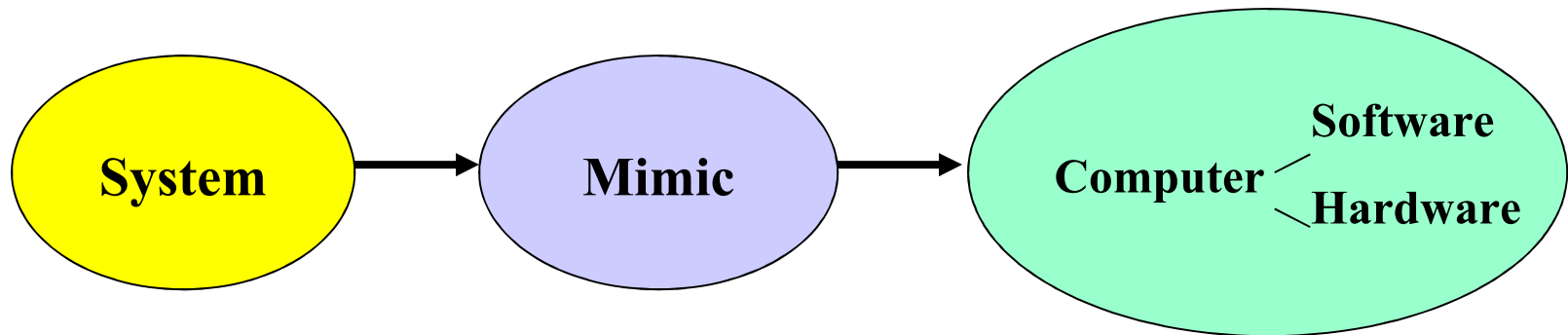


SIMULATION MEANING

(Simulation is a tool for solve problems)

To mimic or model the behavior of real Systems,
by use computer with appropriate software.



System or Process

Manufacturing	Queue
Service Operating	Liquid Flow
Distribution Operating	Parking
Processing Operating	Traffic
Computer Network	Infection disease

Models

Physical Models

Logical Models or Mathematical Models

Computer Simulation

Simulate real time system, complex system,
random parameters with Numerical experiment,
to watch behavior

Kind of simulations

Static & Dynamic

Continuous & Discrete (Continuous & Terminating)

Deterministic & Stochastic

Static	- Time doesn't play role to behavior of model
Dynamic	- Time play role to behavior of model
Continuous	- Liquid flow
Discrete	- entity flow
Deterministic	- No random input
Stochastic	- Random input

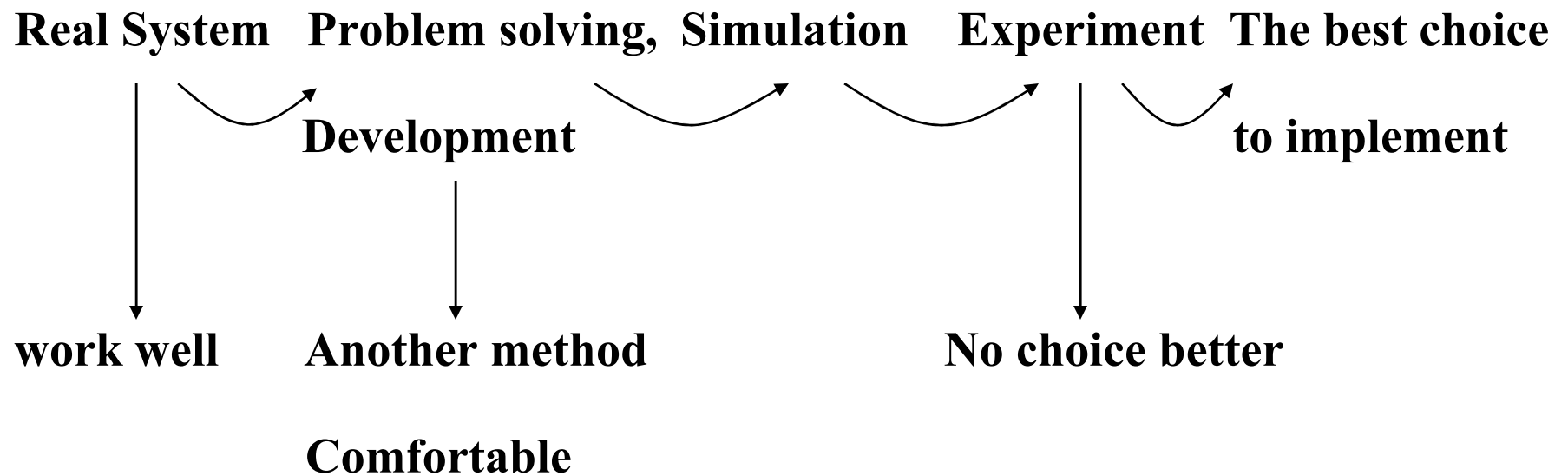
Concerned Characteristic

- Total production.
- Average waiting time in queue.
- Max time waiting in queue.
- Average Number in queue.
- Max Number queue.
- Average and Max flow time or processing time.
- M/C Utilization.

