LUCID Stage 2: Analyze

In LUCID Stage 2, members of the design group work with representatives of the user community to document work processes and identify specific needs. This information is used to produce the requirements analysis.

Because the design team must understand the setting in which the product will be used, LUCID Stage 2 begins with a review of the environment in which the product will be used. Next, the users are divided into groups with similar needs and a data-gathering plan is developed. Then, after data has been gathered, it is used to describe the work flow. Various methodologies may be used to extract functionality requirements from the work flow.

Goals

The primary goal of Stage 2 is to uncover the underlying workflow process and develop a set of objects to represent it. In order to do this, the design team must first understand the requirements in job-related (rather than technical) terms, and then identify key objects that will be used to display, manipulate, or store data.

Prerequisites

- ❑ LUCID Stage 1 has been completed.
- ❑ The high product concept statement, business objectives, user population, usability goals, and high level functionality and constraints have been defined and documented.
- ❑ Preliminary screen sketches have been created.

Decisions

1. How will you gather data? Will you visit customer sites, bring customers in, arrange focus groups, perform observations, or interview user surrogates?

2. Will re-engineering be considered during Stage 2? Your organization may mandate that it be included in the development process, and some minor re-engineering can be incorporated in the LUCID Design Framework. However, major re-engineering should be separated from user interface design.

3. How will you analyze the data to document the work flow?

4. How will you extract the functional requirements from the work flow?

Tasks

Task 2.1 Team preparation
Task 2.2 Segment the user population
Task 2.3 Create a plan for gathering data
Task 2.4 Gather data
Task 2.5 Review and organize data
Task 2.6 Document the work flow
Task 2.7 Extract functionality and requirements
Task 2.8 Create the requirements analysis

Deliverables

The primary deliverable of LUCID Stage 2 is the requirements analysis.

Three issues particularly relevant to Stage 2 activities are the need for a user-centered perspective rather than a technology-centered perspective; the selection of representative users; and granularity considerations. Each issue is discussed below.

Maintaining a user-centered perspective

The difference between a user-centered perspective and a technology-centered perspective is best illustrated by an example. Consider the following message:

> *Error in file conversion attempt. No filter exists for target format.*

While a software engineer would immediately understand this message, a typical user might find it confusing because he or she lacks the information needed to comprehend the process being described. For the message to make sense, a user would need to understand that:

- Data is stored in files.
- Files can be saved on a hard disk.
- Files can be accessed by different programs.
- Word processors have different conventions for the way they store data.
- When you request a file from another word processor it is necessary to recode the file from the form in which it was initially saved into the format used by this word processor.
- The program could not recode the file which represents the document you requested, because it does not have the rules to do so.

This information makes the message comprehensible. However, it is more than many users know—or care to know. A better solution is to present the message in a form which speaks in the language of the user.

Selecting representative users

The selection of an appropriate group of representative users for observation and data gathering is a critical task of this stage. Unfortunately, the answer to “How many users should be included?” is “It depends.” Sufficient information for some interfaces can be gathered by observing or interviewing just a few users; others can require dozens of users to be included. Good user segmentation is part of the solution, as is a careful analysis of what information needs to be gathered.

One of the tenets of user-centered design is to “know your user, for he or she is not you.” This means that information about a user’s typical work day, approach to the software, computer experience, or any of the other many pieces of information the interface designer might want should be obtained *from users*, not by speculating *about users*. There is simply no substitute for direct experience with representative users of the product.

Sometimes, direct user observation is impossible, and surrogates must be used. People offered as surrogates can include content experts, marketing representatives, managers and former users. Be wary of those whose jobs are similar to – but not the same – as the target users group or those who may have other agendas. A manager, for example, may understand how the department works as a whole without having a detailed understanding of the moment-to-moment life of the actual users. Information gathered from surrogates can be valuable. It simply should not be confused with the detail and richness of seeing a user’s perspective.

Granularity considerations

Concerns about the right level of detail are inherent in any process of summarizing information. How many user segments are appropriate? How many major job activities should each segment have, and how much detail should task scenarios include? These concerns, which persist throughout Stage 2, are termed **granularity considerations**.

