

READING & CRITIQUING AN IDEF₃ MODEL

by

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(modified IDEF0 Reading Document by waltman and presley)

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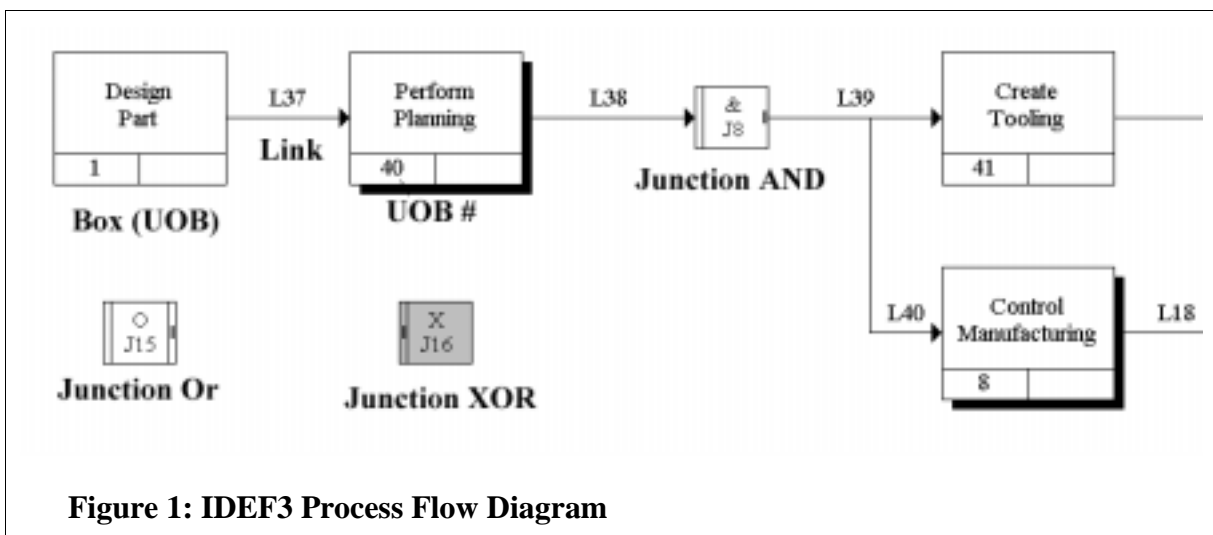
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HOW TO READ AN IDEF3 MODEL

IDEF3 is a modeling tool used to produce a model or structured representation of a system. A system can be any combination of hardware, software, and people. An IDEF3 model consists of diagrams and text pages describing the objects in the diagrams. Diagrams are the major components of a model and this document will concentrate on how to read them.

1. BASIC CONCEPTS

Steps in a process are graphically represented by boxes and links are represented by lines, depicted in Figure 1.



The boxes (called a Unit of Behavior) represent steps such as actions, processes or operations. Boxes are typically denoted by an active verb phrase inside the box. The UOB number is a sequential numbering of the boxes for ease of reference. Lines indicate the links between the boxes. Note the link numbers are not sequential in regard to the sequence of events. These indicate the flow of the process. The junctions provide explicit information as to the type of junction. The various junction types include: fan-in which is designated by the partial vertical bar on the left (as in the **XOR** junction (J16)) for fan-in and on the right for fan-out (as in the **AND** (J8) and the **OR** (J15) junctions). These are further classified into the timing of the inputs or outputs such as asynchronous which is shown by the single vertical bar (as in the **AND** (J8) and the **XOR** (J16) junction) and synchronous which is shown by the double vertical bar (as in the **OR** (J15) junction).

