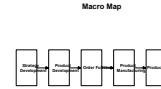
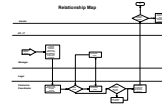
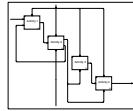
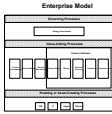


“A Picture is Worth a
Thousand Words”



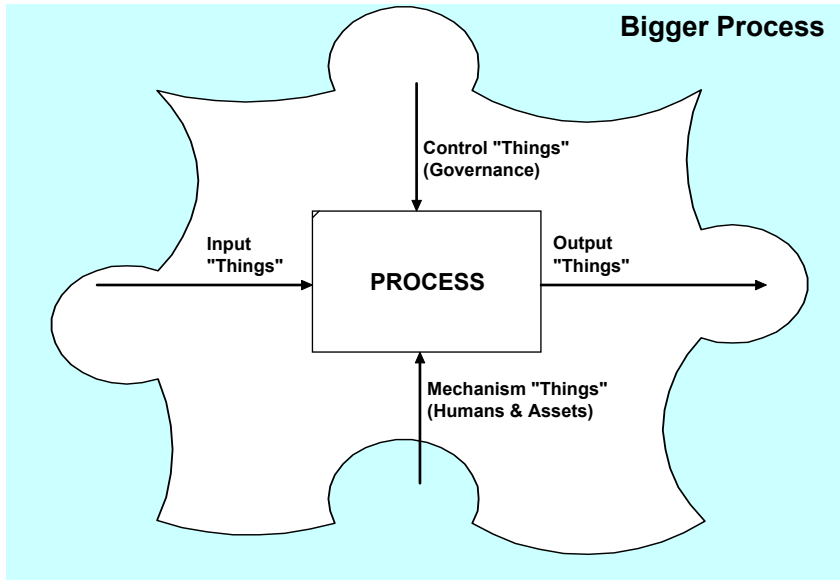
Process & Process Models



Ed Johnson, Consultant
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1

Seeing "Process"



2

Process

What is it?

A system whose components work together to accomplish the aim or purpose of the process.

What it is not?

A “set” of something.

A perspective:

Humans are organic processes that aim to survive and thrive.

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Processes are everywhere present and active, all the time; they are ubiquitous. A particular process of interest can be any size -- from the atomic to the cosmological. Processes that make up a business enterprise fit somewhere in between.

Every process comprises smaller processes and is always a part of a bigger process. Every bigger process imposes an environment, or context, that constrains the smaller processes. Both the bigger process and the smaller processes affect each other's behavior; they are interdependent.

Model

What is it?

An abstraction of a real-world situation or object rendered textually, graphically, concretely, mathematically, cognitively, or some combination of these.

A perspective:

"All models are wrong; some are useful." --W. Edwards Deming

4

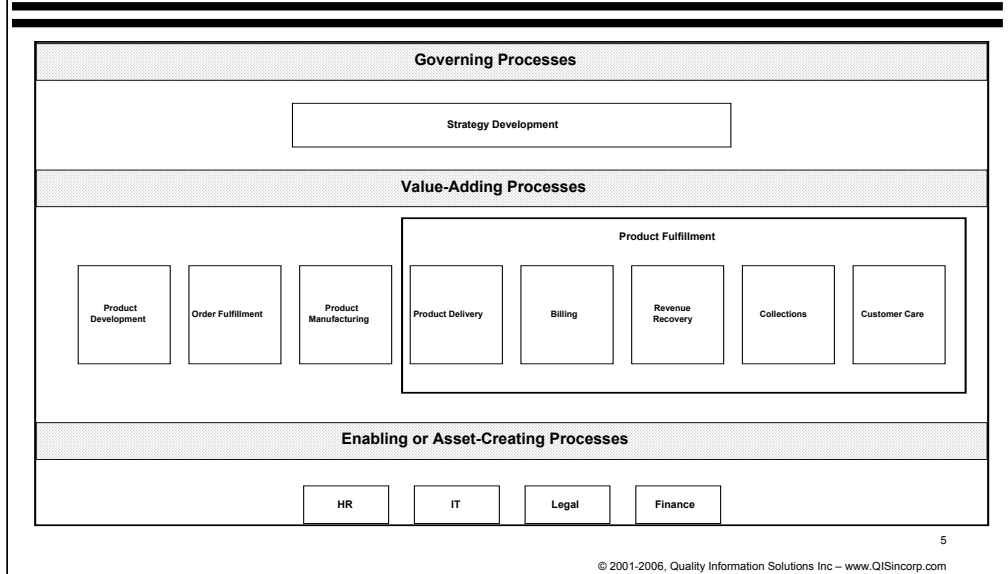
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Models generally can be changed or manipulated so that their creators and users can see how the real thing might work or behave if changed or used under varying conditions.