Develop Model

Customer	Arrival Time	Process Time
1	3.2	3.8
2	10.9	3.5
3	13.2	4.2
4	14.8	3.1
5	17.7	2.4
6	19.8	4.3
7	21.5	2.7
8	26.3	2.1
9	32.1	2.5
10	36.6	3.4

Simulation overview



Manual simulation

Customer Number (1)	Arrival Time (2)	Start Service Time (3)	Departure Time (4)	Time in Queue (5)=(3)-(2)	Time in Bank (6)=(4)-(2)
1	3.2	3.2	7.0	0.0	3.8
2	10.9	10.9	14.4	0.0	3.5
3	13.2	14.4	18.6	1.2	5.4
4	14.8	18.6	21.7	3.8	6.9
5	17.7	21.7	24.1	4.0	6.4
6	19.8	24.1	28.4	4.3	8.6
7	21.5	28.4	31.1	6.9	9.6
8	26.3	31.1	33.2	4.8	6.9
9	32.1	33.2	35.7	1.1	3.6
10	36.6	36.6	40.0	0.0	3

Event-oriented description

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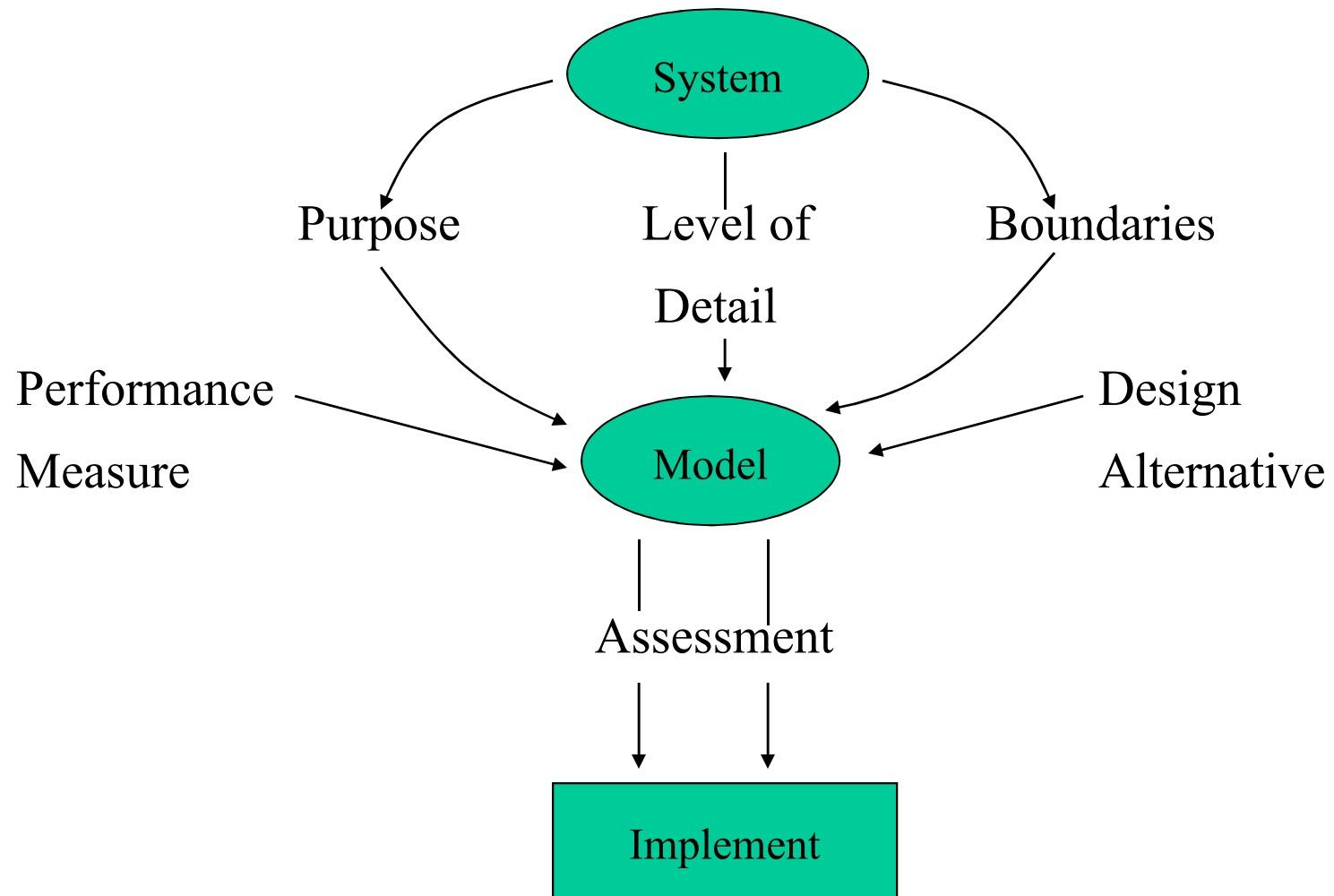
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Simulation Process