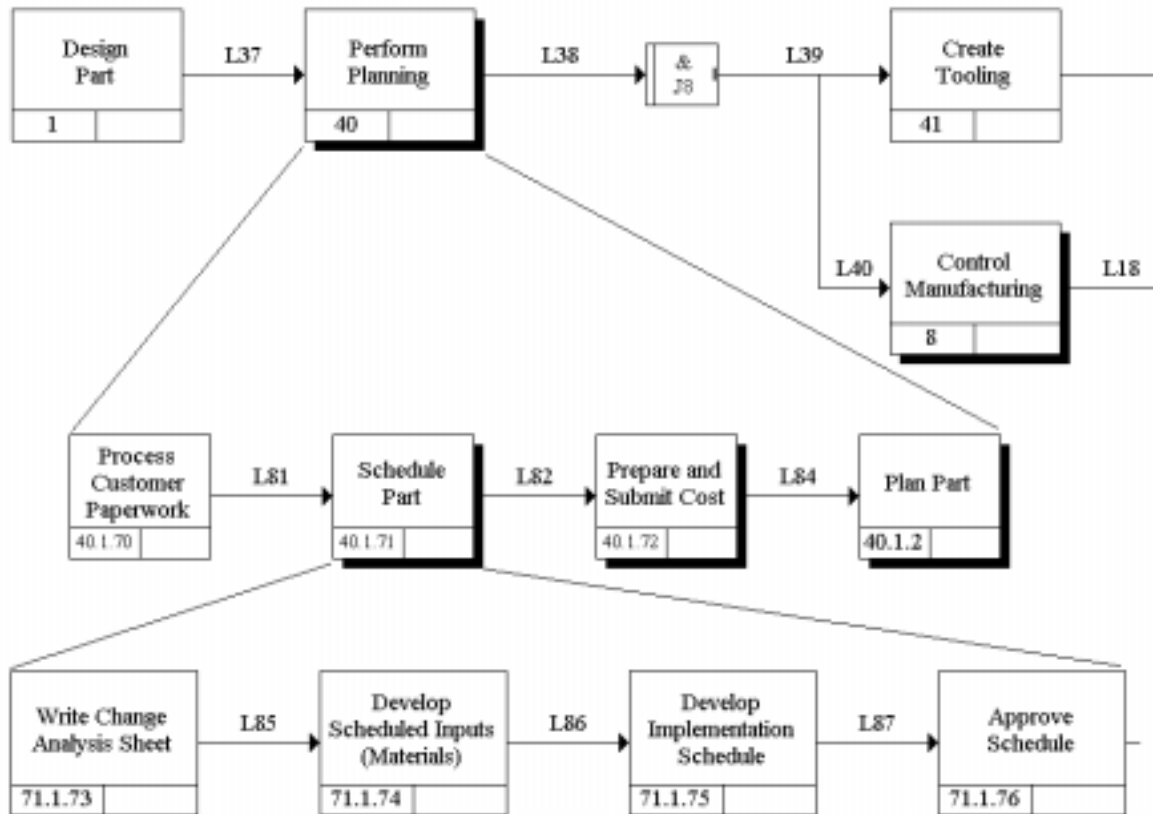
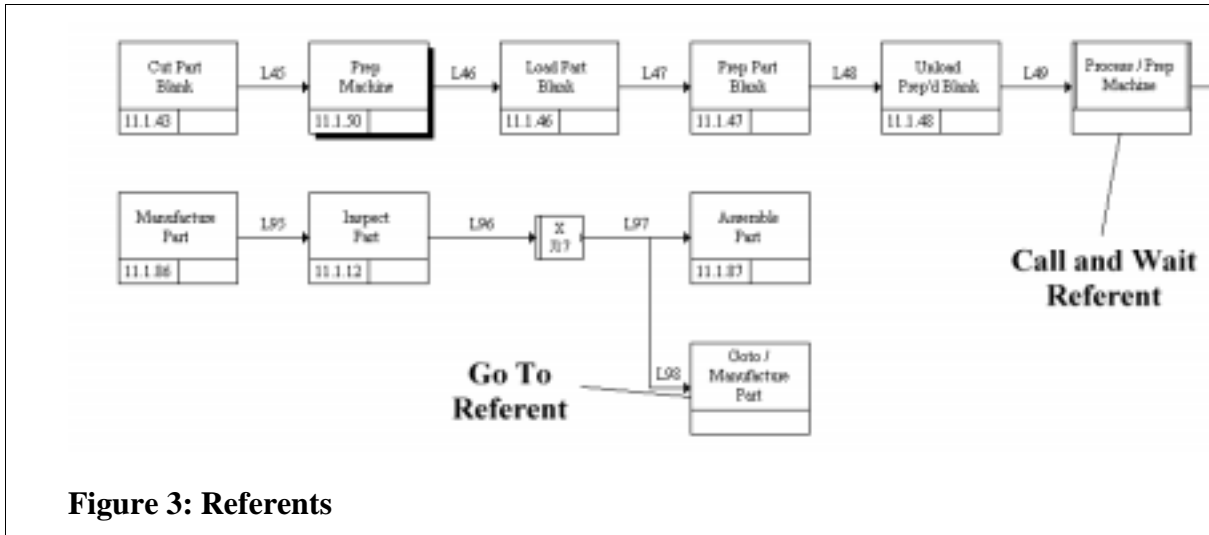