Model types will vary by level of abstraction. The level of abstraction needed depends on the purpose of the model and the questions needing answers. On one hand, flow models tend to map sequence wholly at the lower levels of abstraction. On the other hand, disciplined process decomposition models incorporate varying levels of abstraction, from the most general to the most specific, so as to facilitate understanding, communicating, and analyzing systems, however simple or complex, through gradual exposition of detail.

Transition: A good way to model a process is to “decompose” it into levels of greater and greater detail, as needed. How many levels of detail? As many as it takes for the model to serve a particular purpose and to help answer particular questions about the process. For example, for a business enterprise, the purpose of the model may be to classify the highest-level business processes or functions of the enterprise without depicting their interdependencies. This can be accomplished with an Enterprise Diagram....

Enterprise Diagram



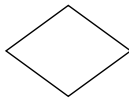
Note how the business processes are grouped by class.

An **enterprise diagram** is a simple model that groups the highest-level business processes or functions by class: governing, value-adding, or enabling or asset-creating. Other classification schemes may be more appropriate.

Transition: Another type of diagram...

Flow Diagram

Commonly used flow diagram symbols:



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A **flow diagram** is a diagram that models **action-decision paths through a process** from a start point to an end point. A flow diagram generally amounts to a script or algorithm—a “set” of sequenced tasks—at a low level of detail. Flow diagrams reflect sequential step dependence.

The number of symbols and the meaning of the symbols used to construct flow diagrams vary considerably, so invite varying interpretations. Still, typical symbols and meanings are...

Boxes represent the action steps in the task sequence.

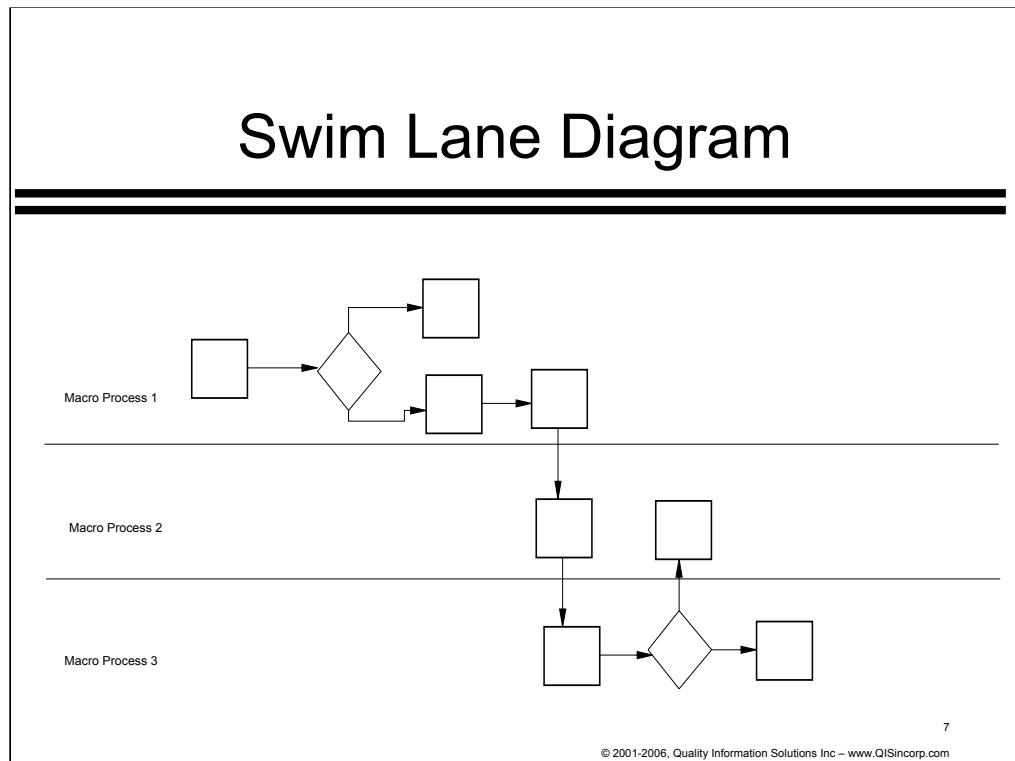
Diamonds represent the decision steps in the task sequence.

