DATA FLOW DIAGRAM (DFD)

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Introduction

- DFD is a technique that diagrams the business processes and the data that pass among them
- Although the name DFD implies a focus on data, this is not the case.
- The focus is mainly on the processes or activities that are performed

Proses Model and DFD

Proses Model

- A formal way of representing how a business system operates
- Illustrates the activities or processes that are performed and how data moves among them
- Both for as-is and to-be systems
- Part of Structured Systems Analysis and Design Techniques

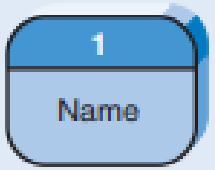
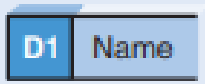
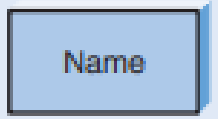
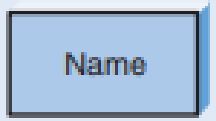
DFD

- A technique that diagrams the business processes and the data that pass among
- Logical process models describe processes without suggesting how they are conducted → Analysis phase
- Physical process models provide information that is needed to build the system → Design phase

DFD Symbols

- The language of DFD includes a set of symbols, naming conventions, and syntax rules.
- There are four symbols in the DFD language : processes, data flows, data stores, and external entities
- There are two commonly used styles of symbols, one set developed by Chris Gane and Trish Sarson and the other by Tom DeMarco and Ed Yourdon.

DFD Symbol

Data Flow Diagram Element	Typical Computer-Aided Software Engineering Fields	Gane and Sarson Symbol	DeMarco and Yourdon Symbol
Every *process* has a number a name (verb phase) a description at least one output data flow at least one input data flow	Label (name) Type (process) Description (what is it) Process number Process description (structured English) Notes		
Every *data flow* has a name (a noun) a description one or more connections to a process	Label (name) Type (flow) Description Alias (another name) Composition (description of data elements) Notes		
Every *data store* has a number a name (a noun) a description one or more input data flows one or more output data flows	Label (name) Type (store) Description Alias (another name) Composition (description of data elements) Notes		
Every *external entity* has a name (a noun) a description	Label (name) Type (entity) Description Alias (another name) Entity description Notes		

Process

- A *process* is an activity or a function that is performed for some specific business reason.
- Processes can be manual or computerized.
- Every process should be named starting with a verb and ending with a noun (e.g., "Determine request quantity").
- Names should be short, yet contain enough information so that the reader can easily understand exactly what they do.
- In general, each process performs only one activity, so most system analysts avoid using the word "and" in process names because it suggests that the process performs several activities. (Ordering Goods vs Search and Ordering Goods)
- Every process must have at least one input data flow and at least one output data flow.

Data Store

- A data store is a collection of data that is stored in some way (which is determined later when creating the physical model).
- Every data store is named with a noun and is assigned an identification number and a description.
- Data stores form the starting point for the data model (next the topic) and are the principal link between the process model and the data model.
- Data flows coming out of a data store indicate that information is retrieved from the data store.
- Data flows going into a data store indicate that information is added to the data store.
- All data stores must have at least one input data flow (or else they never contain any data), unless they are created and maintained by another information system or on another page of the DFD

External Entity

- An external entity is a person, organization, organization unit, or system that is external to the system, but interacts with it (e.g., customer, clearinghouse, government organization, accounting system).
- The external entity typically corresponds to the primary actor.
- External entities provide data to the system or receive data from the system, and serve to establish the system boundaries.
- Every external entity has a name and a description.
- The key point to remember about an external entity is that it is external to the system, but may or may not be part of the organization.
- People who use the information from the system to perform other processes or who decide what information goes into the system are documented as external entities (e.g., managers, staff)