If granularity level is too fine, the amount of data may obscure the essential structure of the system, and the design team may become overwhelmed. If the granularity level is too coarse, the design team may miss important details. Although there are no hard and fast rules that define the ideal level of granularity, it is useful to keep in mind the primary goal of Stage 2:

> *The primary goal of Stage 2 is to uncover the underlying workflow process and develop a set of objects to represent it.*

Michelangelo described his job as revealing the sculpture within every piece of marble. He viewed his task as cutting away the waste marble to expose the hidden figure. Similarly, every system has a natural design: the workflow with which it integrates has some underlying structure (which may or may not be efficient). The activities in Stage 2 are designed to strip away the excess material and reveal the underlying structure.

References

Hackos, JoAnn T. and Redish, Janice C., User and Task Analysis for Interface Design, Wiley Computer Publishing, New York, 1998

Task 2.1: Team preparation

In Task 2.1, the design team reviews the environment in which the product will be used.

Prerequisites Stage 1 has been completed.

Deliverables The primary deliverable of Task 2.1 is a summary of domain- and content-specific concepts, issues, and terminology, including specialized vocabulary terms, jargon, acronyms, etc.

Overview The design team familiarizes themselves with concepts, issues, and terminology that are an integral part of the environment in which the software will be used.

While the domain (defined as ‘field or sphere of activity or influence’) and content (defined as ‘all that is dealt with in a course or area of study, work of art, discussion, etc’) addressed by the software product were considered in general terms in the product prospectus, more specific information may be needed before performing Stage 2 tasks.

Because the domain and content may be very specialized, it is critical that each member of the design group become familiar with them. Although this familiarity is not directly related to the primary deliverable of LUCID Stage 2 (the requirements analysis), being familiar with the domain and content before you begin to interview and observe users will provide a better understanding of user activities.

An important part of this task is identifying any specialized vocabulary and/or jargon prevalent among users. These terms should be collected, defined, and documented. They will be helpful when making decisions about labels and messages, and may also be incorporated in a style guide.

Procedure

Step 1

The design group reviews what is known about the domain and content and documents key concepts and issues, specialized vocabulary terms, jargon, and acronyms. At the same time, the design group should identify any areas where additional information is needed. In some cases, there may be no need for additional information, and the design group can proceed to Task 2.2.

Step 2

If additional domain and/or content information is needed, the design group must locate a resource (such as a domain specialist or user surrogate) who can work with them to fill in the missing information.

Task 2.2: Segment the user population

In Task 2.2, the user population is divided into a series of subsets, each of which is a user group with similar characteristics and needs. These subsets are called user segments.

Prerequisites The overall user population has been defined and documented in LUCID Stage 1.

Deliverables The primary deliverable of Task 2.2 is a matrix that identifies and describes each user segment within the overall user population.

Overview User segments are created and characterized to form the user matrix.

It is rare that all users of a product have the same characteristics. Users typically differ in many ways, and therefore have different needs. Some needs may relate to functionality: users with different job titles may need the software to do different things. Some needs may relate to the way in which data is presented: one group of users may want to see data arranged by customer; another group may require summary reports; still other groups may want data organized by date or by activity. Of course, there will be considerable overlap among the needs of the various user segments.

To make certain that all required functionality is identified, it is necessary to partition the total (heterogeneous) user population into a set of smaller homogeneous user segments.

In this task, the activities in Steps 1 and 2 can be divided among and performed by individual members of the design team. However, the entire group should be involved in the creation of the user matrix in Step 3.

Procedure

Step 1

Using the list of users generated in Stage 1, create a set of user segments.

While the goal of this task is the creation of homogeneous user subsets, the first attempt to create user segments will not necessarily produce homogeneous groups—and that’s OK. The prime concern in Step 1 is the production of a set of user segments that can be examined and, if necessary, refined.