Arrows represent the “flow” of work from one task sequence step to next.

Circles denote flow boundaries; the steps that begin and end the task sequence.

Transition: Another type of diagram...

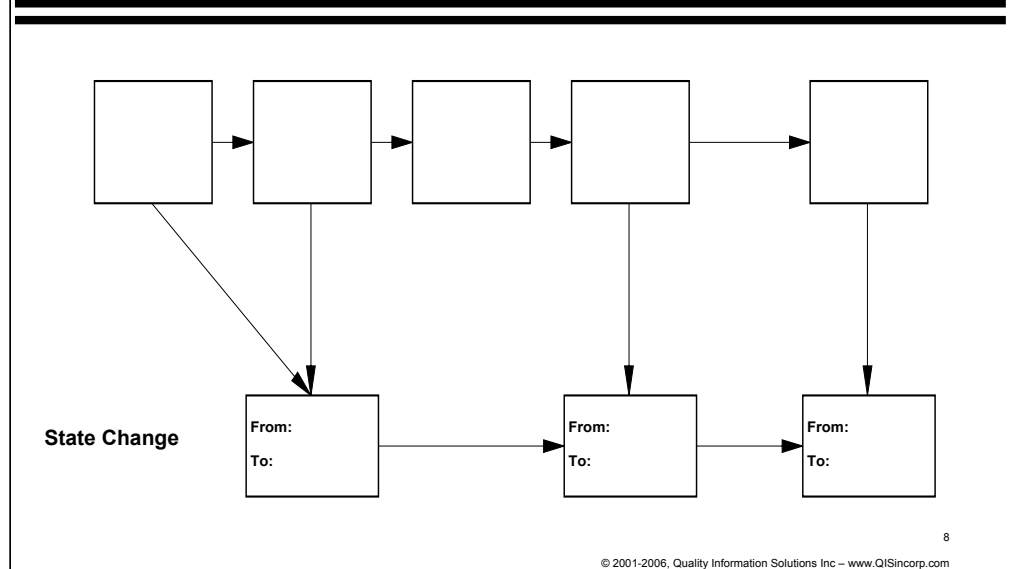
Swim Lane Diagram



A **swim lane diagram** is a flow diagram constructed in such a way that each step in the task sequence is drawn in the “swim lane” that performs or otherwise classifies the step.

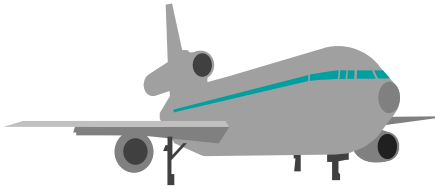
Transition: Another type of diagram...

