Systems Thinking, Remember the City is a System of Systems.

PURPOSE: This is not a tutorial on "systems analysis"; it is notification that systems analysis exists as a refined discipline that should be understood and used by the city-building professions.

SYSTEMS THINKING: When advising clients…policy makers and master developers…on a course of action, systems thinking or systems analysis, as a discipline, can be useful. Systems analysis is a learned skill requiring discipline, not an attitude or intuitive response to stimuli. From the web:

1. **A System** is an organized collection of parts or sub-systems that are integrated to accomplish a pre-meditated objective.
    *   Systems have certain <u>inputs</u> that go through <u>processes</u> that lead to <u>decisions</u> to produce <u>outputs</u>.
    *   If one part of the system is changed, the overall system is changed.
2. **Systems theory** is an interdisciplinary field of science and the study of the nature of complex systems in nature, society and science. It is a framework within which one can examine, analyze or describe any group of objects [inputs] that work in concert [process] to produce a pre-meditated result [output].
3. **Systems analysis** is an explicit formal inquiry carried out to help decision-makers identify a better course of action and make a better decision than s/he might otherwise have made. Systems analysis is called upon when the systems are complex and the outcome of any course of action is uncertain.
4. **Closely related terms**: Systems analysis, operations research, feasibility analysis, cost-benefit analysis, policy analysis, systems thinking.
5. **A systemic view of organizations** is trans-disciplinary and integrative. The systems approach gives primacy to the interrelationships, not to the elements of the system. Systems Analysis, the learned skill, provides tools and techniques for studying systems in a holistic manner.
6. A**nalysis and synthesis** – The terms come from Greek, respectively…to take apart; to put together. In general, analysis is defined as the process by which we break down an intellectual or substantial whole into its component parts. Synthesis, the opposite, is to combine separate components to create a coherent whole.
    *   Remember your Marx…thesis, synthesis, antithesis.
    *   Howard T. Odum and Eugene Odum applied systems analysis to natural systems, 1953.
7. **Systems flow charting** – a flow chart or flow diagram is a graphic representation of a system that details the sequencing of steps required to produce an outcome. Flow charts can be used to document and describe any systems. Flow diagrams can be simple or complex; in their simplest form, there are a few basic symbols [attached below] that represent the basics:
    *   Input, can be same as Data,
    *   Process,
    *   Decision, and
    *   Output, can be same as Document.

THE TECHNIQUE OF "FLOW CHARTING" PROCESSES.

The methods for creating flow diagrams that present decision processes, work flows and administrative processes can be complex, or very simple, as in the adjacent lamp example.

The palette of symbols can also vary from the basics shown in the image below, to a more elaborate collection of symbols that convey complex messages for more involved process descriptions. Many sources are available for learning how to use this technique.

See diagram describing the functions of the world system published by the Club of Rome in *The Limits of Growth* as an extreme example of flow-charting processes.

Simply flow chart from Wikipedia
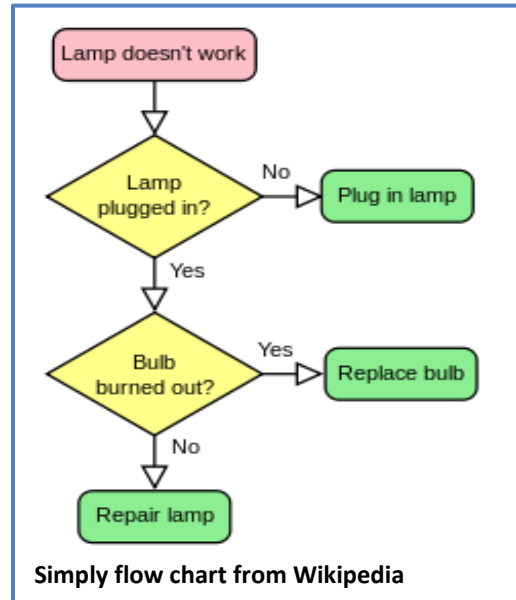
Flow Chart Symbol	Meaning	Explanation
(ellipse)	Start and end	The symbol denoting the beginning and end of the flow chart.
(rectangle)	Step	This symbol shows that the user performs a task. (Note: In many flow charts steps and actions are interchangeable.)
(diamond)	Decision	This symbol represents a point where a decision is made.
(parallelogram)	Action	This symbol means that the user performs an action. (Note: In many flow charts steps and actions are interchangeable.)
(arrow)	Flow line	A line that connects the various symbols in an ordered way.

These basic symbols enable simple, useful diagrams; sophisticated flow diagrams use many more symbols.