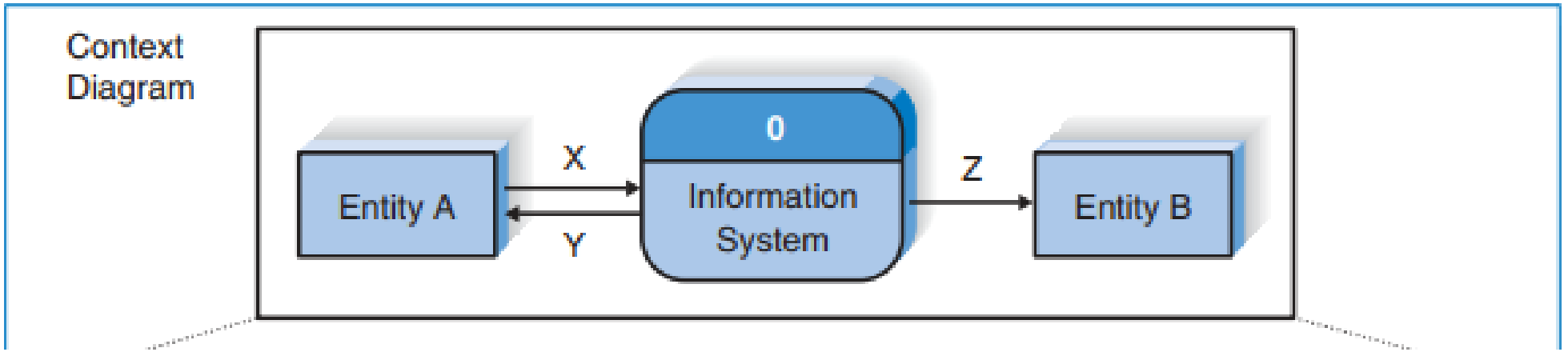
Using DFD to Define Business Processes

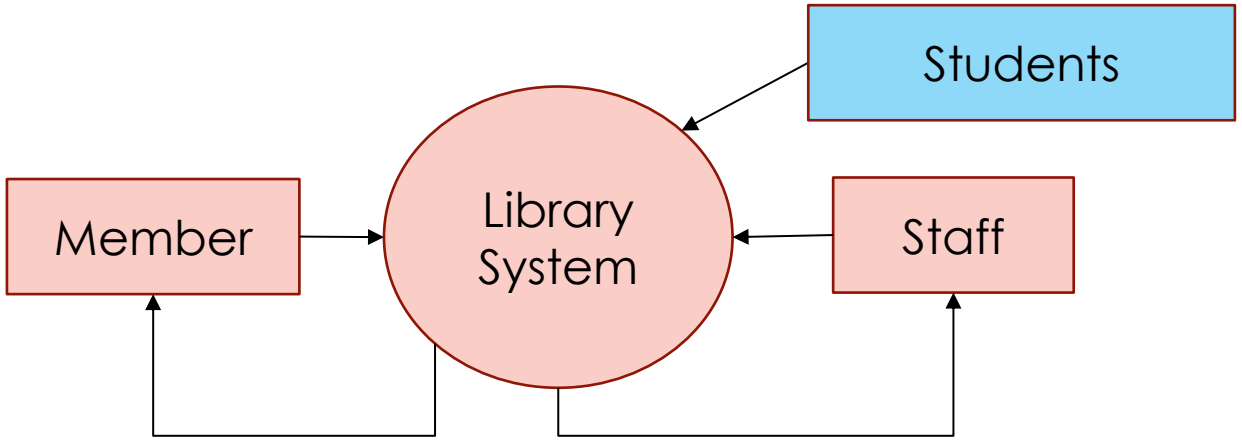
- Most business processes are too complex to be explained in one DFD.
- Most process models are therefore composed of a set of DFDs.
- The first DFD provides a summary of the overall system, with additional DFDs providing more and more detail about each part of the overall business process.
- One important principle in process modeling with DFDs is the decomposition of the business process into a hierarchy of DFDs, with each level down the hierarchy representing less scope but more detail

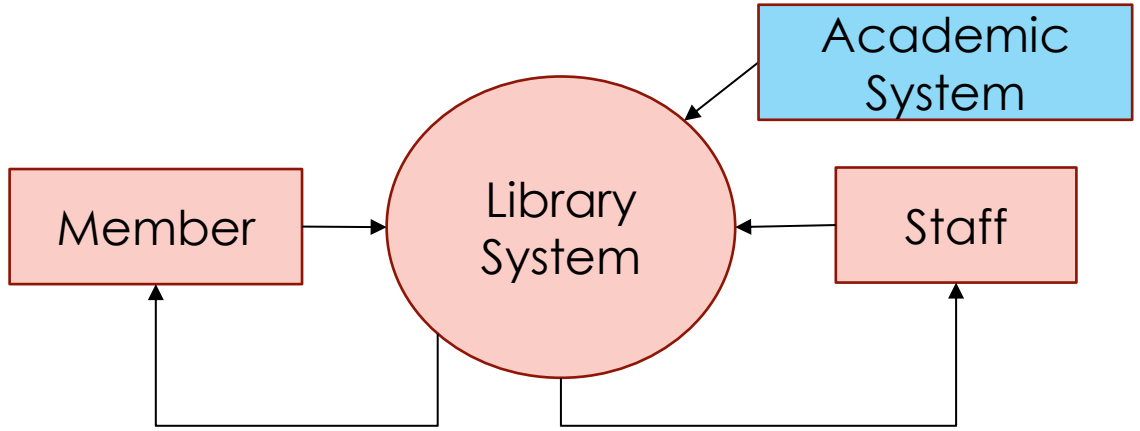
Context Diagram

- The first DFD in every business process model, whether a manual system or a computerized system, is the *context diagram.*
- As the name suggests, the context diagram shows the entire system in context with its environment.
- All process models have one context diagram.
- The context diagram shows the overall business process as just one process (i.e., the system itself) and shows the data flows to and from external entities.
- Data stores usually are not included on the context diagram, unless they are "owned" by systems or processes other than the one being documented. For example, an information system used by the university library that records who has borrowed books would likely check the registrer's student information database to see whether a student is currently registered at the university. In this context diagram, the registrar's student information data store could be shown on the context diagram because it is external to the library system, but used by it. Many organizations, however, would show this as an external entity called "Registrer's Student Information System," not as a data store.