There are many ways that users can be divided into groups. They may be distinguished by such dimensions as job title, location, level of responsibility, training, computer literacy, and frequency of use of the system. Because the characteristics of each user segment will be carefully reviewed in Steps 2 and 3, the specific grouping strategy selected is not critical.

The appropriate number of user segments to create will vary with the complexity of the design project. Fewer groups means less work. However, if the user segments are too large they will not be homogeneous, and you may miss critical functional requirements.

Step 2

For each user segment created in Step 1, answer the questions found on work sheet 2-1, User Segment Characteristics. Use a separate work sheet for each user segment. Be alert to the possibility that new user segments will be suggested as you answer these questions. If a question has two or more answers, you may be dealing with a user segment that is not homogeneous.

Step 3

Using the information generated in Step 2, create a user matrix. The user matrix contains all information for all user segments. Its size is dictated by the number of user segments: each user segment has its own column. Worksheet 2-2 is a blank user matrix that can be used as a starting point.

Worksheet 2-1: User Segment Characteristics

For User Segment					
How much do users know about computer technology?					
How much do users know about the subject matter?					
How complex is the content users must master?					
Are users discretionary or captive?					
With whom (individuals, other user groups) do the users interact?					
For each response above:	How often?				
	What information is exchanged?				
What are the possibilities for training?					
What is the culture of the users?					
How receptive/resistant are users to this product? Why?					

Worksheet 2-2: User Matrix

	User Segment A	***User Segment B***	***User Segment C***	***User Segment D***
Computer technology				
Subject matter				
Complexity of content				
Discretionary or captive?				
With whom do they interact?				
Frequency?				
What is transferred?				
Training?				
Culture?				
Receptive/ resistant?				

Task 2.3: Create a plan for gathering data

In Task 2.3, the design team decides how they will gather data from each user segment.

Prerequisites The user population has been divided into homogeneous user segments in Task 2.2.

Deliverables The primary deliverable of Task 2.3 is a plan that identifies who will provide data for the design team, and how the data will be obtained.

Overview In this task, the design team plans activities for user observation and other data gathering.

Because gathering accurate, representative data has a profound effect on the rest of the design project, LUCID recommends carefully planning exactly how data will be gathered and documented. There are several issues involved:

1. Who will collect the data?

Will all members of the design team participate in data gathering? The answer to this question will depend both on the abilities and preferences of individual design team members and the answer to the question, "Where will the data come from?"

In general, interviews should be performed by team members comfortable with the process. Team members unfamiliar with interviewing might be paired with more experienced members. All team members should be prepared to participate in observation and review secondary resources such as training materials.

2. Where will the data come from?

You can gather data from both primary sources and secondary sources. Primary sources are direct sources: user interviews, user observation, and contextual inquiry. Secondary sources are indirect: interviews with user surrogates, review of training materials, review of other printed materials.

Each type of source has its advantages and disadvantages. Your access to primary sources may be limited, and users may not feel comfortable with interviews or observations, or may feel threatened by changes to the way they perform their job. It is also essential that you use representative users, as described in the introduction to this Stage.

Secondary sources are more easily accessible, but are indirect. It is particularly important to watch for bias in user surrogates, especially if a year or two has passed since they were users.

You must also consider how many individuals you will use. At a minimum, you should have access to at least two sources for each user segment.

3. What kinds of user analysis techniques will be used?

There are several different techniques which can be used for gathering user data:

Individual observation in the environment where the product will be used – contextual inquiry -- allows the interviewer to gather not only direct user comment, but observations of how the environment affects the use of the software.

Structured interviews or individual task analysis can be useful to allow several different interviewers to divide up a large list of subjects. This technique can also be useful for direct comparison or any sort of quantitative analysis of the data collected.

Group interviews can be an efficient way to include a larger number of users than might otherwise be possible. There are two disadvantages to using groups as the only data gathering technique: the work context is not observed, and quiet voices may be “drowned out” in the group discussion.

