Lecture #5

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January 20, 2006

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Describing Processes

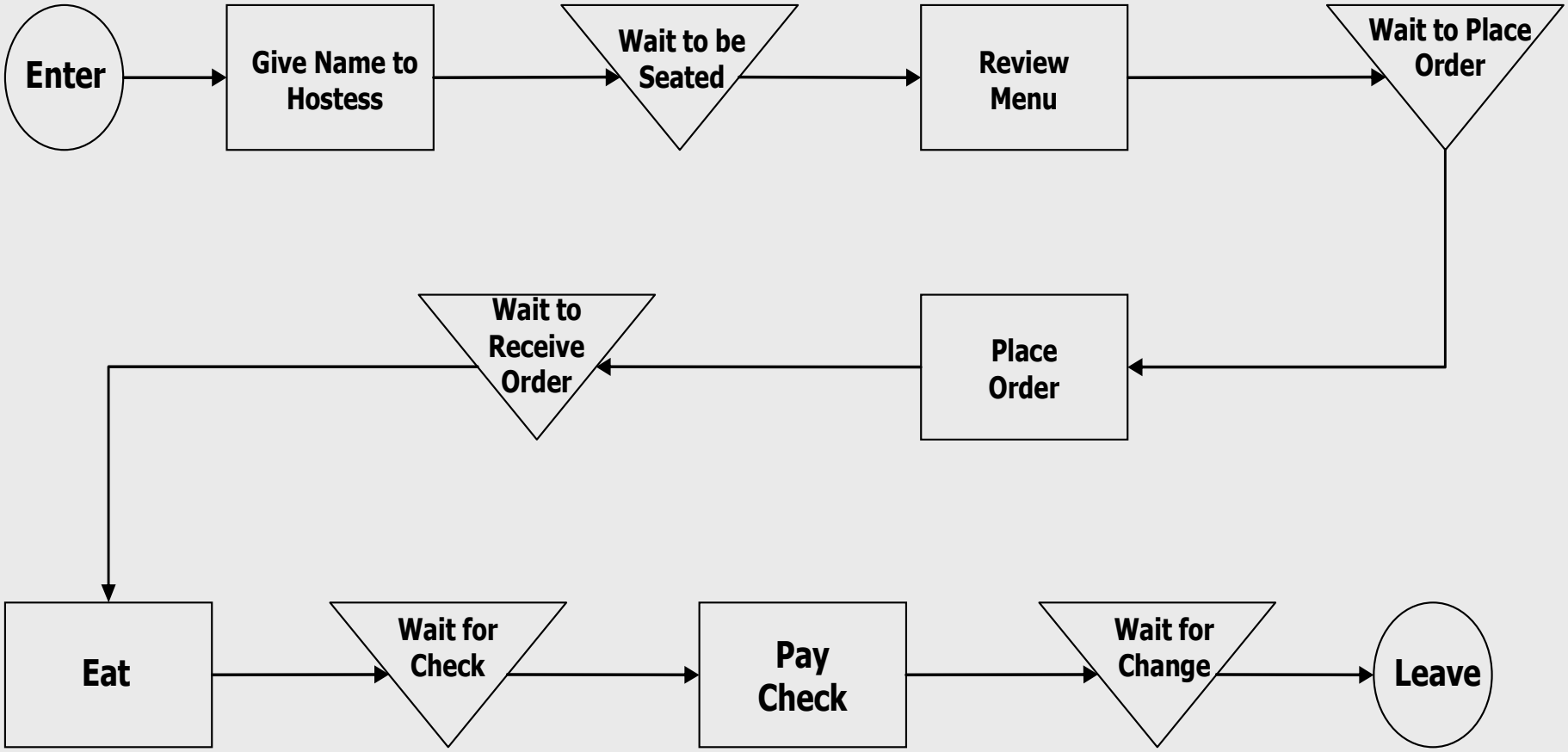
- Over the next few classes we will explore several techniques for describing processes:
  - Flow charts
  - Blueprints
  - IDEF
- We will also examine methods for adding substance to these descriptions

Process Flow Diagram/Chart

- Rectangles – process activities
- Arrows – movements from step to step
- Inverted triangles – waits
- Diamonds – decision points
- Ellipses – start & end

- From customer perspective or worker perspective.