State Change Map



A **state change map** shows the transformations that an input goes through within the process. State change diagrams generally are constructed at low levels of detail to model transformations, which may be physical, conceptual, temporal, and spatial in nature.

Transition: Obviously, sometimes the enterprise diagram, the flow diagram, the swim lane diagram, the state change diagram, and similar other types of diagram won't help answer certain questions, especially questions around process interdependencies, resource usage, behavior, and basic cost and performance characteristics. Sometimes, models that fit more properly the definition and reality of process are needed. So let's now look at a time-tested methodology for creating such models, starting with an analogy for process "decomposition"...



Process Model

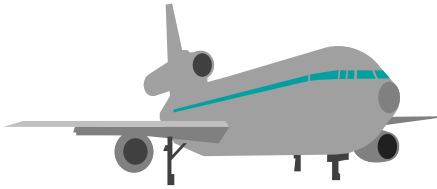
What is “decomposition”?



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Look at the concept of decomposition like a trip on an airplane where, at 30,000 feet, you cannot discern details in the landscape below. But you can see the context of neighboring cities within a state or perhaps neighborhoods within a city.

Transition: So, as you fly over city after city en route to your destination, you’ll see how cities within each state “connect” to each other, but you can’t see much within the cities themselves. Now, what happens as you approach your destination?



Process Model

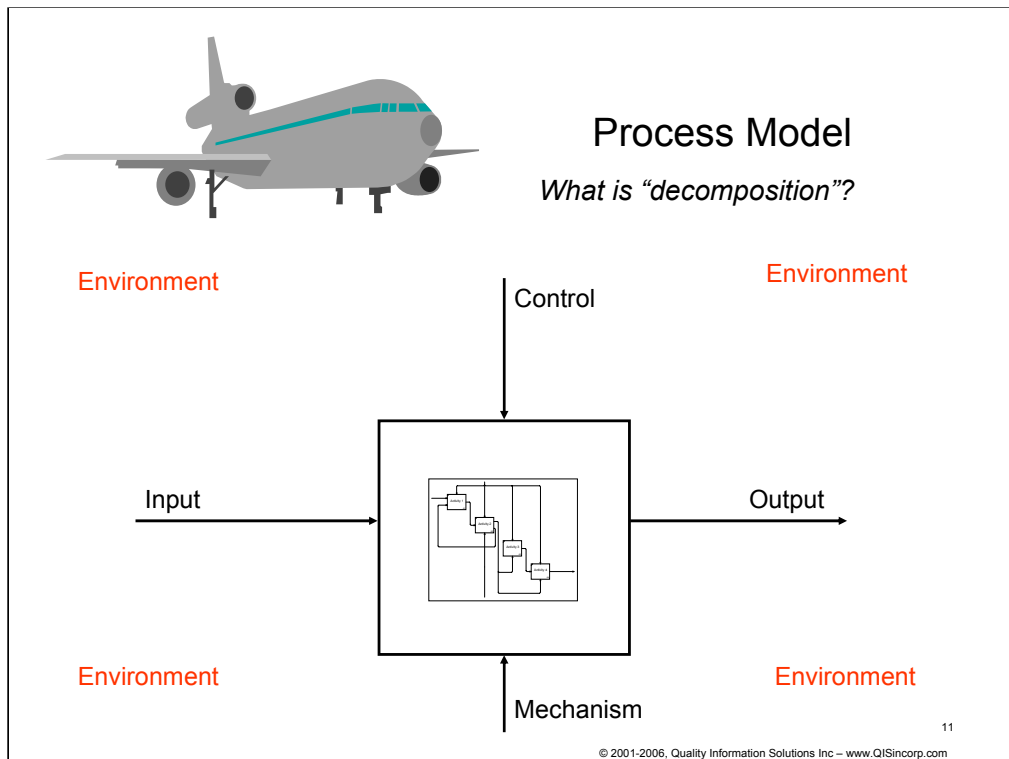
What is “decomposition”?