Context Diagram



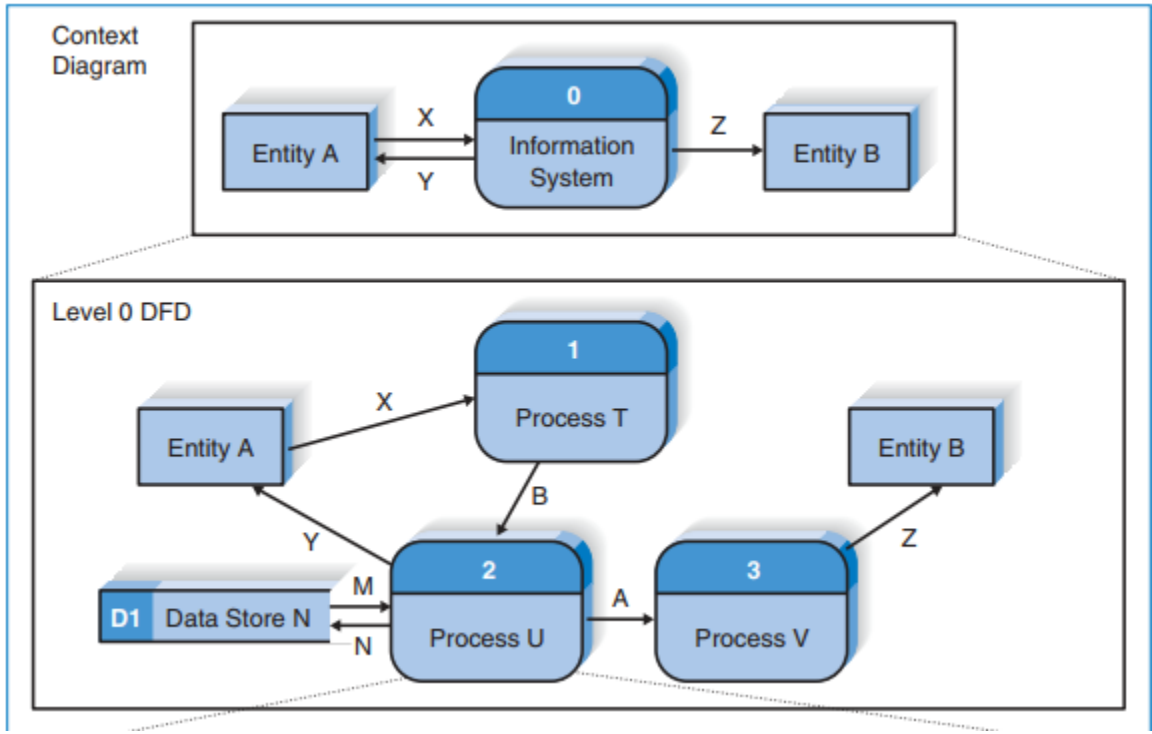




- ✓ Students adalah data yang disupply oleh system luar. Dalam context diagram, tidak menggunakan symbol data store melainkan menggunakan external entity
- ✓ Academic System adalah system luar yang berinteraksi dengan Library System.

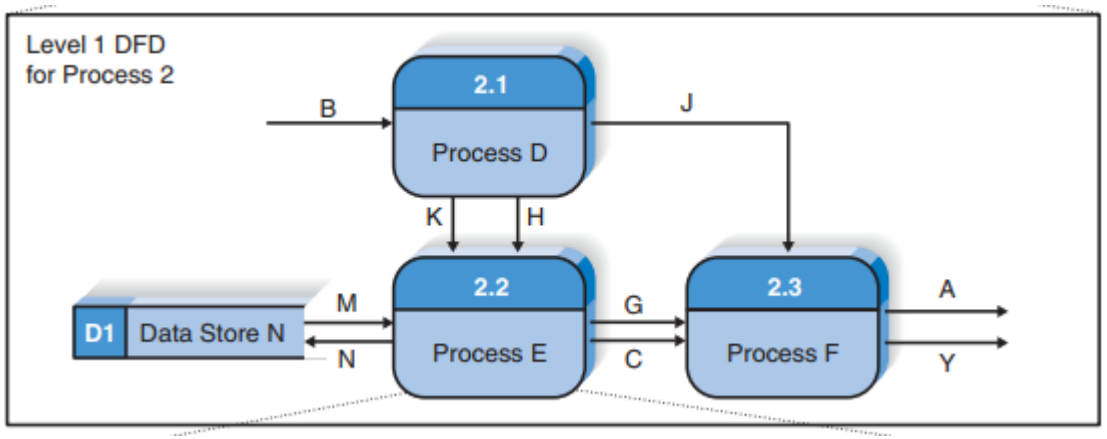
LEVEL 0 DFD

- The level 0 diagram shows all the processes at the first level of numbering (i.e., processes numbered 1 through 3), the data stores, external entities, and data flows among them.
- The purpose of the level 0 DFD is to show all the major high-level processes of the system and how they are interrelated.
- All process models have one and only one level 0 DFD.
- Another key principle in creating sets of DFDs is *balancing*. **Balancing** means ensuring that all information presented in a DFD at one level is accurately represented in the next-level DFD.