Example Process Flow Diagram/Chart: Restaurant Service – Customer



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Waiter Point of View

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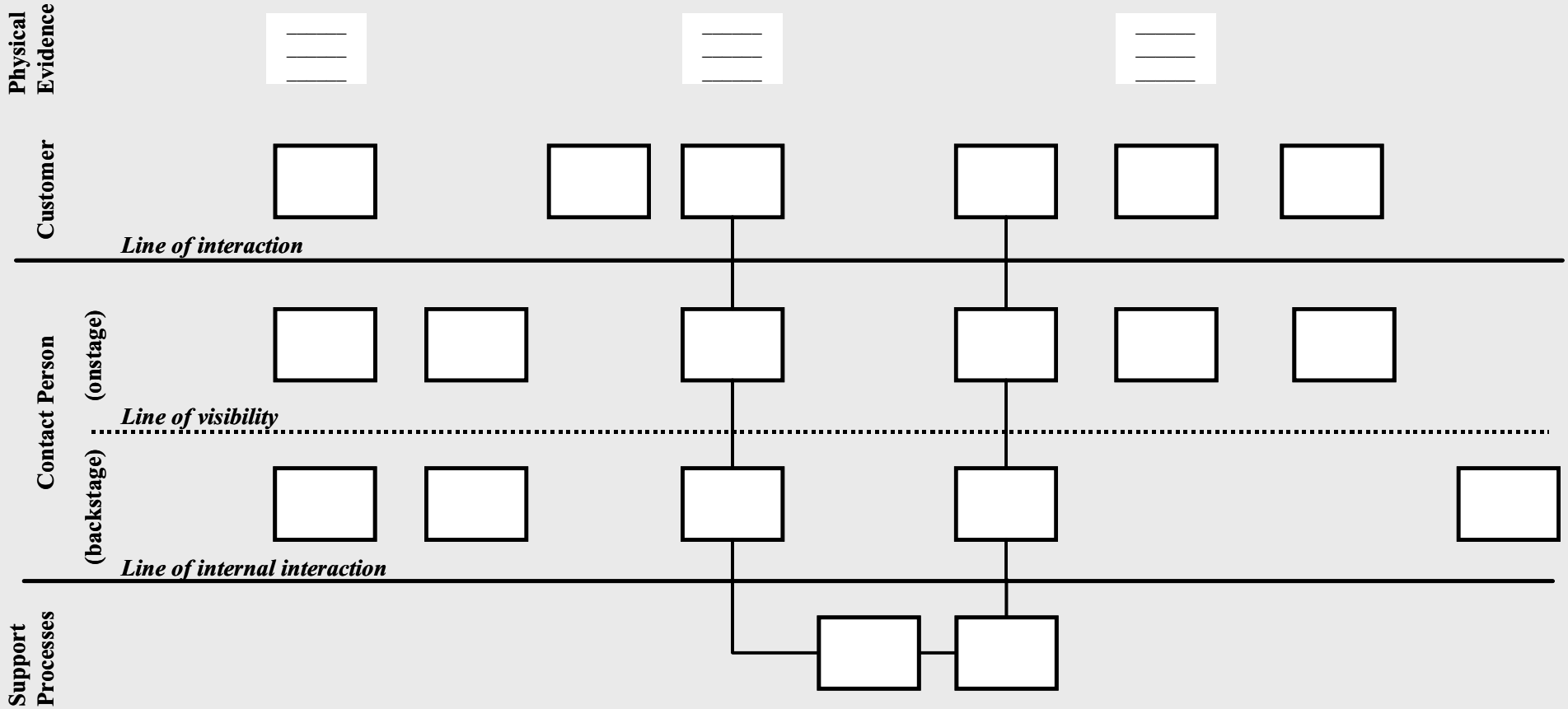
Service Blueprint

- **Four specific components:**
  - **Customer actions. Steps in the process performed by the customer.**
  - **Onstage-contact employee actions. Steps performed by the service provider in the presence of the customer.**
  - **Backstage contact employee actions. Activities by the service provider behind the scenes.**
  - **Support processes. Actions taken by other members of the service team.**
- **These are separated by three lines:**
  - **Line of interaction**
  - **Line of visibility**
  - **Line of internal interaction.**