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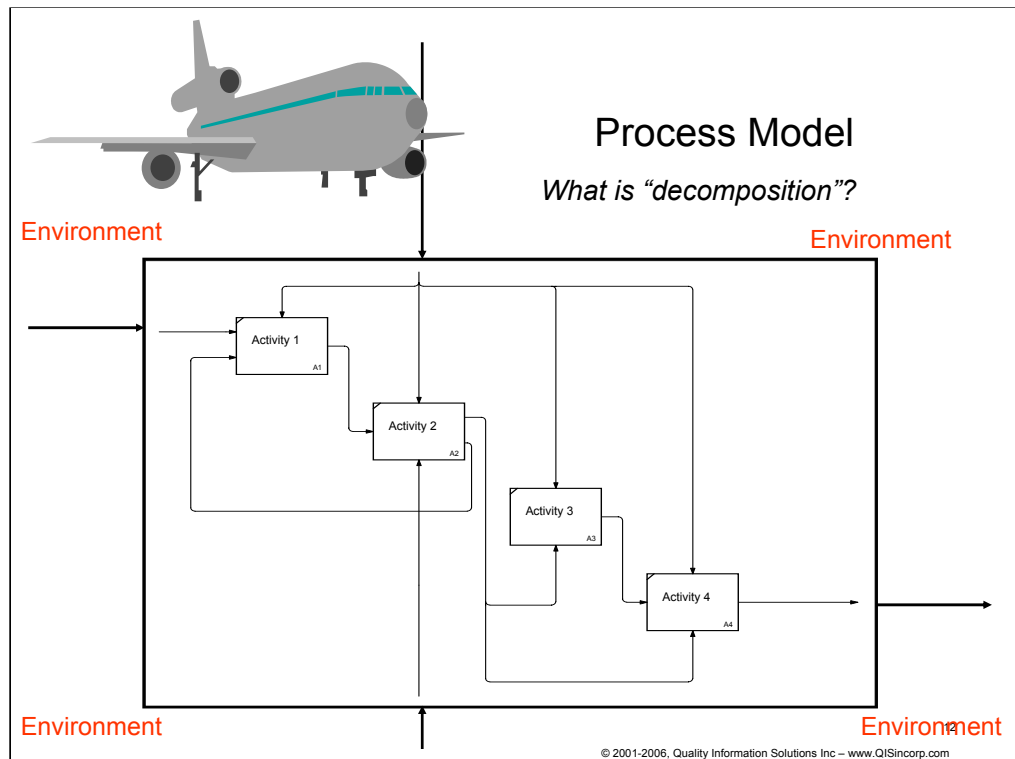
Once you near your destination and begin to “descend,” you begin to see more and more details in the landscape – roadway traffic, names on tall buildings, etc. The lower you descend, the smaller the context of the details you see becomes.

Transition: Decomposition of processes works the same way.



While you are flying at “30,000 feet,” you know that more details lie within the context; you just can’t see them clearly. And that’s OK, at this level. What is important to understand, at this level, is the **context**, the **environment**.

Transition: But when it’s time to gradually expose the details, you will “descend” so you can see what’s written on the buildings!



Once you've descended to inside the bigger box, you can see there are several smaller boxes that relate to each other.

Note how the **constraining arrows** in the environment relate to the arrows we can now see within the box.

Note how Activity 1 produces **output** that becomes **input** to be **transformed** by Activity 2.

Note how Activity 2 provides **feedback** to Activity 1 as input.

Note how Activity 2 enables both Activity 3 and Activity 4 with **mechanisms** to perform work.

And note, especially, how the environment provides **control** to all the activities, so as to give reason to the activities to do what they do.

Transition: So, how do we define "process model?"

Process Model

What is it?

A structured representation of a process that, for a particular purpose and viewpoint, depicts the process activities and the things that interrelate them.

