Requirements Elicitation Using Joint Application Design

Joint Application Design (JAD) is a technique for promoting cooperation, understanding, and teamwork among buyers, users, and developers. It provides a process that facilitates creating a shared vision of what the system should be. Using that process, the developers help the users formulate problems and explore solutions, and the users gain a feeling of involvement, ownership, and commitment to the success of the system.

JAD was developed at IBM in 1977, and it has been applied successfully on hundreds of projects. It has been best used on information systems projects, particularly for identifying system requirements, package requirements, and modification requirements for existing products. IBM reports that the use of JAD has resulted in 20% to 60% gains in productivity.

There are four main tenets of JAD: group dynamics (using facilitated group sessions to enhance the capabilities of individuals); the use of visual aids to enhance communication and understanding; maintaining an organized, rational process; and a “what you see is what you get” documentation philosophy (using standard document forms that are filled in and endorsed by all participants in a session).

As its name implies, JAD is a technique for software design. However, it is understood that the design effort involving both developers and users must be based on a set of software requirements that are well understood by both the developers and the users. Therefore, JAD has two major steps, called JAD/Plan and JAD/Design. The first step addresses requirements elicitation and specification, and the second addresses software design. We focus on the first step.

Each step in JAD consists of three phases: customization, session, and wrap-up.

The customization phase consists of preparation tasks for the session. This includes organizing the team, tailoring the process for the particular system to be built, and preparing materials.

The session phase consists of one or more structured and facilitated meetings involving the developers and users. It is during these meetings that the requirements (or the design) are developed and documented.

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The wrap-up phase is devoted to converting the information from the session phase into its final form, such as the requirements specification document.

**Participants in JAD**

There are six kinds of participants in JAD, although not all participate in all the phases.

The *session leader* is responsible for the overall success of a JAD effort and is the leader and facilitator at meetings. He or she must be familiar with all aspects of JAD, have good meeting management skills, and have sufficient experience in the application area to be able to plan and understand the various JAD tasks and outputs.

Although all participants require training in JAD techniques, the session leader must be especially competent. In choosing employees to be trained as session leaders, an organization usually chooses individuals who have good interpersonal skills and who have shown general leadership qualities. Through practice and experience, session leaders develop the ability to

- understand and facilitate group dynamics;
- initiate and focus discussions;
- recognize when meetings are getting off the track and to put them back on track;
- deal effectively with different personalities and behaviors of participants;
- remain enthusiastic through sometimes long and difficult meetings.

The session leader also needs some general management skills, because he or she is also responsible for planning the JAD process, estimating resource requirements, and tracking the process.

The *analyst* is the participant who is most directly responsible for the production of the output documents of the JAD sessions. However, this is *not* simply a clerical role. The analyst must be an experienced developer who can understand the technical issues and details that are discussed during the sessions. Analysts should be selected also because they have the ability to organize ideas and to express them clearly in writing. They should also be skilled in the use of any software tools that are needed, such as document production or software prototyping tools.

The *executive sponsor* is the manager or executive who has ultimate responsibility for the product being built. He or she has two major responsibilities in the JAD process. The first is giving the other participants high-level or strategic insight into the system being built, such as why it is needed and how the organization is expected to be improved by the use of the system. The second responsibility is making executive-level decisions and commitments, such as resource allocations, that can affect the requirements and design of the new system.

*User representatives* are people in the organization who will use the new software system. During requirements elicitation, user representatives are often managers or key people within the organization; they tend to have a better view of the whole system and
how it will be used. During design, user representatives may also include a variety of other users, so that their particular needs can be addressed as well.

User representatives should be selected on the basis of their knowledge of their own needs within the organization, an understanding of how their departments interact with other departments, and some knowledge of software-based systems. In addition, user representatives should be innovative and creative thinkers, and they should not be afraid to speak up in meetings.

Information systems representatives are people that are very familiar with the capabilities of information systems. Their role is to help the users understand what is and is not reasonable or feasible in the new system. In some cases, this involves educating the users about new hardware or software technologies, so that the users can “think big” and define a significant, forward-looking system. In other cases, the information systems representatives can help users understand tradeoffs among various approaches to solving a problem. This is important when there are two or more approaches that are equally satisfactory from the user’s point of view, but very different in cost or complexity from the implementor’s point of view.