Service Blueprint Components



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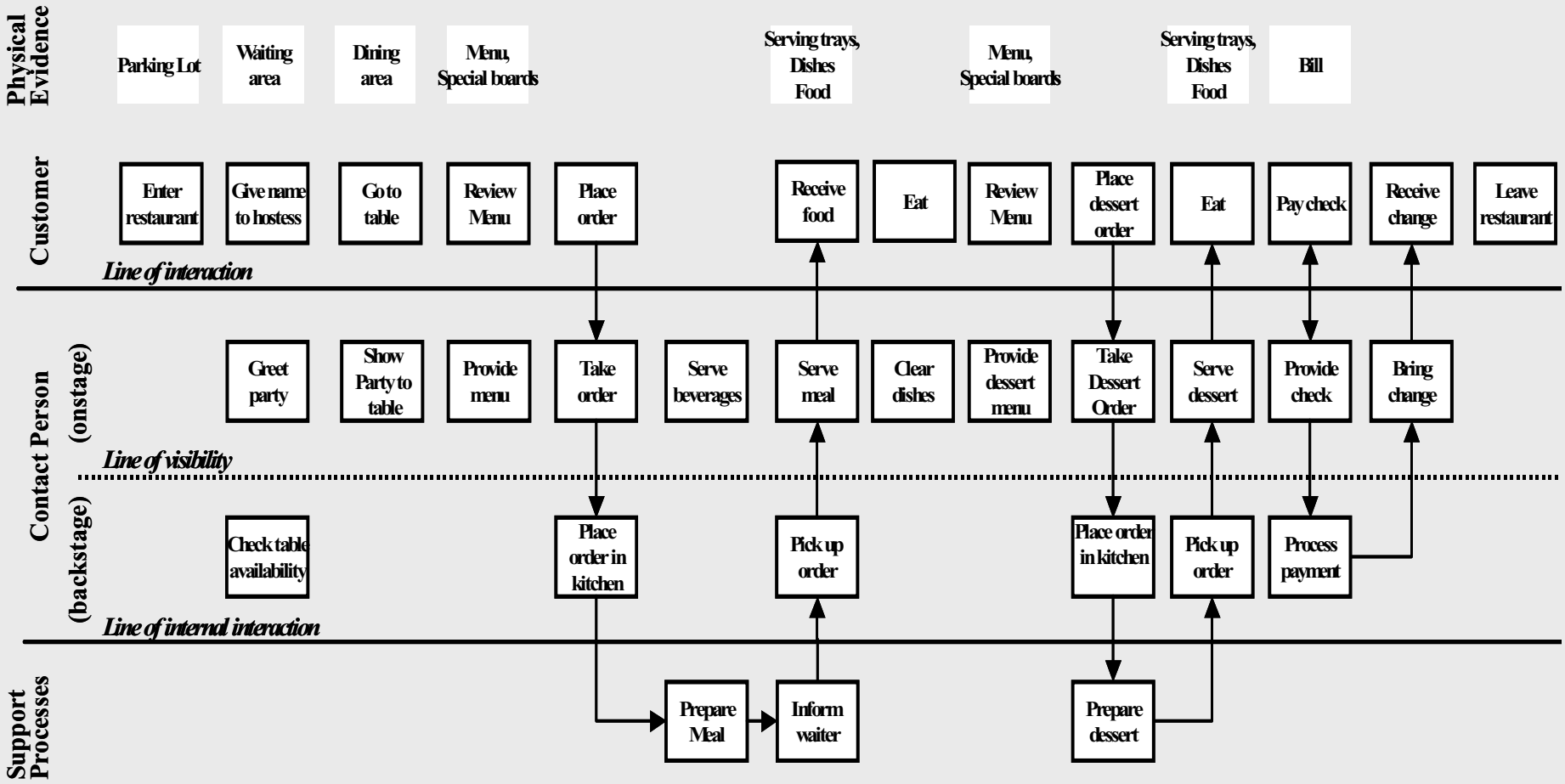
Service Blueprint of Restaurant



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Modeling and Process Modeling

- A model is any representation of reality, an abstraction, e.g. a subscale aircraft is used in a wind tunnel to test the aerodynamics of the real aircraft.

- Models can also be mathematical, a random number generator can be used to model the propensity of a coin to turn up heads or tails in a flip.

Modeling and Process Modeling

- The set of requirements for a system is an example of a qualitative model that serves as a model of the system's performances and capabilities.
- Also each of us has a number of mental models that we use in everyday life.
- The essence of a model is the question or set of questions that the model can reliably answer for us.

Modeling and Process Modeling

- Every modeling technique requires a language to establish a representation of reality.
- Any language has semantics, a set of symbols or signs, which form the basis of representations in the language.
- Every language has a syntax that defines proper ways of combining the symbols to form thoughts and concepts.