When to use it:

- To establish the context of a process within a system
- To understand, communicate, and analyze the activities of a process and their interdependencies, so as to answer certain questions about the process.

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A process model can be used to depict systems of any size -- from the enterprise level to a single, highly specific task performed within the enterprise. It all depends on the purpose for the process model.

Transition: Sometimes, for presentation purposes, it is useful to depict the higher level business processes in an enterprise without showing their interdependencies. This can be accomplished with an Enterprise Model similar to that shown earlier.

Process Model

Process Modeling Methodology: Integration Definition for Function Modeling

IDEF0 (eye-def-zero)

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All of the models mentioned so far might be called “process models.” But that term is generally reserved for a special type of process model that results from applying the **IDEF0** methodology. (IDEF1X is the companion “data modeling” methodology.)

Transition: So what is IDEF0 and where did it come from?

Process Model

IDEF0 Brief Background

- Is today a standard of the Institute of Electrical and Electronic Engineers (IEEE) and the U.S. Department of Commerce, National Institute of Standards and Technology (NIST)
- Is the required standard within the U.S. Department of Defense
- Originated out of the U.S. Air Force project ICAM (Integrated Computer-Aided Manufacturing)
- Is based on concepts first developed in the '60's as Structured Analysis and Design Technique (SADT)

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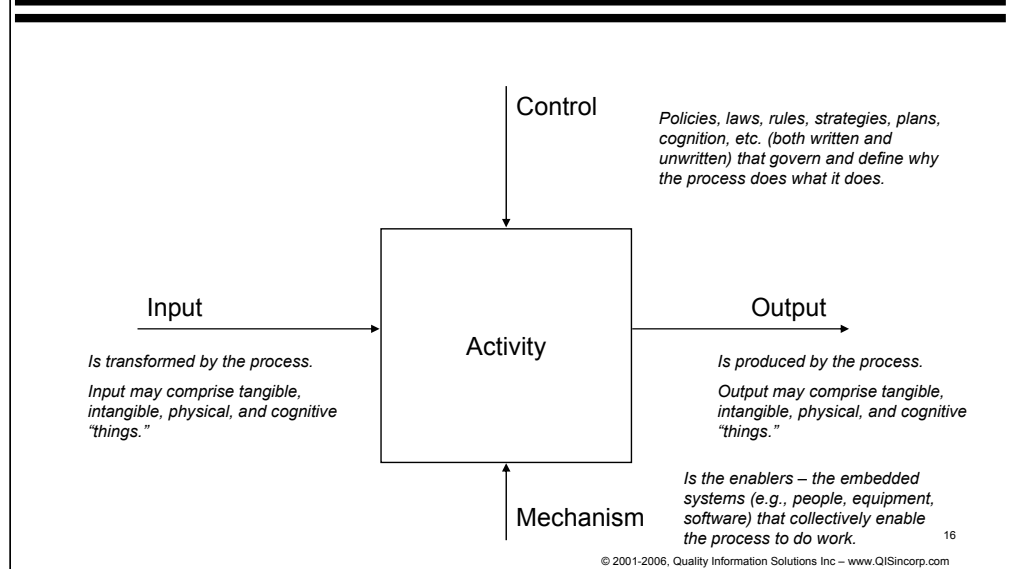
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The ICAM goal is “directed toward increasing manufacturing productivity through systematic application of computer technology. The ICAM program approach is to develop structured methods for applying computer technology to manufacturing and to use these methods to better understand how best to improve manufacturing productivity.”

Even so, IDEF0 has proved to be a strategic element of CIM and FEA and more generally BPR, BPM, TQM, CQI, and various other quality improvement approaches in industry, service, government, and education.

Transition: Now, let's explore a few concepts of the IDEF0 methodology.

