CHAPTER 3: REQUIREMENTS DETERMINATION

In this chapter, we introduced how the requirements are determined in object-oriented systems development projects. Specifically, we described what a requirement is, how to create a requirements definition, and a set of problems that can arise when determining requirements. Next, we reviewed three different requirements analysis strategies, along with a set of techniques that can be used in conjunction with the strategies. After that, we reviewed a set of generic requirements-gathering techniques and a couple of alternative techniques that can be used with an object-oriented system development project. Finally, we showed how the results of the requirements determination processes, along with an updated system request, feasibility analysis, and workplan, are organized into and documented by a system proposal. In this installment of the CD Selections case, we see how Alec and Margaret work through all of these topics with regards to the Web-based solution that they hope to create.

Once the CD Selections steering committee approved the system proposal and feasibility analysis, the project team began performing project management and analysis activities. In addition to the material described in the previous installment, these activities included gathering requirements using a variety of techniques, and analyzing the requirements that were gathered. Furthermore, Alec and Margaret decided to hire an Internet marketing and sales consultant, Chris Campbell, to advise Alec, Margaret, and the project team during the inception phase. Some highlights of the project team's activities are presented below.

Requirements Analysis Techniques

Margaret suggested that the project team conduct several joint application development (JAD) sessions with store managers, marketing analysts, and Web-savvy members of the IT staff. Together, the groups could work through some business process improvement (BPI) techniques and brainstorm how improvements could be made to the current order process using a new Web-based system.

Alec facilitated three JAD sessions that were conducted over the course of a week. Alec' past facilitation experience helped the 8-person meetings run smoothly and stay on track. First, Alec used technology analysis, and suggested several important Web technologies that could be used for the system. The JAD session generated ideas about how CD Selections could apply each of the technologies to the Internet order project. Alec had the group categorize the ideas into three sets: "definite" ideas that would have a good probability of providing business value; "possible" ideas that might add business value; and "unlikely" ideas.

Next, Alec applied informal benchmarking by introducing the Web sites of several leading retailers and pointing out the features that they offered on-line. He selected some sites based on their success with Internet sales, and others based on their similarity to the vision for CD Selections' new system. The group discussed the features that were common across most retailers versus unique functionality, and they created a list of suggested business requirements for the project team.

Requirements Gathering Techniques

Alec believed that it would be important to understand the order processes and systems that already existed in the organization because they would have to be closely integrated with the Web order system. Three requirements gathering techniques proved to be helpful in understanding the current systems and processes–document analysis, interviews, and observation.

First, the project team collected existing reports (e.g., order forms, screenshots of the on-line order screens) and system documentation (functional, structural and behavioral models) that shed light on the as-is system. They were able to gather a good amount of information about the brick-and-mortar order processes and systems in this way. When questions arose, they conducted short interviews with the person who provided the documentation for clarification.

Next, Alec interviewed the senior analysts for the order and inventory systems to get a better understanding of how those systems worked. He asked if they had any ideas for the new system, as well as any integration issues that would need to be addressed. Alex also interviewed a contact from the ISP and the IT person who supported CD Selections' current website–both provided information about the existing communications infrastructure at CD Selections and its Web capabilities. Finally, Alex spent a half-day visiting two of the retail stores and observing exactly how the order and hold processes worked in the brick-and-mortar facilities.

Requirements Definition

Throughout all of the above activities, the project team collected information and tried to identify the business requirements for the system from the information. As the project progressed, requirements were added to the requirements definition and grouped by requirement type. When questions arose, they worked with Margaret, Chris, and Alec to confirm that requirements were in scope. The requirements that fell outside of the scope of the current system were typed into a separate document that would be saved for future use.

After gathering and documenting the requirements, the requirements definition was distributed to Margaret, two marketing employees who would work with the system on the business side, and several retail store managers. This group then met for a two-day JAD session to clarify, finalize, and prioritize business requirements[2].

The project team spent time creating functional, structural and behavioral models (Chapters 4, 5, and 6) that depicted the objects in the future system. Members of marketing and IT departments reviewed the documents during interviews with the project team. Figure 3-A shows a portion of the final requirements definition and Figure 3-B represents the requirements in the form of a concept map.