Taxonomy of Models

Model Categories	Model Subcategories	Typical Systems Engineering Questions
Physical	Full-scale mock-up Subscale mock-up Breadboard	How much? How often? How good? Do they match?
Quantitative	Analytic Simulation Judgmental	How much? How often? How good?
Qualitative	Symbolic Textual Graphic	What needs to be done? How well? By what?
Mental	Explanation Prediction Estimation	All of the above!

Buede 2000

IDEF0 (Integrated Definition for Function Modeling) Background

- The acronym comes from the U.S. Air Force's Integrated Computer-Aided Manufacturing (ICAM) in the 70's
- IDEF is a complex acronym that stands for ICAM Definition. The number 0, is appended because this modeling technique was the first of many developed in this program.

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IDEF0 Background

- The roots of IDEF0 can be traced to the structured analysis and design technique (SADT).
- An SADT model describes a "system" using a graphical modeling language and a comprehensive methodology for developing models.

Functions as Elements of IDEF0

- A function or activity is represented by a box and described by a verb-noun phrase and numbered to provide context within the model.
- A function in this context is a transformation that turns inputs into outputs. Inputs to be transformed into outputs enter the function box from the left, controls that guide the transformation process enter from the top, mechanisms enter from the bottom, and outputs leave from the right.

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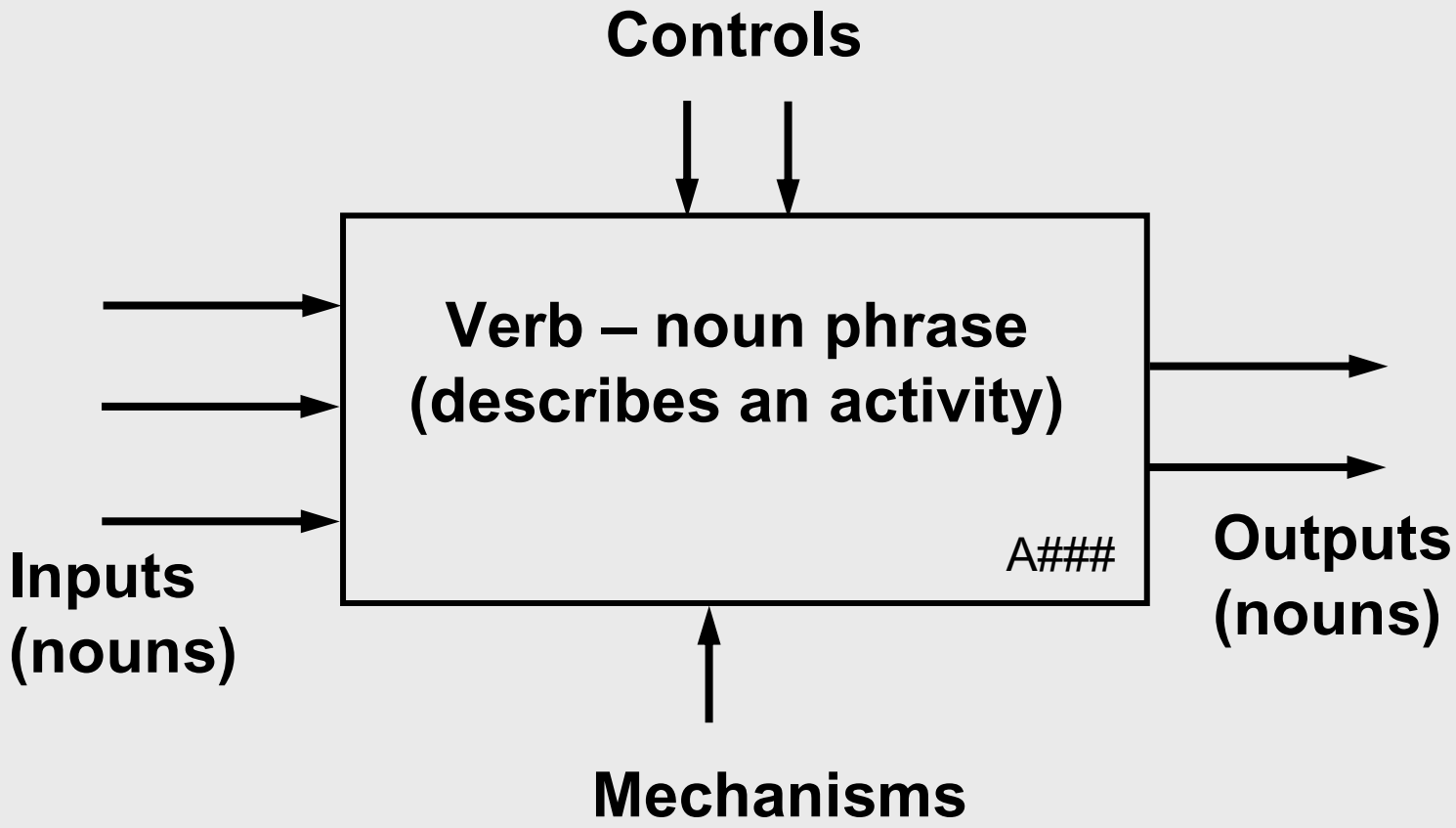
IDEF Functions