IDEF0 Process Model



Basic standard syntax and semantics

Input, at the left side of the box

Control, at the top of the box

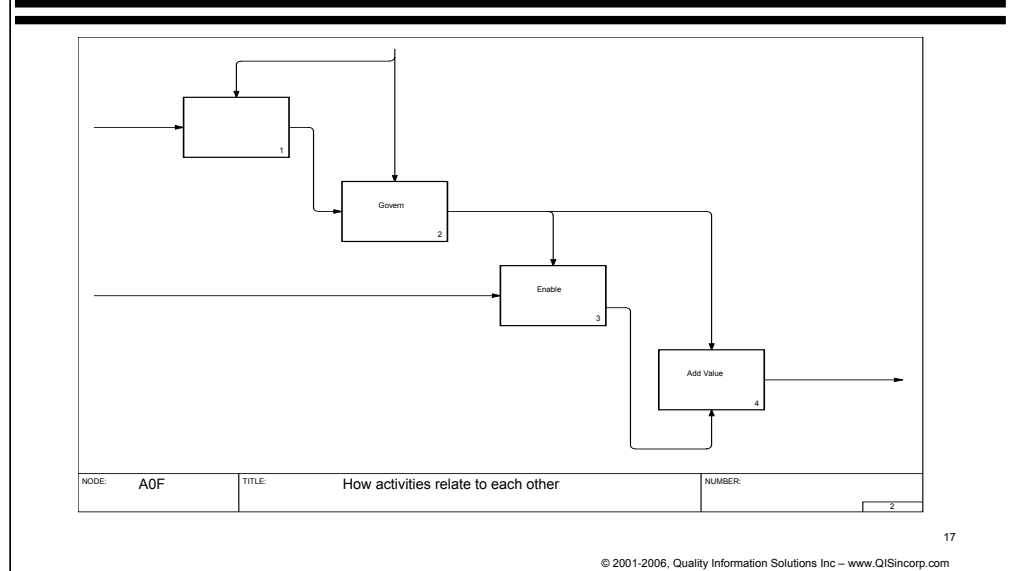
Output, at right side of the box

Mechanism, at the bottom of the box

The box generically named **Activity**, standing for a verb or verb phrase

Transition: The context diagram is always the **TOP** of an IDEF0 process model. It models the boundaries of the process as constrained by its environment. Since a process comprises smaller processes, let's see how IDEF0 represents this.

IDEF0 Process Model



Smaller processes within a bigger process are also described as boxes that have input, control, output, and mechanism. When they are linked together, you can readily see the interdependencies between the smaller processes.

Note that some inputs and controls come from the environment; others are created and used within the process.

Note that some outputs go into the environment; others are used within the process.

Note that one, more or all the smaller processes may activate or be active at the same time.

Transition: Now, let's look at a few underlying principles of the IDEF0 methodology.

IDEF0 Process Model

IDEF0 Pragmatics

- Establish the process model purpose and viewpoint
- Start with a one-box context diagram
- Break a bigger process box into smaller process boxes through “decomposition”
- Each decomposition should contain no less than 3 and no more than 6 boxes
- Use active verbs and verb phrases to name activities
- Use nouns and noun phrases to name arrows
- Arrows are constraints that effect activity activation; activities activate whenever requisite arrow content is present

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One-box context diagram - forces you to define scope

Decomposition - supports the quality tenet that “all work is a process” and each process is a part of a larger, more complex **system**.

No less than 3 boxes - Too few indicates you may be generalizing too highly

No more than 6 - The human brain best handles 5 ± 2 things at any one time

Active verbs - Forces you to describe in concrete terms what the work is

Arrows as constraints, not flows - As activities are verbs, arrows are nouns. Input, control, and mechanism arrows represent the “things” that are required to activate the process. In other words, the process is “constrained” by the existence of the arrows.

Transition: Principles continue on the next slide.