A specialist is a person who can provide detailed information on a narrow, well-defined topic. A specialist from the user community, for example, might be the one person in the organization that handles a particular kind of order or uses a specific report. Thus, no one else in the organization would know the requirements for such orders or reports. A specialist from the developer community might be someone who knows the details of an organization’s internal network, such as its hardware connections or message protocols. Participation from this person would be required when defining networking aspects of a new system.

The JAD/Plan Customization Phase

The JAD technique provides a general structure for requirements elicitation. To be most effective, it should be customized for each particular software project. This is the responsibility of the session leader, with the assistance of one or two analysts. The steps in the customization are outlined below.

Conduct orientation. By the time the executive sponsor has authorized a JAD/Plan effort, some thought has already been given to the purpose of the new software system. Usually this has occurred in the user community, because the users are the first to recognize a potential need for the system. The first step for the session leader and the analysts is to gain an understanding of what has been accomplished so far, what kind of system is being discussed, and what, if any, commitments or decisions have already been made. This typically requires short meetings with one or more users, and perhaps a meeting with the sponsor.

The session leader and analysts may also need to familiarize themselves with the organization or department for whom the system is being built. A company organization
chart can be helpful in identifying the key people who will ultimately contribute to the JAD effort.

**Organize the team.** The session leader next selects the participants for the session. The executive sponsor may already have identified some of the participants, but the session leader has the final responsibility for ensuring that all the needed people are identified and invited.

The session leader also should prepare the participants for the session. In addition to telling them the date, time, and location of the session, the leader gives them a list of questions to think about before the session. The questions are chosen to match the high-level requirements addressed in the session (objectives; anticipated benefits; strategic and future considerations; constraints and assumptions; and security, audit, and control), and they are tailored to the particular system. The participants are asked to address the issues from their own perspectives; for example, the users address constraints from the business point of view and the information systems representatives address constraints from the technology point of view. The participants are asked to make notes on these issues to bring to the meeting.

**Tailor the process.** The session leader uses experience and judgment to adjust the general JAD process to the system being built. Typically this includes deciding how much time and how many meetings will be required for the session phase. It also includes tailoring the generic JAD document formats to match the needs of the current system.

**Prepare materials.** The session leader makes the necessary logistical arrangements for the session, including reserving and setting up a meeting room. Visual aids and supplies are ordered and placed in the room; these typically include blank transparencies, flip chart paper, marking pens, and "magnetics"—vinyl magnetic rectangles that can be written on and moved around on a whiteboard to facilitate visualization of the system.

To facilitate the smooth running of the session, the session leader also prepares several overhead transparencies or flip charts in advance. These include a welcome message, a meeting agenda, a review of the JAD process, a review of high-level requirements categories and system scope issues (described below), and the blank forms required by the JAD process for recording information, decisions, and issues.

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**The JAD/Plan Session Phase**

The JAD/Plan session consists of one or more group meetings to define the high-level requirements for the new system and to define its scope. The subsequent JAD/Design is also planned in the session.

All the participants bring different ideas and views of the system to the session. Through carefully facilitated discussions, these ideas and views are presented, analyzed, and refined, so that by the end of the session, everyone is in agreement. To achieve this goal, the session follows a well-defined process, as outlined below.
Conduct orientations. The session begins with a welcome to the participants from the executive sponsor and from the session leader. All the participants are introduced. The executive sponsor gives a brief summary of the history of the effort to date and describes the expectations of the participants during the session.

The session leader then gives an overview of the JAD process, including the amount of time to be spent on each task. However, this overview is not a detailed training course. As each new task is begun, the leader provides more detailed information about the task. This includes the purpose of the task, the roles of the participants, how the task is performed, and how the output is recorded and formatted.

Define high-level requirements. The session leader facilitates the group discussion that elicits the high-level requirements. Five major topics are addressed:

1. Objectives: what is the reason for building this system; what purpose will it serve?
2. Anticipated benefits: what benefits (quantifiable or unquantifiable; tangible or intangible) will be derived from the use of this system?
3. Strategic and future considerations: how can this system help our company in the future; how will it give us a competitive or strategic advantage over our competitors?
4. Constraints and assumptions: what constraints exist for the system we are building (resources, organizational structure, standards, laws); what constraints exist for the project that is developing the system?
5. Security, audit, and control: are there internal or external security requirements for the system and its data; are their audits or controls that will be required?

