecture
- **Learning and exploitation**
IS Architectural Standards

IS Architectural standards as a kind of ‘boundary object’
Provides a shared context and understanding of dependencies

Integrated process outcomes

• IS Architecture Development
  • On-going process…
  • ≠ one time planning exercise
“Internal ICT standards are manifest as IS architectures standards and frameworks.” (Boh et al, 2004)

**Infrastructure architecture**
- concerns computer and communications/network operations and infrastructure planning activities
- Standards

**Integration architecture**
- focused on systems development, including application planning, software acquisition and maintenance

*The differences are in scope, focus and benefits of each type of architecture*
Focus differs

“This standardization is expected to significantly reduce the number of vendor packages and infrastructure services that perform similar functions” (Ross, 2003).

Consists of a set of architectural components, such as data, processes, and event models, application architecture and service-oriented architectures (Brown, Johnston, and Kelly, 2003).
Abstraction
Models

- An abstract representation of reality that excludes much of the world’s infinite detail.

- The purpose of a model is to reduce the complexity of understanding or interacting with a phenomenon by eliminating the detail that does not influence its relevant behavior.
Alter’s Work System Framework

THE WORK SYSTEM METHOD
Connecting People, Processes, and IT for Business Results

Steven Alter
Work System Snapshot

Figure 2.2: Work system snapshot for a loan approval system for loans to new clients

<table>
<thead>
<tr>
<th>Customers</th>
<th>Products &amp; Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Loan applicant</td>
<td>• Loan application</td>
</tr>
<tr>
<td>• Loan officer</td>
<td>• Loan write-up</td>
</tr>
<tr>
<td>• Bank’s Risk Management Department and top management</td>
<td>• Approval or denial of the loan application</td>
</tr>
<tr>
<td>• Federal Deposit Insurance Corporation (FDIC) (a secondary customer)</td>
<td>• Explanation of the decision</td>
</tr>
<tr>
<td></td>
<td>• Loan documents</td>
</tr>
</tbody>
</table>

Work Practices (Major Activities or Processes)

- Loan officer identifies businesses that might need a commercial loan.
- Loan officer and client discuss the client’s financing needs and discuss possible terms of the proposed loan.
- Loan officer helps client compile a loan application including financial history and projections.
- Loan officer and senior credit officer meet to verify that the loan application has no glaring flaws.
- Credit analyst prepares a “loan write-up” summarizing the applicant’s financial history, providing projections explaining sources of funds for loan payments, and discussing market conditions and applicant’s reputation. Each loan is ranked for riskiness based on history and projections. Real estate loans all require an appraisal by a licensed appraiser. (This task is outsourced to an appraisal company.)
- Loan officer presents the loan write-up to a senior credit officer or loan committee.
- Senior credit officers approve or deny loans of less than $400,000; a loan committee or executive loan committee approves larger loans.
- Loan officers may appeal a loan denial or an approval with extremely stringent loan covenants. Depending on the size of the loan, the appeal may go to a committee of senior credit officers, or to a loan committee other than the one that made the original decision.
- Loan officer informs loan applicant of the decision.
- Loan administration clerk produces loan documents for an approved loan that the client accepts.

<table>
<thead>
<tr>
<th>Participants</th>
<th>Information</th>
<th>Technologies</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Loan officer</td>
<td>• Applicant’s financial statements for last three years</td>
<td>• Spreadsheet for consolidating information</td>
</tr>
<tr>
<td>• Loan applicant</td>
<td>• Applicant’s financial and market projections</td>
<td>• Loan evaluation model</td>
</tr>
<tr>
<td>• Credit analyst</td>
<td>• Loan application</td>
<td>• MS Word template</td>
</tr>
<tr>
<td>• Senior credit officer</td>
<td>• Loan write-up</td>
<td>• Internet</td>
</tr>
<tr>
<td>• Loan committee and executive loan committee</td>
<td>• Explanation of decision</td>
<td>• Telephones</td>
</tr>
<tr>
<td>• Loan administration clerk</td>
<td>• Loan documents</td>
<td></td>
</tr>
</tbody>
</table>
Example ADLs and foci

- Many attempts with a large variety of foci
  - e.g., Aesop, ArTek, C2, Darwin, LILEANNA, MetaH, Rapide, SADL, UniCOn, Weaves, Wright
  - i.e., Rapide - general purpose system description language
  - i.e., Wright - focuses on modeling connectors

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**TABLE 1**

<table>
<thead>
<tr>
<th>ADL</th>
<th>ACME</th>
<th>Aesop</th>
<th>C2</th>
<th>Darwin</th>
<th>MetaH</th>
<th>Rapide</th>
<th>SADL</th>
<th>UniCOn</th>
<th>Weaves</th>
<th>Wright</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus</td>
<td>Architectural interchange, predominately at the structural level</td>
<td>Specification of architectures in specific styles</td>
<td>Architectures of highly-distributed, evolvable, and dynamic systems</td>
<td>Architectures of highly-distributed systems whose dynamism is guided by strict formal underpinnings</td>
<td>Architectures in the guidance, navigation, and control (GN&amp;C) domain</td>
<td>Modeling and simulation of the dynamic behavior described by an architecture</td>
<td>Formal refinement of architectures across levels of detail</td>
<td>Glue code generation for interconnecting existing components using common interaction protocols</td>
<td>Data-flow architectures, characterized by high-volume of data and real-time requirements on its processing</td>
<td>Modeling and analysis (specifically, deadlock analysis) of the dynamic behavior of concurrent systems</td>
</tr>
</tbody>
</table>

(Medvidovic & Taylor, 2000, p. 78)
UML Diagrams as ADL surrogate and R-form?