IDEF0 Process Model

IDEF0 Pragmatics (continued)

- Every activity has at least one control but may or may not have inputs (as with “creation” processes)
- The roles of input and control are different -- inputs are transformed by the process; controls define the why of the process and aim to govern process behavior
- Use “For Exposition Only” (FEO) diagrams to map out process scenarios or to incorporate sequential flow diagrams or other non-IDEF0 diagrams that enhance understanding the process

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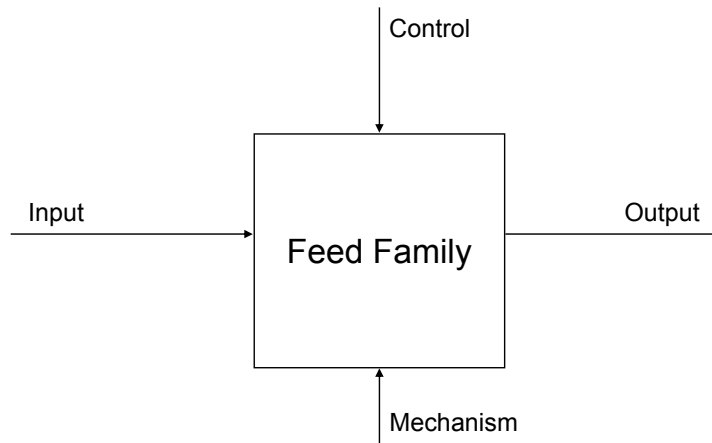
At least one control - Controls tell you why an activity is being performed. EVERY activity exists for some reason, written or unwritten, logical or illogical. It is activated because of that reason, even if it does not require transformation of input.

Controls vs. Inputs - When in doubt, label it as a control until modeling proves otherwise.

FEO diagrams - Decomposition is an art, not a science. IDEF0 process models are NOT intended to represent sequential flow like a flow diagram. However, the methodology does allow for sequencing; it simply has to be modeled. Once activities have been sufficiently decomposed to communicate the intended purpose of the model, the next level of decomposition could be a flow diagram or other type of non-IDEF0 diagram or model.

Transition: Let’s take a look at another explanation of the concept of decomposition by asking you to consider your “Feed the Family” process.

IDEF0 Process Model



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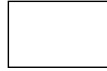
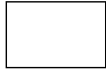
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Develop the context diagram for “Feed Family”.

Discuss: What are the inputs, controls, outputs, mechanisms? Consider unfed people, budget, availability of foods, menu, recipes, etiquette, family policy, schedule, food not eaten, etc.

Transition: Here’s a blank decomposition diagram...

IDEF0 Process Model



Feed Family

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Try naming the boxes and identifying and naming the “things” that interrelate the boxes.

Transition: Let’s now summarize what a process model is and how to use it.

Putting it all together...

- Establish the process model purpose and viewpoint
- Start with a context diagram
- Identify inputs, controls, outputs, and mechanisms
- Decompose the context to at least one more level
- Always consider the needs of the audience
- Remember... Process modeling (and data modeling) is about 80% thinking and interacting and 20% constructing

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This is essentially taking a top-down approach, or starting out at a high altitude and gradually descending until the landscape becomes as clear as you need it to be!

Modeling tools built based upon the IDEF0 language (syntax and semantics) are your best bet, practice-wise as well as long-term cost-wise. Still, general-purpose drawing tools can be used to construct IDEF0 process model diagrams. Or, they can be drawn by hand using pencil and paper, as was done in the early days of IDEF0 practice.

The tool isn't important! What's important is what you are saying with your picture! Does it serve its stated purpose and adhere to its stated viewpoint?

In Summary...

- A process model can be a powerful way to
 - » Understand a process
 - » Communicate a process
 - » Analyze a process
 - » Plan to improve a process
- Sometimes flow diagrams alone are not enough
- Wide variety of diagramming techniques
 - » Which is best? It depends!
- Need common terminology
- IDEF0, a consistent, disciplined methodology and standard
 - » Concepts
 - » Grammar (syntax, rules, and semantics)
 - » Pragmatics