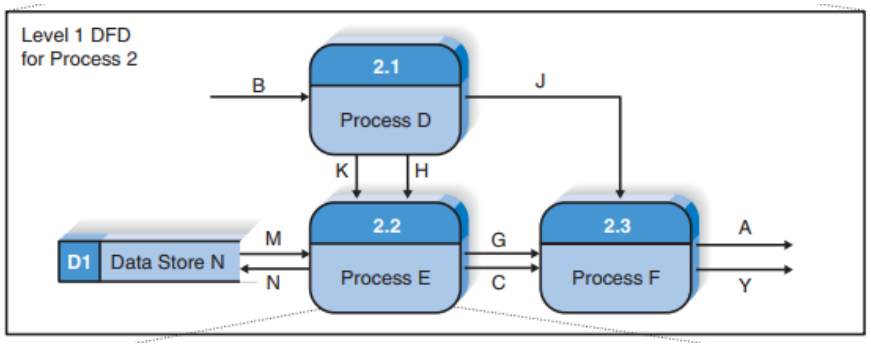
Level 1 DFD

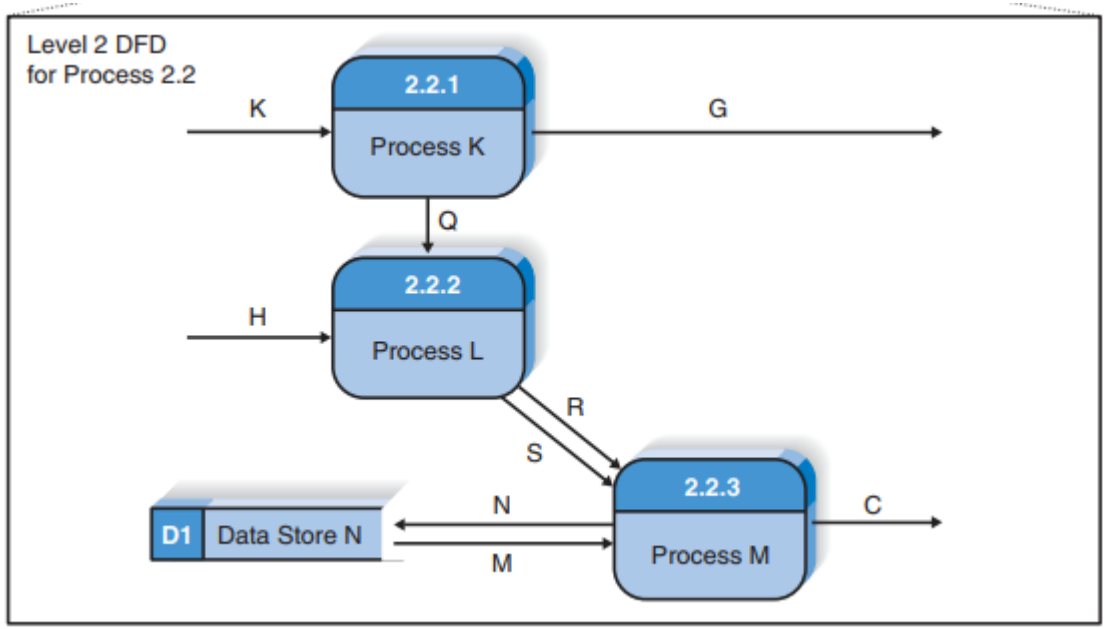
- The level 0 DFD shows only how the major high-level processes in the system interact.
- Each process on the level 0 DFD can be decomposed into a more explicit DFD, called a level 1 diagram, or level 1 DFD, which shows how it operates in greater detail.
- In general, all process models have as many level 1 diagrams as there are processes on the level 0 diagram.
- Every process in the level 0 DFD would be decomposed into its own level 1 DFD
- For example, we are decomposing process 2, so the processes in this level 1 DFD are numbered 2.1, 2.2, and 2.3.



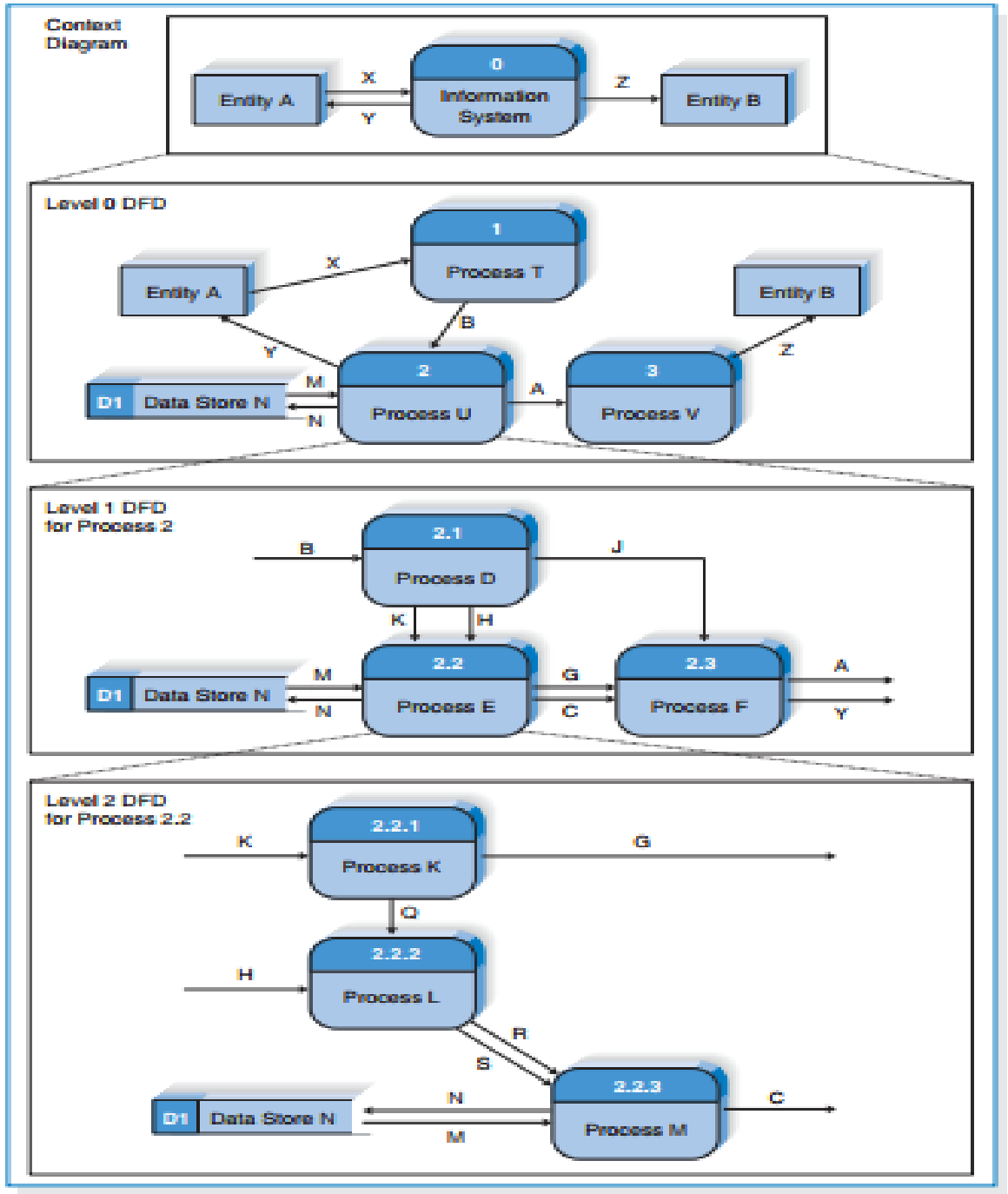
Level 2 DFD

- Level 2 DFD, for process 2.2 shows that process 2.2 is decomposed into three processes (2.2.1, 2.2.2, and 2.2.3).
- The level 1 diagram for process 2.2 shows interactions with data store D1, which we see in the level 2 DFD as occurring in process 2.2.3. Likewise, the level 2 DFD