Typically, to begin the discussion the leader asks general questions (that have been prepared in advance) on each of these topics. As requirements are identified by the participants, they are recorded by the analyst on flip charts or transparencies, which remain available throughout the discussion. The participants discuss, refine, and assess the requirements.

Bound the scope of the system. The discussion generates a large number of requirements. The next step is to begin to organize the requirements and agree on the scope of the system to be built. For an information system, a helpful way to proceed is to identify who will actually use the system and what major tasks the system will help them do. For example, sales representatives may be identified as users, and the major task for them is submitting an order from a customer. Note that it is also important to identify tasks that are outside the scope of the system. The goal is to bound the scope, so that the system is large enough to meet its objectives but not so large as to be too costly or complex to build.

It is in this step that the magnetic visual aids can be most useful. The names of tasks can be written on the magnetics, which are then placed on a whiteboard and connected with arrows that represent data flows. As the discussion proceeds, the shape of the system changes, and the magnetics can be moved to show the evolving system.
At this point, the requirements elicitation part of the JAD/Plan session is essentially complete. The next three parts of the session identify information that will be needed in the JAD/Design step.

**Identify and estimate JAD/designs.** A critical step in the planning for a software project is estimating resource needs (especially people and time). Some estimating techniques (including one called *function point analysis*) depend on estimates of the number of inputs to the system (input files or data entry screens) and the number of outputs from the system (output files or reports). This kind of information is also useful in predicting how much time will be needed for the JAD/Design step.

The session leader conducts a discussion in which this kind of estimating is done by the group. The data is recorded and estimates for the length of the JAD/Design step are made.

**Identify participants for JAD/Design step.** The group next determines who should participate in the JAD/Design step. It may be desirable to have different design steps for different subsystems. Different user representatives and specialists may be needed for each subsystem.

**Schedule JAD/Design meetings.** The group discusses the structure for the JAD/Design step. This is particularly important in sequencing several design steps for subsystems. Some organizations choose to have sequential design steps, while others interleave the phases (customization, session, and wrap-up) of the separate design steps.

**Document issues and considerations.** During the course of the session, there arise issues that affect the requirements for the system, but for which none of the participants has the necessary information or the authority to resolve. It is important that these be documented and resolved. Sometimes there arise considerations that don’t affect the current JAD process, but that can affect how the system is built or how it is used in the organization. These are also be documented for later reference.

The JAD process specifies document forms for recording issues and considerations. Figure 1 (page 7) shows an example of an issue recording form. Note that each issue is assigned to a person for resolution by a particular date. Considerations are generally recorded simply as a list.

**Conclude the session phase.** The session leader concludes the session by reviewing with the participants the information collected and the decisions made. Each participant is given an opportunity to express any remaining concerns about the requirements. The session leader conducts this discussion so that everyone gains a sense of ownership of and commitment to the requirements that have been documented. Concluding the session on a psychologically high note helps ensure future productive contributions from everyone involved.
Figure 1. Issue recording form

The JAD/Plan Wrap-Up Phase

The main goal of the wrap-up phase is to transform the transparencies, flip charts, and other handwritten documents from the session phase into formal planning documents, including the software requirements specification. The analysts work full time during this phase, assisted by the session leader. The phase has three distinct parts.

Complete the JAD/Plan document. An organization normally has a set format for a JAD/Plan document, although it may be customized somewhat for a particular software project. The analysts are responsible for translating the outputs of the session into a document that conforms to this format.

Review the JAD/Plan document. After the analysts have produced a complete JAD/Plan document, all participants in the session are given an opportunity to review
and comment on it. Usually, this can be done by giving each participant a copy of the document and asking for written comments.

If there are substantive comments from the reviewers, a meeting is called to discuss the comments. All the participants in the original session are invited, so that changes in the document are agreed to by everyone.

**Obtain executive sponsor approval.** After the analysts have revised the plan document to reflect the comments of the reviewers, the session leader submits it to the executive sponsor for approval. Such approval gives the weight of authority to the document and brings closure to the JAD/Plan process. All of the session participants are then given copies of the final document.

**Professional Facilitation Services**

Facilitating a group process is considerably more difficult than it sounds. A large company that builds many systems over a long period of time can benefit from an investment in training of their own staff members to be JAD session leaders and facilitators. Other companies can employ consultants, skilled in facilitating JAD sessions, to work with company users and developers during the JAD sessions. This can greatly improve the success of the JAD process.

**Suggested Reading**

This book is perhaps the most detailed description of the JAD technique.