You should also consider whether it will be possible to gather data over several encounters. Ideally, the initial encounter would be used to gather general information and subsequent encounters would be used to refine and clarify data collected initially. If multiple direct encounters are not possible, consider the possibility of asking a user or user surrogate to review a transcript or notes, or follow-up by telephone or email.

Information gathered from secondary sources should be checked against primary sources whenever possible.

4. How will you document the information gathered in each encounter?

Several different tools are available for recording gathered data. If interviews are used, the interviewer may prepare a list of questions and allow room for note-taking on the list. Tape recorders may also be useful, although some people feel inhibited when they are being recorded. Video recorders are also useful but may be even more intimidating than audio recordings.

If your data gathering plan includes direct contact with primary sources, you should prepare an information package that can be used to let individuals know what is being developed and what role they play in the process. The specific form this information takes will depend on the nature of the project. For example, a slide-show presentation can be prepared and placed on a web site, or a short document might be given to a participant shortly before an interview.

Procedure

Step 1

Use the information discussed above to prepare the information gathering plan for your project. Your plan should address each of the points mentioned: who will collect the data, where the data will come from, and how the data will be recorded.

Step 2

Prepare an information package that can be used to familiarize primary sources with the project.

Task 2.4: Gather data

Such a short title for so much work!.

Prerequisites

A plan for gathering data was created in Task 2.3.
The design team has access to primary and secondary information sources.

Deliverables

The primary deliverable of Task 2.4 is the raw data gathered by the design team.

Overview

In this task, the team gathers the information from users that is at the core of "user-centered" design.

In order to make the best use of your information-gathering opportunities, you should use the overall plan formulated in Task 2.3 to carefully prepare for each individual encounter. Consider these questions:

❑ What do I need to know, either about this user segment or about their work?

❑ How will I record the information I gather?

❑ How will I extract the information I need from the source material?

For example, you may compile a preliminary list of activities for each user segment by using information from managers. The purpose of this step is to generate a starting point for interviews with and/or observations of members of each user segment. The managers will be able to describe the activities in general terms, and may also be able to provide some detail (although detail is not necessary for this preliminary list). Using the draft list of user activities as a starting point, add, elaborate, and delete as necessary. Take careful notes (a tape recorder is helpful) and prepare a report for each interview or observation session.

For projects which include work flow or information sharing, it can also be important to be sure the tasks each user participates in are thoroughly explored. Information to be collected includes:

❑ The steps or actions they perform
❑ The objects with which they interact
❑ The secondary resources they must consult
❑ The messages the actors send and receive
❑ Predicates (if-then statements)

Procedure

Step 1

Prepare for each encounter by reviewing the information above.

Step 2

After each information gathering session, review your source material and note any information which is requires additional clarification.

Task 2.5: Review and organize the data

The information gathered in Task 2.4 is organized for presentation and reviewed by the team

Prerequisites Data gathering is complete

Deliverables The deliverables for this task may include user profiles, scenarios, task flow descriptions and quantitative analysis.

Overview The goal of this task is to organize information collected from user inquiry into a form which will facilitate both task and requirements analysis.

The next step of the process is to organize the information collected into a format which assists the design team in understanding the needs of the users for whom the software is intended. There are several possible formats for this work, which may be done by individual team members, or constructed in team work sessions.

Quantitative Summaries

The responses to any questions or information which has been collected from all users should be summarized in a chart showing aggregate responses both totalled and broken down by user segments.

User Profiles

One of the most important purposes of user analysis is to develop a strong picture of “typical” users which can be used for reference during the design stages. These profiles might include a standard list of facts and responses, accompanied by interesting anecdotal evidence such as photographs, stories or quotes.

Scenarios

Short scenarios can cover an entire task flow (perhaps involving several users) or illustrate a requirement or environmental issue which should be taken into account in the design. These stories can be an excellent way to communicate a sense of a situation without formal specifications or flow charts.

Process Diagrams

When a complex work flow is part of the domain, it can be useful to draw simple process flow diagrams from the point of view of each user interviewed, or as described in a group interview. This is especially important when not all steps in the work flow will be handled in software. These diagrams do not attempt to capture each step and decision as a formal flow chart would, but are intended to capture the *users'* view of the process.

