Systems Analysis and Design

Alan Dennis, Barbara Haley Wixom, and Roberta Roth
John Wiley & Sons, Inc.

Slides by Candace S. Garrod
Red Rock Community College
Key Definitions

- **Design phase**
  - Decide *how* to build the system
  - Create *system requirements* that describe technical details for building the system

- **Architecture Design Document**
  - Final deliverable from design phase
  - Conveys exactly what system the design team will implement during the implementation phase
Transition from Requirement to Design

- Influences on the Acquisition Strategy
- Selecting a Design Strategy
- Selecting a System Acquisition Strategy
- Developing an Alternative Matrix
Classical Design Mistakes

- Reducing design time
- Feature creep
- Silver bullet syndrome
- Switching tools in mid-project
Design Strategies

- Custom development (build from scratch) in-house
- Purchase software package (and customize it)
- Outsource development to third party
Custom Development

<table>
<thead>
<tr>
<th>PROS</th>
<th>CONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allows flexibility and creativity</td>
<td>Requires significant time and effort</td>
</tr>
<tr>
<td>Consistent with existing technology and standards</td>
<td>May exacerbate existing backlogs</td>
</tr>
<tr>
<td>Builds technical skills and functional knowledge in-house</td>
<td>May require missing skills</td>
</tr>
<tr>
<td></td>
<td>Often costs more</td>
</tr>
<tr>
<td></td>
<td>Often takes more calendar time</td>
</tr>
<tr>
<td></td>
<td>Risk of project failure</td>
</tr>
</tbody>
</table>
Packaged Software

- Available for many common business needs
- Tested, proven; cost and time savings
- Rarely a perfect fit with business needs
- May allow for customization
  - Manipulation of system parameters
  - Changing way features work
  - Synchronizing with other application interfaces
- May require workarounds
Systems Integration

- Building systems by combining packages, legacy systems, and custom pieces
- Integrating data is the key
Outsourcing

- Hiring an external vendor, developer, or service provider
- May reduce costs or add value
- Risks include possibly
  - Losing confidential information
  - Losing control over future development
  - Losing learning opportunities
Outsourcing Contracts

- Time and arrangements
- Fixed-price
- Value-added
Outsourcing Guidelines

- Keep the lines of communication open between you and your outsourcer.
- Define and stabilize requirements before signing a contract.
- View the outsourcing relationship as a partnership.
- Select the vendor, developer, or service provider carefully.
- Assign a person to manage the relationship.
- Don't outsource what you don't understand.
- Emphasize flexible requirements, long-term relationships, and short-term contracts.
INFLUENCES ON THE ACQUISITION STRATEGY
Selecting a Design Strategy

Consider each of the following when deciding what strategy to use:

- Business need
- In-house experience
- Project skills
- Project management
- Time frame
## Selecting a System Acquisition Strategy

<table>
<thead>
<tr>
<th>When to Use Custom Development</th>
<th>When to Use a Packaged System</th>
<th>When to Use Outsourcing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Business need</strong></td>
<td>The business need is unique</td>
<td>The business need is common</td>
</tr>
<tr>
<td><strong>In-house experience</strong></td>
<td>In-house functional and technical experience exists</td>
<td>In-house functional experience exists</td>
</tr>
<tr>
<td><strong>Project skills</strong></td>
<td>There is a desire to build in-house skills</td>
<td>The skills are not strategic</td>
</tr>
<tr>
<td><strong>Project management</strong></td>
<td>The project has a highly skilled project manager and a proven methodology</td>
<td>The project has a project manager who can coordinate vendor’s efforts</td>
</tr>
<tr>
<td><strong>Time frame</strong></td>
<td>The time frame is flexible</td>
<td>The time frame is short</td>
</tr>
</tbody>
</table>
SELECTING AN ACQUISITION STRATEGY
<table>
<thead>
<tr>
<th></th>
<th><strong>When to Use Custom Development</strong></th>
<th><strong>When to Use a Packaged System</strong></th>
<th><strong>When to Use Outsourcing</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Business need</strong></td>
<td>The business need is unique.</td>
<td>The business need is common.</td>
<td>The business need is not core to the business.</td>
</tr>
<tr>
<td><strong>In-house experience</strong></td>
<td>In-house functional and technical experience exists.</td>
<td>In-house functional experience exists.</td>
<td>In-house functional or technical experience does not exist.</td>
</tr>
<tr>
<td><strong>Project skills</strong></td>
<td>There is a desire to build in-house skills.</td>
<td>The skills are not strategic.</td>
<td>The decision to outsource is a strategic decision.</td>
</tr>
<tr>
<td><strong>Project management</strong></td>
<td>The project has a highly skilled project manager and a proven methodology.</td>
<td>The project has a project manager who can coordinate vendor’s efforts.</td>
<td>The project has a highly skilled project manager at the level of the organization that matches the scope of the outsourcing deal.</td>
</tr>
<tr>
<td><strong>Time frame</strong></td>
<td>The time frame is flexible.</td>
<td>The time frame is short.</td>
<td>The time frame is short or flexible.</td>
</tr>
</tbody>
</table>
In-House Experience

If in-house experience exists for all the functional and technical needs of the system, it will be easier to build a custom application.