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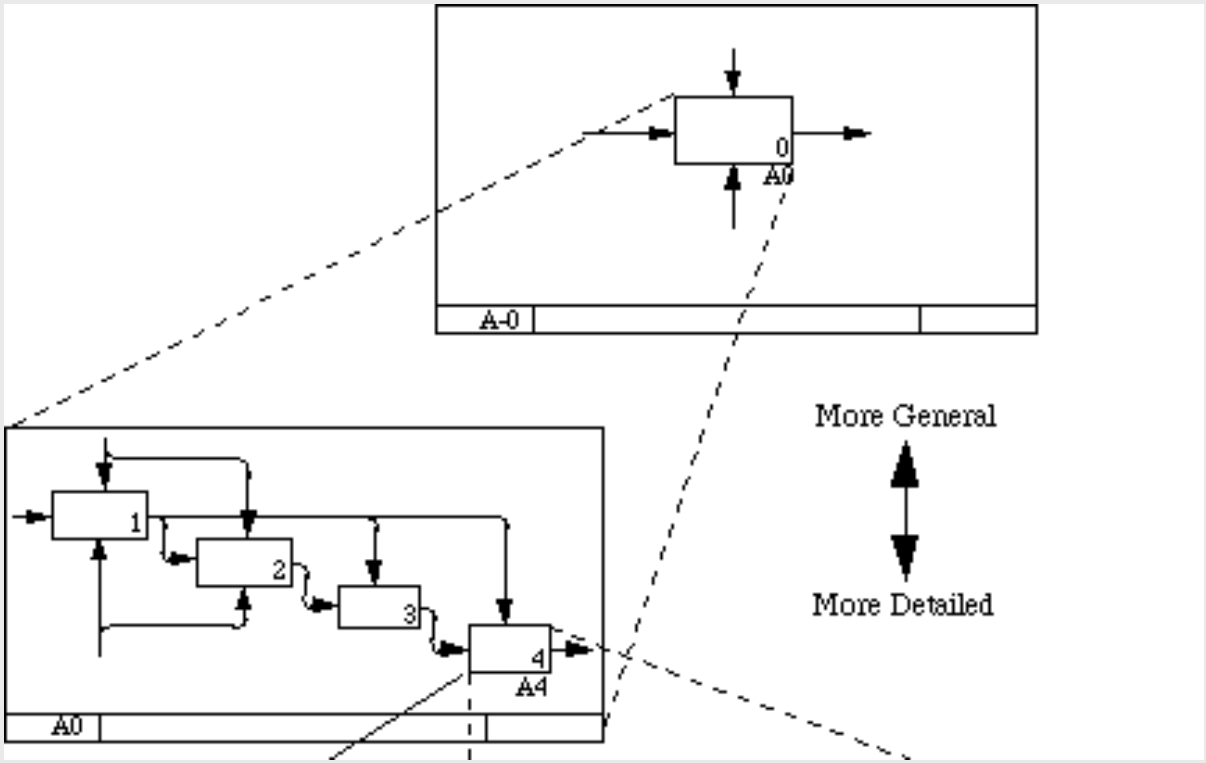
More on IDEF

- A flow of material or data is represented by an arrow or arc that is labeled by a noun phrase. This label is a noun phrase and represents a set or collection of elements defined by the noun phrase. The label is connected to the arrow by an attached line, unless the arc leaves the page, in which case the label is placed on the appropriate edge of the page.

