Audio

Transcript

WORKFLOW ANALYSIS

Component 10	Fundamentals of Health Workflow Process Analysis & Redesign
Unit 3	Interpreting and Creating Process Diagrams
Lecture D	Process Mapping Gane-Sarson Notation

Slide 1

Welcome to **Fundamentals of Health Workflow Process Analysis and Redesign: Process Mapping: Gane-Sarson Notation.** This is Lecture **d.**

The Component **Fundamentals of Health Workflow Process Analysis and Redesign,** examines different diagramming methods for developing graphical representations of processes in health care settings. Throughout the last century, different diagrams and notations have arisen. There is considerable overlap between them. Some have fallen by the wayside and others remain in use. Some have become international standards, while others exist in textbooks and articles. In this unit, we present major formalisms for process diagramming in use today and the process aspects that each covers.

Lecture d, **Process Mapping: Gane-Sarson Notation,** covers Gane-Sarson notation for data flow diagrams.

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The objectives for this unit, **Fundamentals of Health Workflow Process Analysis and Redesign: Process Mapping: Gane-Sarson Notation** are to:

- Create a process flowchart for a health care system (or system component) using appropriate ISO 5807 symbols and conventions,
- Create context and data flow diagrams for a health care system (or system component) using appropriate Yourdon symbols and conventions,
- Choose the correct scope and detail level for a process flowchart and data flow diagram,
- Read and interpret Gane-Sarson data flow diagrams,
- Read and interpret an entity relationship diagram in crow's foot notation, and
- Read and interpret UML class, activity, and state diagrams.

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Lecture **d** provides details about Gane-Sarson notation for data flow diagrams. We describe the Gane-Sarson symbols and conventions for process mapping. Lecture **d** does not cover other parts of Gane-Sarson notation, and is not meant to teach you how to draw the diagrams, only to understand and interpret them in case you encounter them in practice.

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Each of the methods for diagramming a process has its own set of capabilities. Gane-Sarson represents the process context (that is, the process or system boundaries, interactions with the outside world, and the major functions). It also represents information content, the order or sequence of the data flow steps involved in the process, the transformations that occur or should occur, and the roles that perform the processes. While Gane and Sarson recognized the importance of representing information content and flow control, they did so through text data dictionaries (lists of the data elements) and structured if-then type statements. Since these are not graphic representations, we will not cover them here.

Gane and Sarson represented context, data flow and data transformation through one diagram type, the Data Flow Diagram (DFD). Their approach used a high-level DFD to show context, and a more detailed (or series of more detailed) diagrams to show data flow steps. Data transformation is represented on the DFD by a process symbol that indicates that data transformation occurs. Then the actual transformation is specified using text.

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Gane-Sarson notation was introduced in Chris Gane and Trish Sarson's 1977 book, *Structured Systems Analysis: Tools and Techniques*. The book was later published in 1979 by Prentice-Hall. (Gane and Sarson, 1979)

Gane-Sarson notation is used for data flow diagrams.

Although we have not seen Gane-Sarson notation used in health care, process analysts might encounter Gane-Sarson style diagrams, thus, we provide introductory-level information to the notation.

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Gane-Sarson notation is specific to data flow diagrams which show the movement, transformation and storage of data.

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This is an example of a simplified on-line appointment scheduling Gane-Sarson diagram. The diagram describes a data flow where a patient enters a web inquiry which generates two checks against different databases. After which, the information including an option to accept or decline the appointment is returned to the patient for acceptance.

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Gane-Sarson data flow diagram notation uses these four symbols:

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Entities show the people, roles, organizations or other things with which the system communicates, i.e., sources or consumers of data.

Processes are shown by square rectangles with rounded corners. They represent data processes, i.e., the various individual functions that the system carries out to transform data inputs into outputs. Process boxes can be numbered to show the sequence in which they are carried out.

Flows are shown by straight arrows. They are the connections between the entities, processes, and data stores. They represent the information that the processes require as input and the information they generate as output.

Data stores are shown by an open-ended long rectangle. They represent collections of data that the system must access (read from or write to) or remember for some period of time. Data stores typically exist as files or databases.

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Entities represent people, organizations, or other things that interact with the system, i.e. entities are outside of the system, that is they are part of a process, but external to the information system.

Entities send or consume information, and in Gane-Sarson notation are also called sources or sinks of information.

If the same entity is shown more than once in a diagram, a diagonal line is added to the lower right-hand corner to visually distinguish it. For example, if the nurse entity was drawn twice, to keep from having a lot of criss-crossing lines on the diagram, a single diagonal line would be added to the lower right-hand corner. Further, if a medical assistant entity was similarly drawn twice on the same diagram, two diagonal lines would be added to visually distinguish it from the nurse and patient entities.