System Proposal

Alec reviewed the requirements definition and the other deliverables that the project team created during the inception phase. Given Margaret's desire to have the system operating before next year's Christmas season, Alec decided to timebox the project, and he determined what functionality could be included in the system by that schedule deadline (see Chapter 2). He suggested that the project team develop the system in three versions rather than attempting to develop a complete system that provided all the features initially. The first version, to be operational well before the holidays, would implement a "basic" system that would have the "standard" order features of other Internet retailers. The second version, planned for late spring or early summer, would have several features unique to CD Selections. The third version would add more "advanced" features, such as the ability to listen to a sample of music over the Internet, to find similar CDs, and to write reviews.

[2] This JAD session was not originally planned. As such, the workplan (see Figure 2-E) should be modified

Nonfunctional Requirements

1. Operational Requirements
   - 1.1 The Internet sales system will draw information from the main CD information database, which contains basic information about CDs (e.g., title, artist, ID number, price, quantity in inventory). The Internet sales system will not write information to the main CD information database.
   - 1.2 The Internet sales system will store orders for new CDs in the special order system and will rely on the special order system to complete the special orders generated.
   - 1.3 A new module for the in-store system will be written to manage the "holds" generated by the Internet sales system. The requirements for this new module will be documented as part of the Internet sales system because they are necessary for the Internet sales system to function.
2. Performance Requirements

   No special performance requirements are anticipated.
3. Security Requirements

   No special security requirements are anticipated.
4. Cultural and Political Requirements.

   No special cultural and political requirements are anticipated.

Functional Requirements

1. Maintain CD Information
   - 1.1 The Internet sales system will need a database of basic information about the CDs that it can sell over the Internet, similar to the CD database at each of the retail stores (e.g., title, artist, ID number, price, quantity in inventory).
   - 1.2 Every day, the Internet sales system will receive an update from the distribution system that will be used to update this CD database. Some new CDs will be added, some will be deleted, and others will be revised (e.g., a new price).
   - 1.3 The electronic marketing (EM) manager (a position that will need to be created) will also have the ability to update information (e.g., prices for sales).
2. Maintain CD Marketing Information
   - 2.1 The Internet sales system provides an additional opportunity to market CDs to current and new customers. The system will provide a database of marketing materials about selected CDs that will help Web users learn more about them (e.g., music reviews, links to Web sites, artist information, and sample sound clips). When information about a CD that has additional marketing information is displayed, a link will be provided to the additional information.
   - 2.2 Marketing materials will be supplied primarily by vendors and record labels so that we can better promote their CDs. The EM manager of the marketing department will determine what marketing materials will be placed in the system and will be responsible for adding, changing, and deleting the materials.
3. Place Order
   - 3.1 Customers will access the Internet sales system to look for CDs of interest. Some customers will search for specific CDs or CDs by specific artists, whereas other customers will want to browse for interesting CDs in certain categories (e.g., rock, jazz, classical).
   - 3.2 When the customer has found all the CDs he or she wants, the customer will "check out" by providing personal information (e.g., name, e-mail, address, credit card), and information regarding the order (e.g., the CDs to purchase, and the quantity for each item).
   - 3.3 The system will verify the customer's credit card information with an online credit card center and either accept the order or reject it.
   - 3.4 Customers will also be able check to see if their preferred stores have the CDs in stock. They will use zip code to find stores close to their location. If the CD is available at a preferred store, a customer can immediately place a hold on the CD in stock and then come into the store and pick it up.
   - 3.5 If the CD is not available in the customer's preferred store, the customer can request that the CD be special ordered to that store for later pickup. The customer will be notified by e-mail when the requested CD arrives at the requested store; the CD will be placed on hold (which will again expire after 7 days). This process will work similarly to the current special order systems already available in the regular stores.
   - 3.6 Alternatively, the customer can mail order the CD (see requirement 4).
4. Fill Mail Orders
   - 4.1 When a CD is mail-ordered, the Internet sales system will send the mail order to the mail order distribution system.
   - 4.2 The mail-order distribution system will handle the actual sending of CDs to customers; it will notify the Internet sales system and e-mail the customer.
   - 4.3 Weekly reports can be run by the EM manager to check the order status.