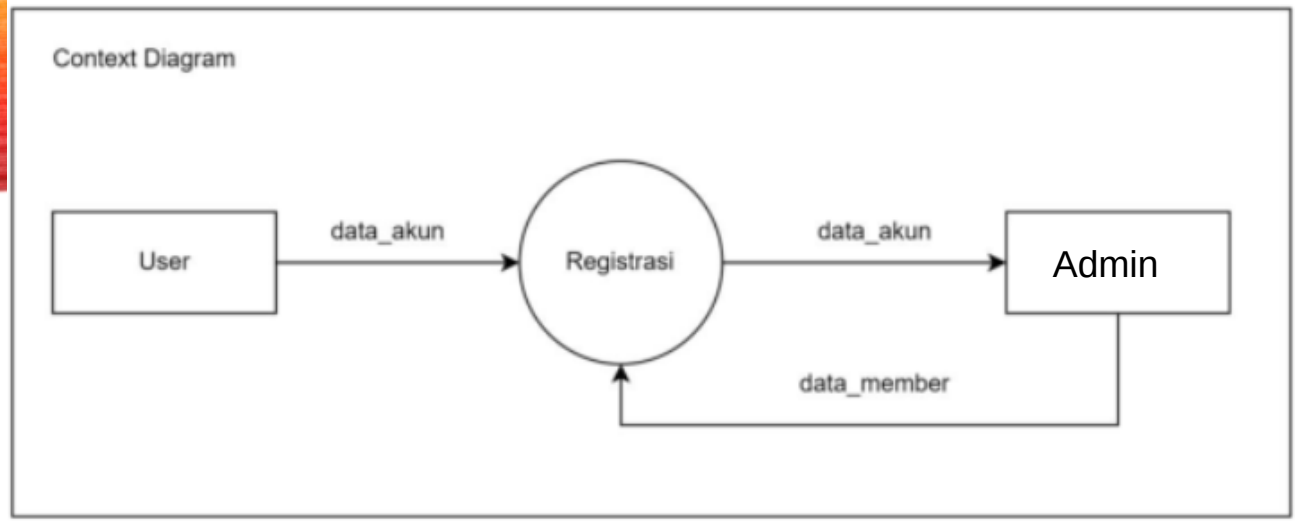
DFD Hierarchy

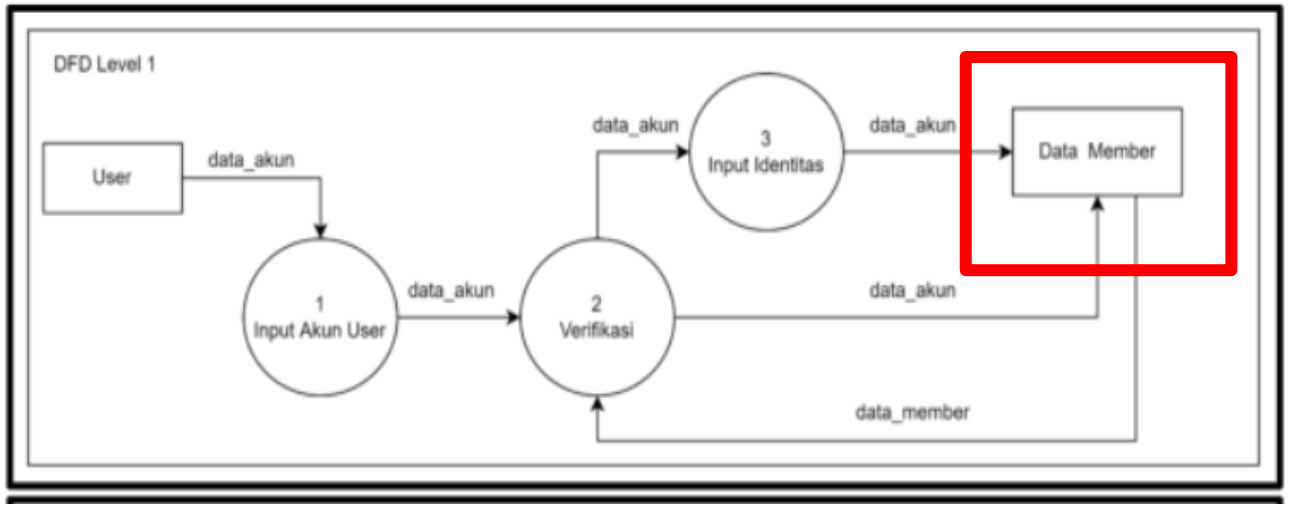


Illegal Process

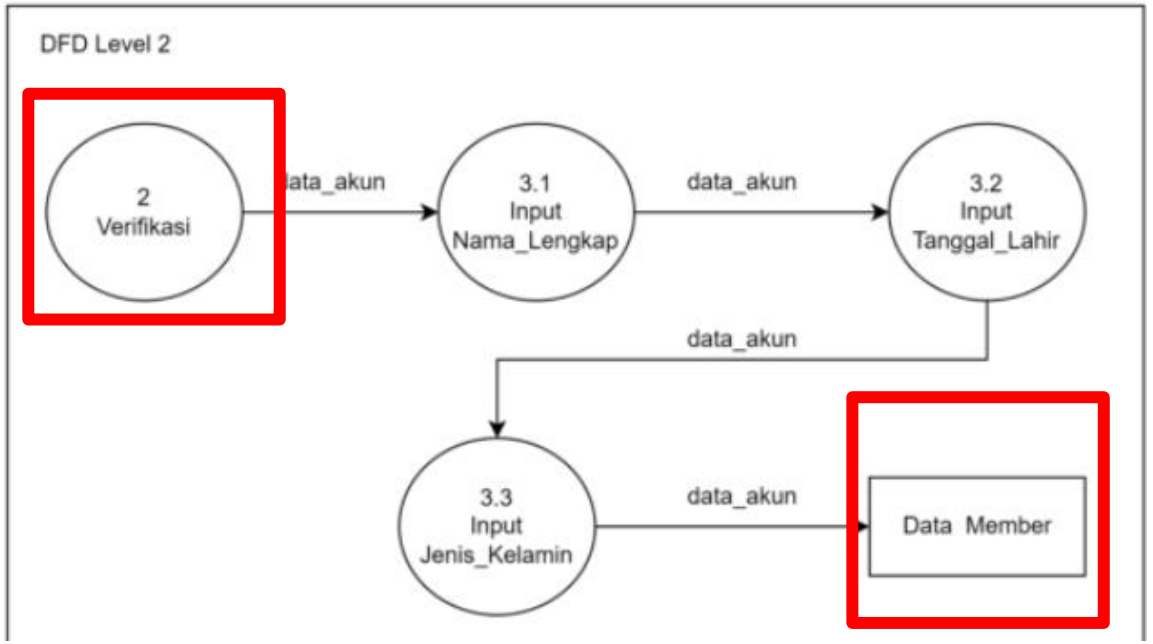
- Spontaneous generation (miracle) → Process with no inputs
- Black Hole → Process with no outputs
- Gray Hole → The inputs is insufficient to generate the output