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Processes transform data.

The process should be named or described by a single word (a verb), phrase, or simple sentence that describes what the process does.

Similar to other notations, a good name will generally consist of a verb-object phrase such as check availability.

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In some cases, the processes are named for a role, an organization, or a machine that performs the process.

Processes are given a number in the upper right-hand corner; this is an identifier and does not imply sequence. Optionally, processes can also have a lower section, similar in appearance to the process identifier part at the top, in which the role or machine that accomplishes the process, or the physical location of the process is undertaken.

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Similar to ISO 5807, Gane-Sarson notation uses straight arrows.

Arrows should be named to indicate the meaning of the data that moves along the flow that is, a noun. Data flows with a verb name are incorrect; they signify a process that has been omitted. Data flow in and out of a process must be altered in some way, i.e., not labeled the same thing.

A flow can:

Represent only one type of data, e.g., request or reply, or
Consolidate several elementary dataflows into one flow, e.g., request and reply. This is dependent on the intended detail-level of the diagram.

The same content may have a different meaning in different parts of the system, for example, address (as input by the receptionist) versus address after validation with the directory.

Arrows indicate direction of the data flow, for example, from the practice EMR to the pharmacy.

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The data store is used to model a collection of data at rest.

Data stores can be in computerized or non-computerized form, such as paper charts, microfiche, index cards, etc.

Stores are passive; processes put data in or read data.

Like processes, data stores can be given an identifying number, e.g., D1, D2, etc., where D denotes a data store and the number serves as a unique identifier. Like entities, data stores can be drawn more than once on a diagram to avoid crisscrossed lines; in this case, a vertical line is added to the closed end of the data store shape.

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Unlike Yourdon notation, Gane-Sarson does not use an event list to indicate things that stimulate action from the system.

Things that stimulate action from a system are indicated by entities.

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Gane-Sarson, like Yourdon notation, uses leveled diagrams, that is, a roll-up and drill-down approach where increasing levels of detail are shown on successive diagrams.

A process called functional decomposition is used to represent each process in more detailed steps / processes. Each process in a DFD can be exploded, i.e., redrawn to show increasing levels of detail. When this is done, decimal numbers can be used to identify the lower detail level process, while maintaining the links to the parent or higher level process on the parent diagram.

Context diagram is the highest level.

There are as many lower-levels as needed.

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Gane-Sarson Conventions include:

- Choosing meaningful names for processes, flows, stores, and terminators,
- Numbering the processes and data stores,
- Making sure the DFD is internally consistent and consistent with any associated DFDs, and
- Exceptions and error handling are shown on lower-level diagrams.

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The size of the shapes should be consistent throughout the diagram. Keeping the size of the boxes consistent means that a short enough process name needs to be found so that it fits in the box, or that the name may be abbreviated.

We found no guidance on the use of color shading for shapes or arrows, and expect that since the notation was developed in the 1970's, that color was not commonly used on the diagrams. However, today, color may be used to visually show different types of entities, processes, data stores or flows.

Arrows in Gane-Sarson are straight, and horizontal or vertical i.e., no diagonal or curved arrow lines. Double headed arrows can be used instead of two separate arrows in opposite directions, such as to represent request and reply.

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Hopkins enumerated Rules for Correctness for these diagrams (Hopkins, 2006). These rules can be used to assess the logical consistency of the diagrams and include:

- Entities may not send data directly to other entities,
- Entities may not send data directly to data stores (data must be processed in some way first), and
- Entities may not get data directly from data stores (data must be processed in some way first).

Information is neither created nor destroyed; it must come from and go to somewhere. Information comes from and goes to entities and data stores via processes. Watch for spontaneous data creation and black holes. Note: in-only data stores may be ok, as when being read by another system. Also out-only data stores may be ok, as when getting data from another system.

Data flows with a verb name signify a process that has been omitted.

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Like Yourdon notation, Gane-Sarson is a set of symbols and conventions named for the people who developed it.

Gane-Sarson notation has not been adopted as a standard. As such, there is no formal maintenance organization.

Individuals use and adapt it to suit their needs.

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This concludes Lecture **d, Process Mapping: Gane-Sarson Notation.**

After completing Lecture **d** you should be able to:
- Understand Gane-Sarson symbols and conventions for data flow diagrams, and
- Be able to read and interpret data flow diagrams that use Gane-Sarson notation.

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