FIGURE 3-A CD Selections Requirements Definition

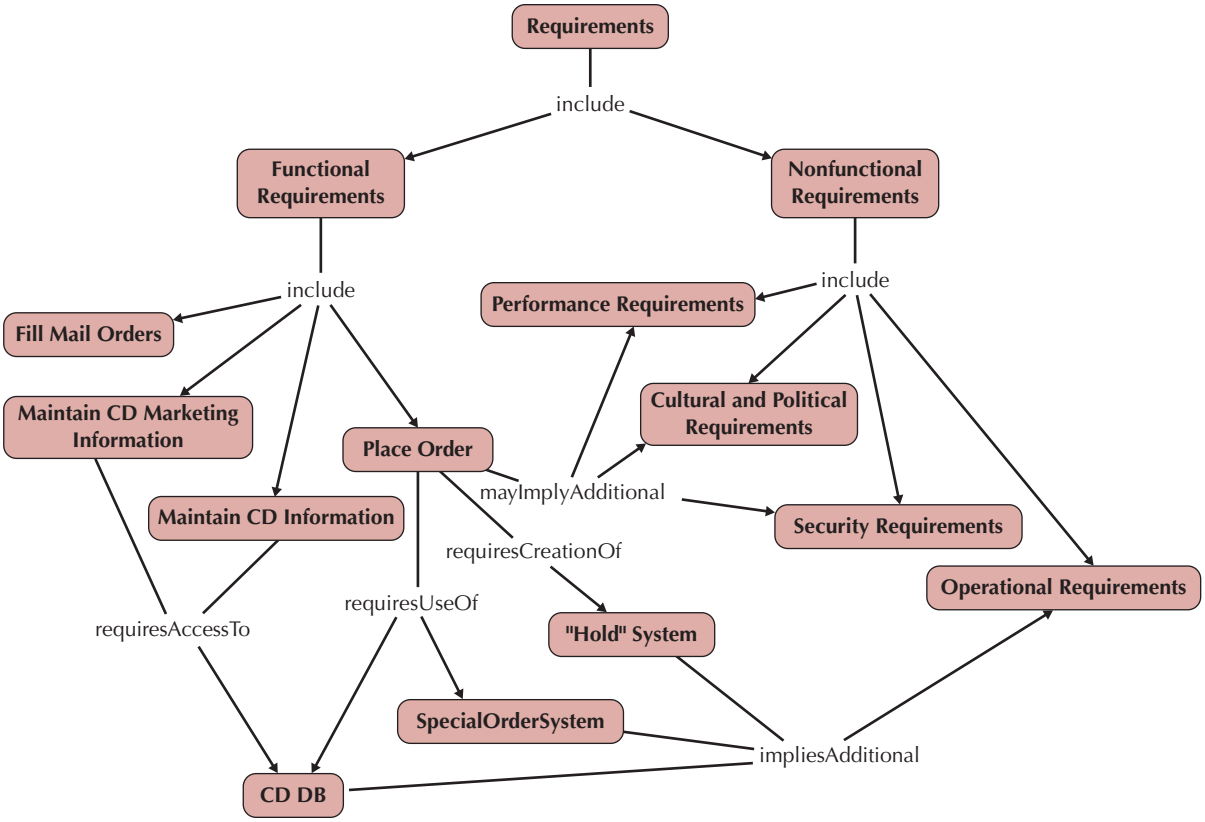

FIGURE 3-B Concept Map Requirements Model

Based on the requirements definition, Alec revised the workplan accordingly, and he worked with Margaret and the folks in marketing to review the feasibility analysis and update it where appropriate. Furthermore, Alec and Margaret realized that they had missed both actors and use cases. Consequently, they went back and revised the project effort estimation (see Figure 3-C). At this point in time, the effort estimation went from about 12 person months to over 20 person months. As Alec explained to Margaret, until we complete a rough functional model of the business processes, this estimation is still fairly volatile. However, since Alec, Margaret, and the development team have a reasonable understanding of the functional requirements, they decided to stay with the original effort estimation of 24 person months (Remember, Alec doubled the estimation.). Using the System Proposal Template in Figure 3-16, Alec combined all of the deliverables from the project a System Proposal and submitted to the steering committee for approval. Figure 3-D shows the outline of the CD Selections System Proposal. Margaret and Alec met with the committee and presented the highlights of what was learned during the inception phase and the final concept of the new system. Based on the proposal and presentation, the steering committee decided that they would continue to fund the Internet Sales System.