It can be helpful to have a place to post this material for easy access, whether this is a physical location (such as a team design room) or a shared electronic location.

Procedure

Step 1

Each team member involved in information gathering reviews and organizes the data he or she has collected.

Step 2

The presentations are reviewed by the entire team. Brainstorming discussions are used to analyze the implications of the data.

Step 3

Identify any gaps or additional information required, and repeat Task 2.4 to gather the new data.

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Task 2.6: Document the users' task flow

Using the information gathered from users the flow of tasks within the software is documented.

Prerequisites	Data gathering is complete, and the information has been organized for analysis.
Deliverables	Flow charts showing key tasks supported by the product functionality
Overview	The goal of this task is to create a flow chart which documents the task analysis as represented by the users.

The task flow should represent the desired end-state for the program. Where minor re-engineering from existing practice has been included, this should be noted for inclusion in the final report of Stage 2.

The scope and format of the task flow must be determined by the project team. For large projects, the deliverable for this task may be a formal document, with detailed explanations. This will also be the case in situations where a distributed team needs access to the task flow to review and discuss. On the other hand, smaller projects with simple task domains may require only very informal documentation of the task flow.

Procedure

Step 1

For each major task supported by the product, draw a flow chart showing how user tasks are organized. Be careful to maintain a user-centric task analysis, rather than representing data or document flow.

Step 2

Add notations for any places where information resources outside of the software are used, or where reference information, task domain training or procedural help would be required. This portion of the task analysis will be used as the basis for user assistance design.

Step 3

Review the task analysis against the information in the UI Roadmap to determine whether there are any discrepancies which should be resolved, either by changing the scope of the project or by making a decision to limit support for some tasks. Revise the documents as necessary.

Task 2.7: Extract functionality and requirements

In Task 2.7, the task flow and user scenarios are analyzed to extract detailed functionality requirements.

Prerequisites The task flow in Task 2.6 has been completed.

Deliverables The primary deliverable of Task 2.6 is a list of the functionality required to support the task flow.

Overview

The program task flow and usage scenarios all suggest specific requirements for how the software will support the high level functionality listed in the UI Roadmap. During this task, the design team uses this information to create a comprehensive functional requirements list for the interface.

This work may overlap with the technical analysis done by the development group, but it is not the intention to replace that work. Instead, the design team concentrates on the user interface implications, looking for interaction styles, connections between information or other elements which the software will have to support.

For example, a product may have a high level requirement that the user be able to see and edit all account information for a customer. The user analysis suggests that this work is often interrupted, and the user needs to be able to temporarily switch to a different account, without losing the work being done on the first. This would produce a requirement that more than one account can be open, and that the interface provide a means to switch rapidly between open accounts.

Procedure

Step 1

For all high level functional requirements in the UI Roadmap, examine the task flows and any other user analysis to identify functionality which the interface must support.

Step 2

Once the list is complete, examine it for overlap – places where a similar requirement appears in several different task contexts, or inconsistencies which will need to be addressed during the design phase.

Step 3

If there are requirements which may have implications for the implemenation plan, review the list with the development team to determine the severity of the potential problem and brainstorm potential solutions.

Task 2.8: Create the requirements analysis

In Task 2.8, the user task and requirements analysis work of Stage 2 is reported in a requirements analysis document. This document includes the task flow and the functionality requirements derived from it.

Prerequisites Tasks 2.1 – 2.7 have been completed

Deliverables The primary deliverable of Task 2.8 is a requirements analysis document reporting the work of Stage 2

Overview The goal of this task is to create a final report for the user analysis of Stage 2.

Procedure

Step 1

Create a requirements analysis document which includes the task flow analysis, functionality requirements and any user interview material needed to support choices made in the analysis.

Step 2

Circulate the requirements analysis among the product team, and review it with them.

Step 3

If there are issues raised by the document (or its implications for the product or any team), they should be discussed and resolved before proceeding.

Step 4

Revise the document following any discussion or comment.