Figure 2: Decomposition Overview

An IDEF3 model is made up of several diagrams. Each diagram describes in more detail a box from a more general diagram. The process of describing a box in more detail is known as decomposition. The more general diagram is called the parent of the detailed diagram. IDEF3 models are read in a "Top-Down" fashion. The top level diagram, summarizes the overall function of the system. This diagram represents the first decomposition of the system. The numbers help tie the diagrams together. For example, in Figure 2, Box 40 of the top diagram is decomposed on the diagram displayed below the top diagram. Notice how all of the boxes on this diagram are numbered beginning with '40'. This indicates the parent of the diagram. The "Schedule Part" box is then further decomposed into the diagram shown below it. These boxes are numbered starting with the number of its parent. So, the first box on the bottom diagram may be read as 71.1.73 which means the parent is box 71 and it is the first (1) decomposition of box 71 and it is the 73rd box in the entire project.

The location of the boxes on a diagram *do* imply sequence or time. Feedback loops are shown with a feature called a *referent*. Examples of referents are shown in figure 3. A *go to* referent simply means that system control is passed back to a previous process. A *Call and Wait* referent is similar, except that it *only* performs the process referred to and

then continues from the referent. So, in the top example in the figure below, the *Process/Prep Machine* referent passes control to the *Prep Machine* process and once that is completed, control is passed back to the next process after the *Process/Prep Machine* referent. In the lower example in the figure below, the *Goto/Manufacture Part* referent passes control to the *Manufacture Part* process and when that is completed, control continues from the *Manufacture Part* process to the *Inspect Part* process and so on.



2. THE GOAL

The goal of this project is to develop a correct and complete description of the system. IDEF methodology contends that correctness can only come from the experts who do the actual work.

UNDERSTANDING DETAILS OF A SINGLE DIAGRAM

1. **Read the Title & Node Number** - Start reading a diagram by first scanning the form, and concentrate especially on the title and node number of the diagram.
2. **Review the Entire Diagram** - Now look over the diagram as a whole. Try to get a feel for the overall process to provide context.
3. **Review Each Box** - read each box separately. Concentrate on understanding a single box in its entirety. By focusing on just a single box, you can understand how all links that touch it are related.
4. **Read Any Accompanying Text** - Once you have studied boxes and links, read the associated text. Use the text to gain a better understanding of what the diagram is trying to say, or use them to give specific feedback to the author.

5. **Read Associated Supporting Material** - Read any associated supporting material. Figures, text, and glossary are often attached to a diagram to provide a visual context, elaborate on a key point, or clarify terminology.