A packaged system may be a better alternative for companies that do not have the technical skills to build the desired system.
Project Skills

The skills that are applied during projects are either technical or functional.

Different design alternatives are more viable, depending on how important the skills are to the company’s strategy.
Project Management

Custom applications require excellent project management and a proven methodology.

There are so many things that can push a project off track, such as funding obstacles, staffing, and overly demanding business users.
The project team should choose to develop a custom application only if it is certain that the underlying coordination and control mechanisms will be in place.

Packaged and outsourcing alternatives also must be managed; however, they are more shielded from internal obstacles.
When time is a factor, the project team should probably start looking for a system that is already built and tested.

If a custom alternative is chosen, and the time frame is very short, consider using techniques like timeboxing to manage the problem.
Selecting an Acquisition Strategy

Once a project team has a good understanding of how well each acquisition strategy fits with the project’s needs, it must begin to understand exactly how to implement these strategies.

One helpful tool is the request for proposal (RFP), a document that solicits a formal proposal from a potential vendor, developer, or service provider.
Selecting an Acquisition Strategy - continued

For smaller projects with smaller budgets, the request for information (RFI) may be sufficient, as it is shorter and less detailed.

A request for quote (RGQ) may be used when a list of equipment is so complete that the vendor only need provide a price.
Developing an Alternative Matrix

- What tools and technologies are needed for a custom development project?
- What vendors make products that address the project needs?
- What service providers would be able to build this application if outsourced?
Developing an Alternative Matrix

- Combine several feasibility analyses into one matrix
- Include technical, budget, and organizational feasibilities
- Assign weights to indicate the relative importance of the criteria
- Assign scores to indicate how well the alternative meets the criteria
## Developing an Alternative Matrix

<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>Relative Importance (Weight)</th>
<th>Alternative 1: Custom Application using VB.NET</th>
<th>Score (1-5)*</th>
<th>Weighted Score</th>
<th>Alternative 2: Custom Application using Java</th>
<th>Score (1-5)*</th>
<th>Weighted Score</th>
<th>Alternative 3: Packaged Software Product ABC</th>
<th>Score (1-5)*</th>
<th>Weighted Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Technical Issues:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Criterion 1</td>
<td>20</td>
<td>5</td>
<td>100</td>
<td></td>
<td>3</td>
<td>60</td>
<td></td>
<td>3</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Criterion 2</td>
<td>10</td>
<td>3</td>
<td>30</td>
<td></td>
<td>3</td>
<td>30</td>
<td></td>
<td>5</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Criterion 3</td>
<td>10</td>
<td>2</td>
<td>20</td>
<td></td>
<td>1</td>
<td>10</td>
<td></td>
<td>3</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td><strong>Economic Issues:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Criterion 4</td>
<td>25</td>
<td>Supporting</td>
<td>3</td>
<td>75</td>
<td>Supporting</td>
<td>3</td>
<td>75</td>
<td>Supporting</td>
<td>5</td>
<td>125</td>
</tr>
<tr>
<td>Criterion 5</td>
<td>10</td>
<td>Information</td>
<td>3</td>
<td>30</td>
<td>Information</td>
<td>1</td>
<td>10</td>
<td>Information</td>
<td>5</td>
<td>50</td>
</tr>
<tr>
<td><strong>Organizational Issues</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Criterion 6</td>
<td>10</td>
<td>5</td>
<td>50</td>
<td></td>
<td>5</td>
<td>50</td>
<td></td>
<td>3</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Criterion 7</td>
<td>10</td>
<td>3</td>
<td>30</td>
<td></td>
<td>3</td>
<td>30</td>
<td></td>
<td>1</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Criterion 8</td>
<td>5</td>
<td>3</td>
<td>15</td>
<td></td>
<td>1</td>
<td>5</td>
<td></td>
<td>1</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>100</td>
<td></td>
<td>350</td>
<td></td>
<td></td>
<td>270</td>
<td></td>
<td></td>
<td>360</td>
<td></td>
</tr>
</tbody>
</table>
Summary Slide

- System Design Phase – transitioning from requirements to design
- Design all the elements of the system
- First Task – determine the system acquisition strategy
  - Custom development
  - Purchase software package
  - Outsource
- Use Alternatives Matrix to structure the system acquisition decision