IDEF0- Function Modeling Method

Decomposition Diagram: links together the context diagrams



IDEF0 – Example (Bosilj-Vuksic)

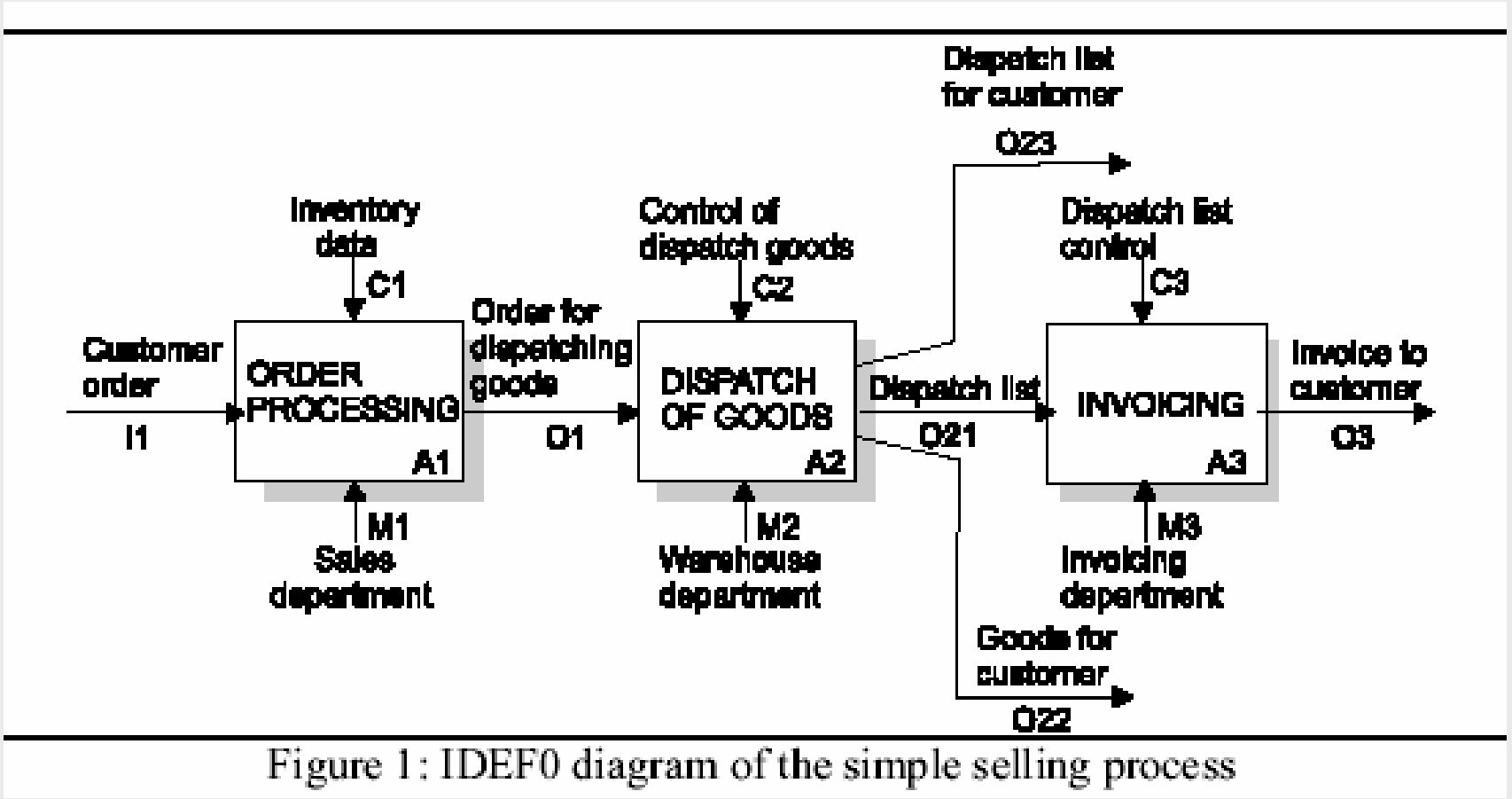


Figure 1: IDEF0 diagram of the simple selling process

IDEF- Strengths

- **The model has proven effective in detailing the system activities for function modeling.**
  - **IDEF0 models provide an abstraction away from timing, sequencing and decision logic. However, it is easy to use IDEF0 for modeling activity sequences whenever needed. (Order the activities from left to right in the decomposition diagram).**
  - **Provides a concise description of systems, by using the ICOMS. (Inputs, Controls, Output, Mechanism)**
  - **The hierarchical nature of IDEF0 allows the system to be easily refined into greater detail until the model is as descriptive as necessary for the decision making task.**

IDEF - Weaknesses

- IDEF models might be so concise that only the domain experts can understand.
- IDEF models are sometimes misinterpreted as representing a sequence of activities.
- The abstraction away from timing, sequencing and decision logic leads to comprehension difficulties for the people outside the domain.

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