Example #1 (Incorrect)





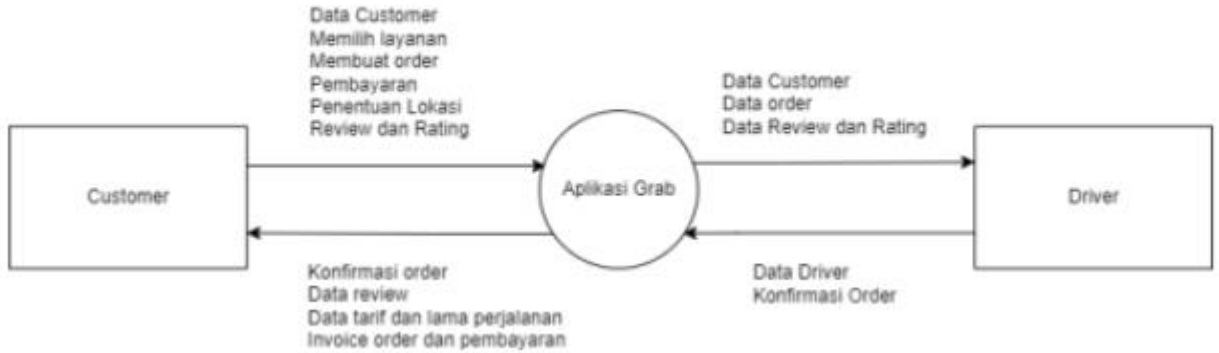
- ✓ Entitas Admin tidak ada di DFD Level 1, padahal di context diagram nya ada.
- ✓ Data Member salah symbol, seharusnya menggunakan symbol data store.



- ✓ DFD Level 2 tapi masih bercampur dengan DFD level 1 yaitu proses verifikasi.

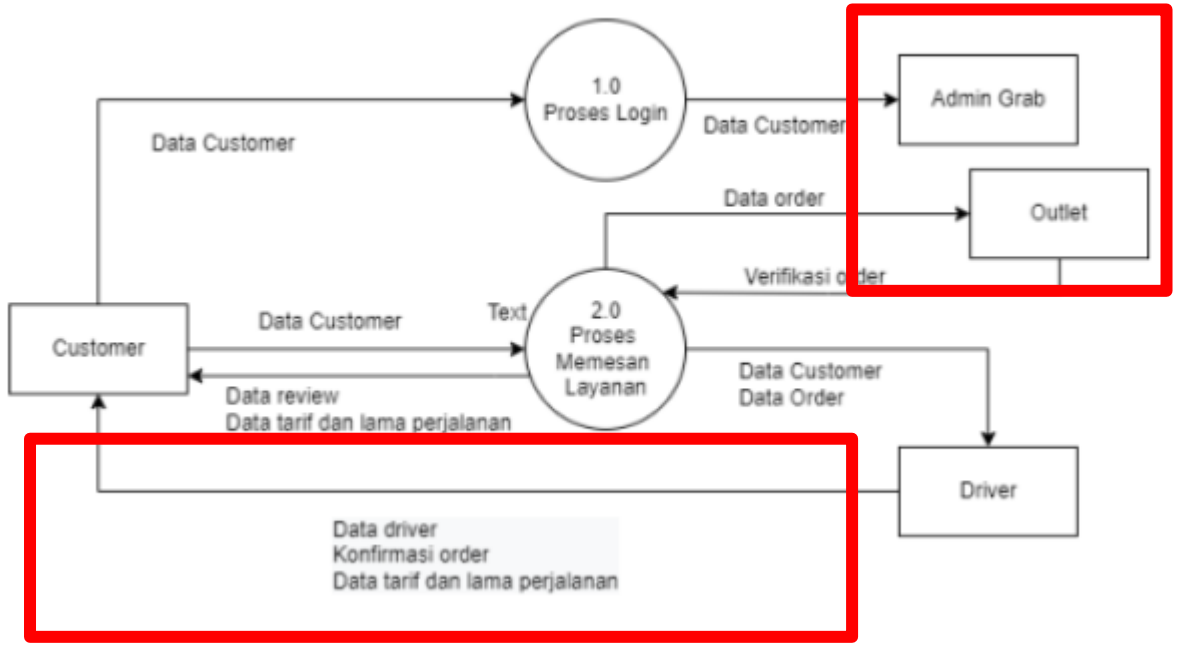
Example #2 (Incorrect)