Unadjusted Actor Weighting Table:

Actor Type	Description	Weighting Factor	Number	Result
Simple	External System with well-defined API	1	2	2
Average	External System using a protocol-based interface, e.g., HTTP, TCT/IP, or a database	2	1	2
Complex	Human	3	2	6
			Unadjusted Actor Weight Total (UAW)	**10**

Unadjusted Use Case Weighting Table:

Use Case Type	Description	Weighting Factor	Number	Result
Simple	1–3 transactions	5	3	15
Average	4–7 transactions	10	1	10
Complex	>7 transactions	15	4	60
			Unadjusted Use Case Weight Total (UUCW)	**85**

Unadjusted use case points (UUCP) = UAW + UUCW 95 = 10 + 85

Technical Complexity Factors:

Factor Number	Description	Weight	Assigned Value (0–5)	Weighted Value	Notes
T1	Distributed system	2.0	5	10.0	
T2	Response time or throughput performance objectives	1.0	5	5.0	
T3	End-user online efficiency	1.0	5	5.0	
T4	Complex internal processing	1.0	4	4.0	
T5	Reusability of code	1.0	3	3.0	
T6	Easy to install	0.5	3	1.5	
T7	Ease of use	0.5	5	2.5	
T8	Portability	2.0	4	8.0	
T9	Ease of change	1.0	3	3.0	
T10	Concurrency	1.0	3	3.0	
T11	Special security objectives included	1.0	5	5.0	
T12	Direct access for third parties	1.0	5	5.0	
T13	Special User training required	1.0	3	3.0	
			Technical Factor Value (TFactor)	**58.0**	

Technical complexity factor (TCF) = 0.6 + (0.01 * TFactor) 1.18 = 0.6 + (0.01 * 58)

Environmental Factors:

Factor Number	Description	Weight	Assigned Value (0–5)	Weighted Value	Notes
E1	Familiarity with system development process being used	1.5	1	1.5	
E2	Application experience	0.5	2	1.0	
E3	Object-oriented experience	1.0	0	0.0	
E4	Lead analyst capability	0.5	3	1.5	
E5	Motivation	1.0	4	4.0	
E6	Requirements stability	2.0	4	8.0	
E7	Part time staff	–1.0	0	0.0	
E8	Difficulty of programming language	–1.0	4	–4.0	
			Environmental Factor Value (EFactor)	**12.0**	

Environmental factor (EF) = 1.4 + (–0.03 * EFactor) 1.04 = 1.4 + (–.03 * 12)
Adjusted use case points (UCP) = UUCP *TCF *ECF 116.584 = 95 * 1.18 * 1.04
Person hours multiplier (PHM) PHM = 28
Person hours = UPC * PHM 3,264.352 = 116.584 * 28

FIGURE 3-C Use-Case Points Estimation for the Internet Sales Systems

1. Table of Contents

2. Executive Summary
   To be completed once everything else is done.

3. System Request
   See Figure 2-A.

4. Workplan
   See Figure 2-E.

5. Feasibility Analysis
   See Figures 2-B and 2-C.

6. Requirements Definition
   See Figures 3-A and 3-B.

7. Functional Model
   To be completed in the future (see Chapter 4).

8. Structural Models
   To be completed in the future (see Chapter 5).

9. Behavioral Model
   To be completed in the future (see Chapter 6).

Appendices

A. Effort Estimate
   See Figure 3-C.

B. Staffing Plan
   See Figure 2-F.

C. Project Charter
   See Figure 2-G.

FIGURE 3-D
Outline of the CD Selections System Proposal