UNDERSTANDING THE IMMEDIATE CONTEXT OF THE DIAGRAM

Once you have read the internals of the diagram, focus on their context by determining all the connections between the diagram and its parent. By doing so you will get a clearer understanding of the diagram, because the subject boundary defines how the diagram fits into the overall model. An understanding of the diagram context is acquired by performing the following tasks in a sequential fashion:

1. Read the Parent Box and Its Arrows
2. Read How the Diagram Connects to its Parent
3. Read the Supporting Material of the Parent

UNDERSTANDING HOW A DIAGRAM FITS INTO A MODEL

Once you understand the immediate context of the diagram, focus on how the data fits into the rest of the model. This is done by tracing data flows and constraints from the top of the model down to the diagram under consideration. This will give you a complete understanding of the diagram, because a top-down reading reviews the successive functional details that led to developing the diagram and reveals the way the arrows were decomposed.

CRITICIZING AUTHOR'S MESSAGE

At this point in the reading process, the IDEF reader has acquired an understanding of the diagram, its immediate context, and how the diagram fits into the overall model. *Good IDEF readers know only what is written on paper; they assume nothing.* Thus their acquired understanding comes only from the model and its supporting material.

Now comes the time when the author's message is constructively criticized according to the readers newly acquired understanding. Criticizing means questioning the message told by a diagram.

IDEF readers must ask three basic kinds of questions:

1. Questioning Syntax
2. Questioning Your Understanding of the Message
3. Agreeing with the Author's Message

All of the questions in each of these three groups are explicitly listed in **APPENDIX B** at the end of this paper.

COMMENTING CONSTRUCTIVELY

The documenting of issues as they arise when reading a diagram is called **commenting**. Commenting is a skill, and constructive comments — those that criticize with the goal of improving a diagram — are the only kind readers should make. Comments are written directly on the pages of the kit in RED. Simple agreement and disagreement marking conventions make comments easy to write. Numbered notes help keep track of each comment and the sequence in which they were written.

Record Work Times - Record the the start and finish times for reading and commenting on a kit in the Special Instructions area of the Kit Cover Page. As you become familiar with the Author-Reader Cycle, your elapsed times to process a kit will drop considerably.

Checking Frame Contents:

- Check the author's name, project, date, revision, and C-Number to distinguish this diagram from all others.
- Check the context box, title, and node number to see how the diagram fits into the model.
- Check the status area to determine the level of approval this diagram has received.
- Finally, place your initials and the date of your review in the Reader Area.

After reading and commenting on several kits you will find these actions become automatic.

Simple agreement is recorded with a red check mark (✓). Similarly, simple disagreement is noted with a red X. These marks tell the author that the diagram or page was read and that the reader generally agrees or disagrees with the message presented. More substantive comments should also be included on each page of the kit.

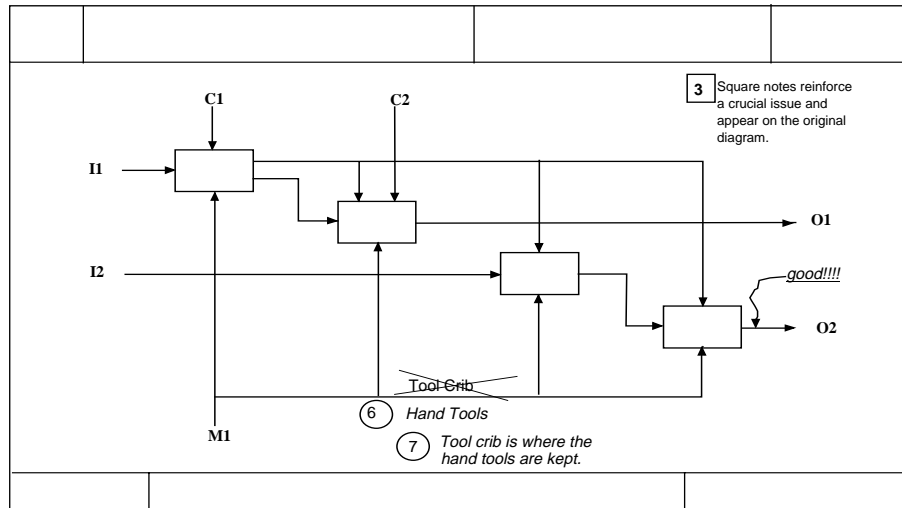


Figure 9: Commenting Examples

Making IDEF Notes - The IDEF methodology distinguishes between "Round" \textcircled{n} notes — those added to diagrams by the reader/commenter to explain disagreement with point(s) the Author has made on the diagram, and "Square" \textcircled{n} notes — those included by the Author on the original diagram to highlight or explain specific details or issues.