- **Context Diagram**



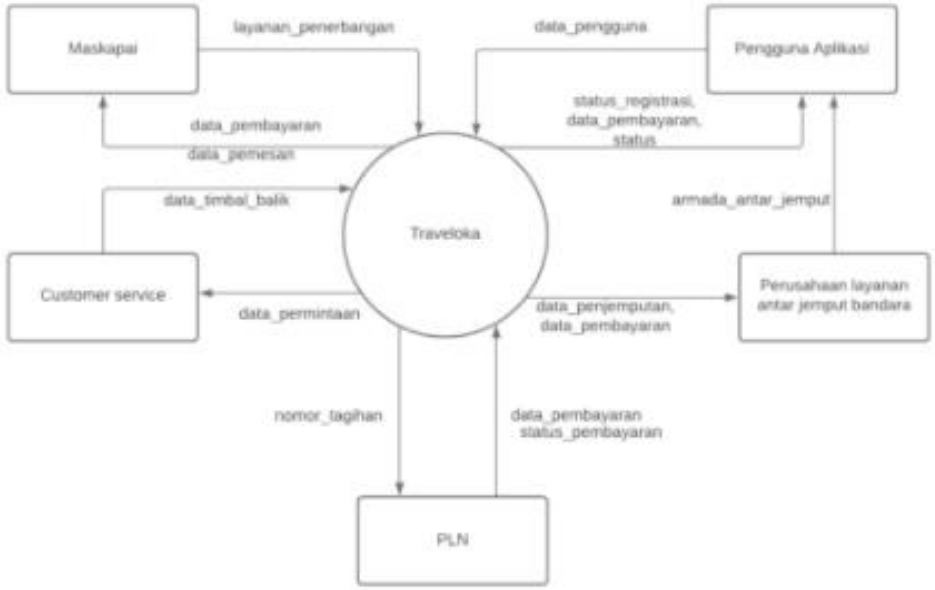
- ✓ Entitas Admin Grab dan Outlet tiba-tiba muncu di DFD Level 1, padahal tidak ada di context diagram
- ✓ Customer dan Driver berhubungan langsung, seharusnya tidak boleh ada interaksi langsung antar entitas

DFD Level 1

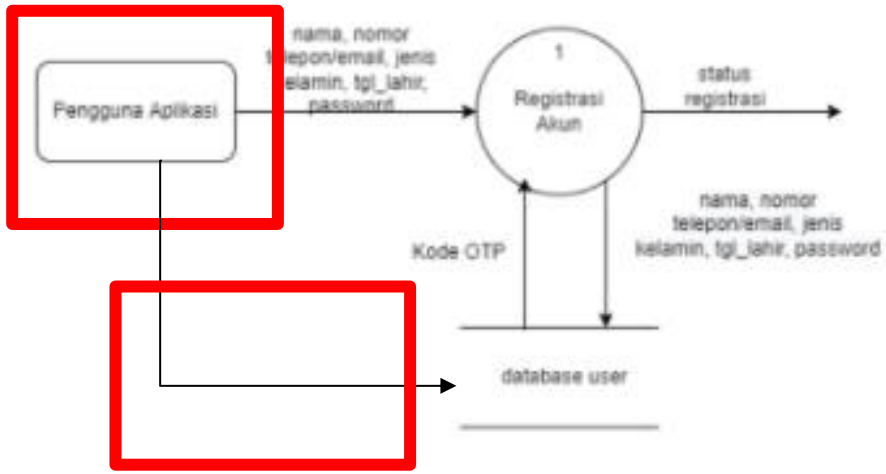


Example #3 (Incorrect)

- **Context Diagram**



- **Register**
  - Level 1



- ✓ Entitas Pengguna Aplikasi pada Level 1 hanya memberi data ke system, tidak menerima data/informasi dari system padahal di Context Diagram, Pengguna Aplikasi menerima data/informasi dari system.
- ✓ Entitas Pengguna Aplikasi tidak boleh berinteraksi langsung dengan data store database user.