- view a software system from different perspectives and varying degrees of abstraction.
  - UML is not a development method
    - But it was designed to be compatible with leading object-oriented software development methods like
    - e.g., Rational Unified Process (RUP) – an iterative software development process framework

- UML 2.2 has 14 diagram types in two categories.
  - 7 static – *structural* types
    - Emphasizes the *static structure of the system* using objects, attributes, operations and relationships
  - 7 dynamic – *behavior* types
    - Emphasizes the *dynamic behavior of the system* by showing collaborations among objects and changes to internal states of objects – sequence diagrams, activity diagrams, state machine diagrams
The challenge mapping Enterprise Architectures with UML

- “UML is a general modeling language and does not provide all concepts that are important to architecture description.” (p. 1, Roh, Kim and Jeon, 2004)

- “Architectural Description Languages (ADL) describe the structure of a software system at a level of abstraction that is more closest to the intuition of a system designer.” (Arvind W. Kiwelekar, 2010)

- So, what is the problem?
  - ADLs designed to model software systems
  - UML designed to model software systems
  - EAs model?
# Zachman Framework

Different descriptions for different purposes

<table>
<thead>
<tr>
<th>DATA</th>
<th>FUNCTION</th>
<th>NETWORK</th>
<th>PEOPLE</th>
<th>TIME</th>
<th>MOTIVATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objective/Scope Contextual</strong></td>
<td>List of Things Important in the Business</td>
<td>List of Core Business Processes</td>
<td>List of Business Locations</td>
<td>List of Important Organizations</td>
<td>List of Events</td>
</tr>
<tr>
<td>Role: Planner</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Enterprise Model Conceptual</strong></td>
<td>Conceptual Data/Object Model</td>
<td>Business Process Model</td>
<td>Business Logistics System</td>
<td>Work Flow Model</td>
<td>Master Schedule</td>
</tr>
<tr>
<td>Role: Owner</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>System Model Logical</strong></td>
<td>Logical Data Model</td>
<td>System Architecture Model</td>
<td>Distributed Systems Architecture</td>
<td>Human Interface Architecture</td>
<td>Processing Structure</td>
</tr>
<tr>
<td>Role: Designer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Technology Model Physical</strong></td>
<td>Physical Data/Class Model</td>
<td>Technology Design Model</td>
<td>Technology Architecture</td>
<td>Presentation Architecture</td>
<td>Control Structure</td>
</tr>
<tr>
<td>Role: Builder</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Role: Programmer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Functioning Enterprise</strong></td>
<td>Usable Data</td>
<td>Working Function</td>
<td>Usable Network</td>
<td>Functioning Organization</td>
<td>Implemented Schedule</td>
</tr>
<tr>
<td>Role: User</td>
<td></td>
<td></td>
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</tbody>
</table>

The Zachman framework (Sowa and Zachman, 1992)
Architecture Evaluation - Two Techniques

- Architecture Tradeoff Analysis Method (ATAM)
  - Qualitative approach to prioritizing requirements

- Cost Benefit Analysis Method (CBAM)
  - Takes the output of the ATAM and adds economic analysis in the form of cost benefit tradeoffs
Understand the meaning, scope and reach of EAs

The ‘Why’ ‘What’ and ‘How’ of EAs from a managerial and an architect’s perspective

EA Frameworks - The components and structure of an EA

EA standards

Modeling R-forms that are in a typical EAs

• The view from many authors and sources - academic, govt. and practitioner communities?

• What roles do we as IS/IT professionals in creating and managing the EA?

• Hands-on development of high level, mid-level and lower level R-forms?
  • Framework choice and TOC
  • Work System Models
  • Core diagram and Reference Model
  • ULMs
Prof Truex …

1. Began each day with an intro/agenda) and ended the day with a wrap-up (the big picture)
2. Introduced the day’s concept with opening questions
3. Regularly re-visited material and examined the bigger picture.
   • brought in experience, readings and issues from the outside and from contemporary events
4. Provided lectures from the text and other sources
   • In advance and on-line
5. Directed case and lecture discussion
6. Created the learning environment –TLD…
7. Was well-prepared for class; and was available to discuss the ‘real time’ student concerns
8. Provided bizarre sense of humor and stories. ==> HumoUr.
9. Provided clear grading guidelines and regular detailed feedback
10. Genuinely cared about your learning
Wrap Up...a final, ‘final word’

- Recall that:
  - success is measured not by heights achieved but by obstacles overcome.

- You have each overcome differing obstacles, and I hope, you have learned.
So...remember...

- If you have learned and have enjoyed in the process when you fill out the course evaluation my name is ....

- ...Duane Truex

- If not....
  - my name is
  - Balasubramain Ramesh (;

- Course Evaluation: the MOST important % participation and questions:....
  - Questions: #34, (Importance of the course) and
  - #35 (overall assessment of the Professor)

  - Question #5, Prof. Prepared?,
  - Question #11 Prof. Explain clearly?,
  - Question #18, Prof. Know if we were following/awake/present/...alive?
  - Question #28, Makes me work harder...?
Thank You!

Enjoy the next term and do keep in touch