To make a round note \textcircled{n} , first make a tick mark over the next available Note Number on the Kit Cover Page then write that number on the diagram and circle it. Finally, write down your issue next to the circled number. If necessary, connect the note to the appropriate part of the diagram a squiggle. Figure 9 provides examples of round and square notes as well as reinforcing comments.

It is also a good practice to acknowledge agreement on important issues with comments such as "good!!!".

Rereading the Kit - After a kit has been commented, it is wise to go back and reread it. Rereading isn't busywork. As with any written document, IDEF first drafts are rarely good enough to publish. So by reviewing your comments, you can mark important notes with a check, cross out irrelevant notes with an X, clarify weak notes, add new notes, and summarize your review on the cover page. Experience has shown that the quality of review is greatly increased if several minutes are taken to reread the entire kit.

SOME FINAL THOUGHTS ON MAKING CONSTRUCTIVE CRITICISM

No one likes to receive one's work that criticism without suggestions of ways to improve what was done. The IDEF methodology strongly advocates a *positive* and *constructive* commenting style. Constructive comments should be brief, clear, positive and specific.

It is especially important to be helpful when an author makes a large oversight, has misunderstood basic terminology, or has drawn a diagram outside the purpose or viewpoint of the model. In such cases you should make a note on the Kit Cover Page describing the problem as you see it and arrange to meet with the author to discuss the matter.

Good IDEF readers are not satisfied if they see nothing wrong - they must also see everything right. Important points may have been overlooked, parts of the diagram could be irrelevant, or a diagram could even be drawn from the wrong point of view. That is why readers need to point out the good as well as the bad. Authors need to know they are on the right track.

2. QUESTIONING SYNTAX

To be completed.

2. QUESTIONING YOUR UNDERSTANDING OF THE MESSAGE

- What is the role of each box in the diagram?
- How is each box activated?
- Is the role of each box clear?
- How does the box transform its inputs to outputs?
- Is important error handling clear?
- Is the main story-line clear?
- Are alternate data flow paths understood?
- Does the terminology support the story line?
- How do the boxes decompose the parent box?
- What are the source and target of all external arrows?
- Are there too many or too few boxes?
- Should the boxes be reordered?
- Is part of the diagram unusually busy or inactive?
- Are there too many arrows?
- Are arrow crossings confusing?
- Are labels too long or too wordy?
- Is jargon used heavily?
- Does the terminology match the viewpoint of the intended audience?

APPENDIX B (CONTINUED)

3. AGREEING WITH THE AUTHOR'S MESSAGE

- Is the decomposition complete?
- Is there a missing box?
- Is there a box that doesn't belong?
- Are there any surprises in the decomposition?
- Would I have come up with a radically different decomposition?
- What questions will this diagram answer?
- Does this match the purpose of the model?
- From whose viewpoint is the system being described?
- Does this viewpoint match the viewpoint of the model?
- Is the diagram too vague or detailed to answer the question set implied by the purpose of the model?
- Does the diagram answer questions outside the purpose of the model?
- Are all terms used from the same viewpoint?
- Are the facts relevant to the viewpoint of the model?
- Does the model reflect reality?
- Are boxes properly placed in order of precedence?
- Are there extraneous or missing arrows between boxes?
- Are titles and labels misleading?
- Do arrow branches contain only data which is required by a box?
- Do "normal" data flow paths seem to work?
- How will wrong data affect a box?
- Are essential error paths accounted for?
- Should a function do more work than is implied by the arrows touching it?