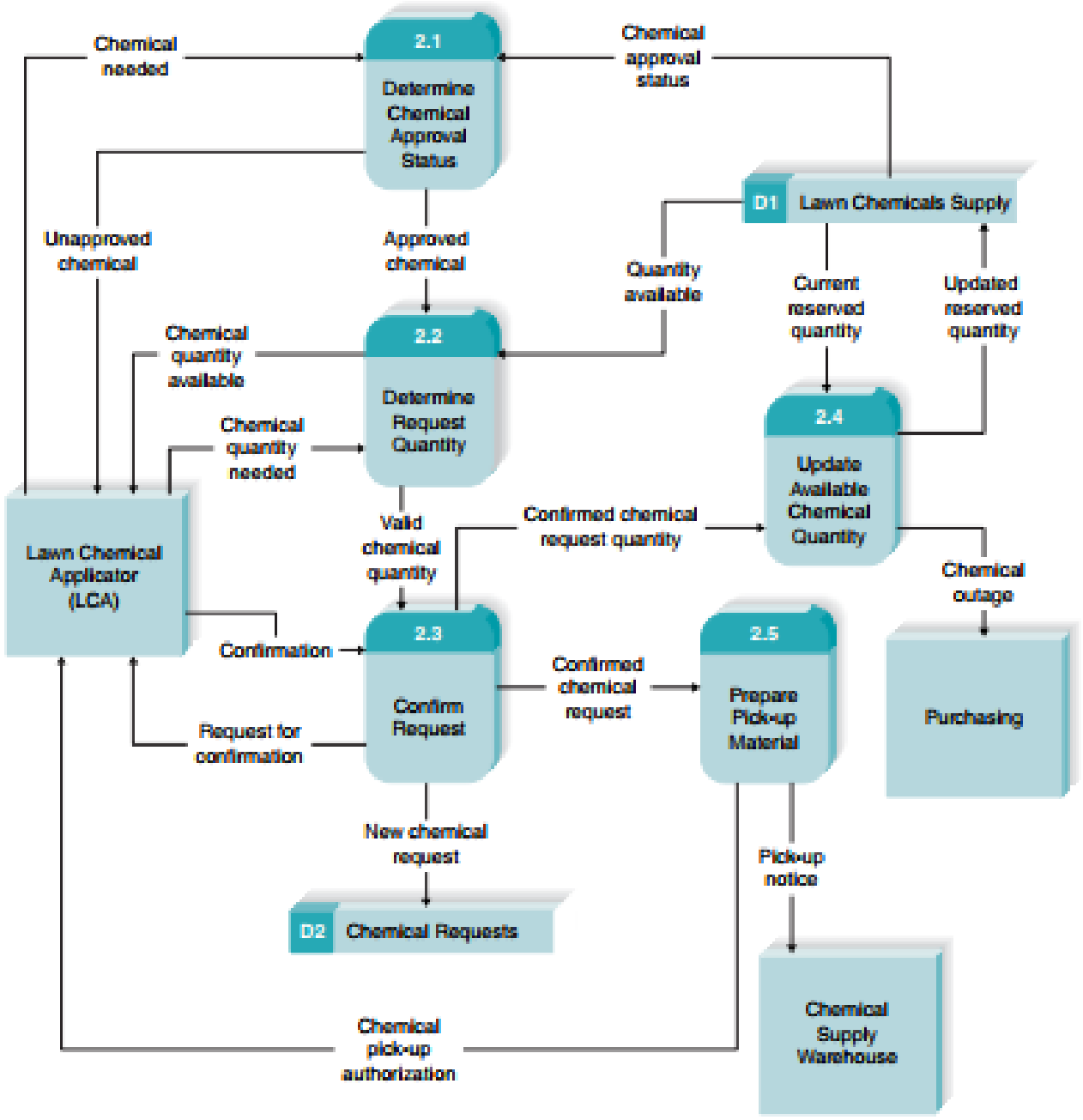


FIGURE 5-1 Request a Chemical Level 1 DFD

Deskripsikan DFD berikut secara detail!

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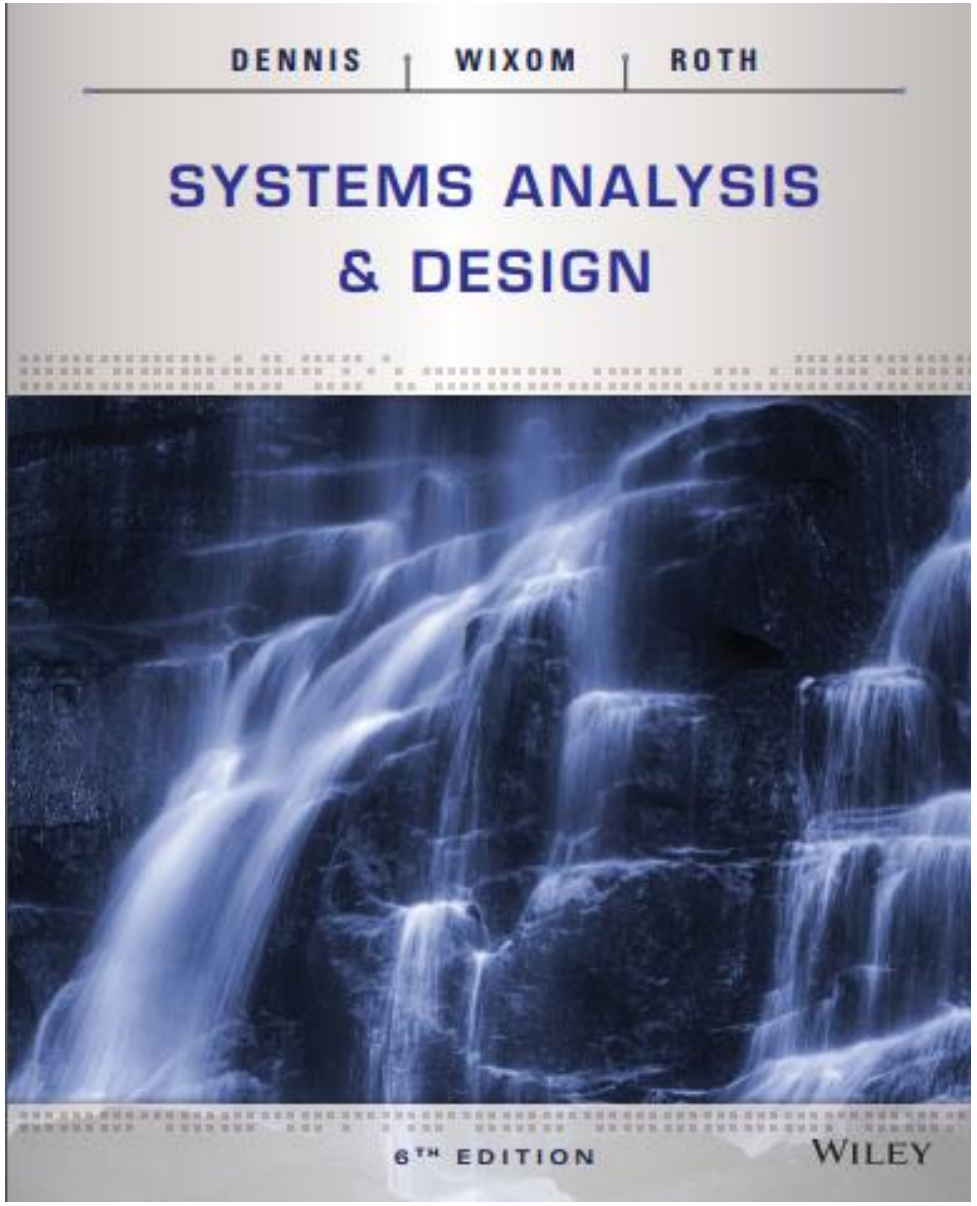
Reference


DENNIS
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& DESIGN
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