1. Problem Formulation
2. Model Building
3. Data Acquisition
4. Model Translation
5. Verification
6. Validation
7. Experimentation
8. Analysis of Results
9. Implementation and Documentation

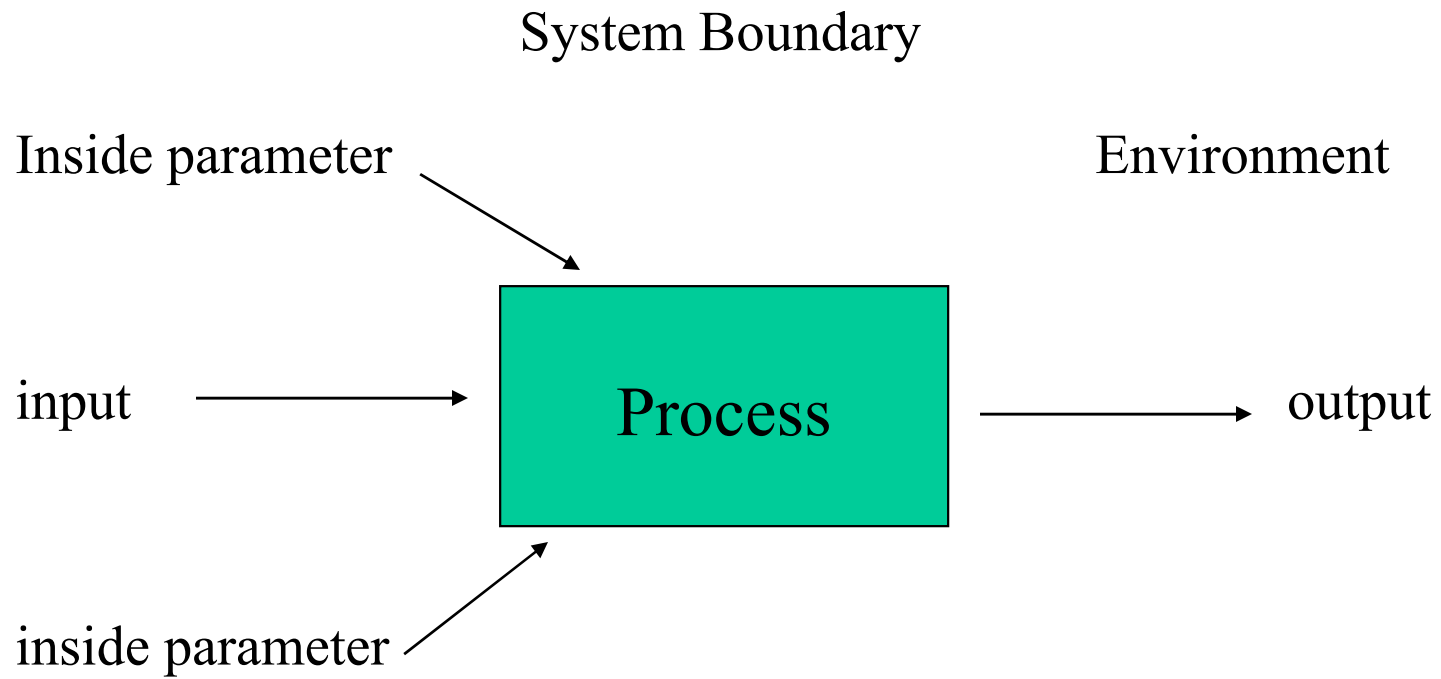
Model Building Approach for Problem Solving



Simulation

- Without building Real System for experiment.
- Without disturbing exist system.
- Without destroying exist system.

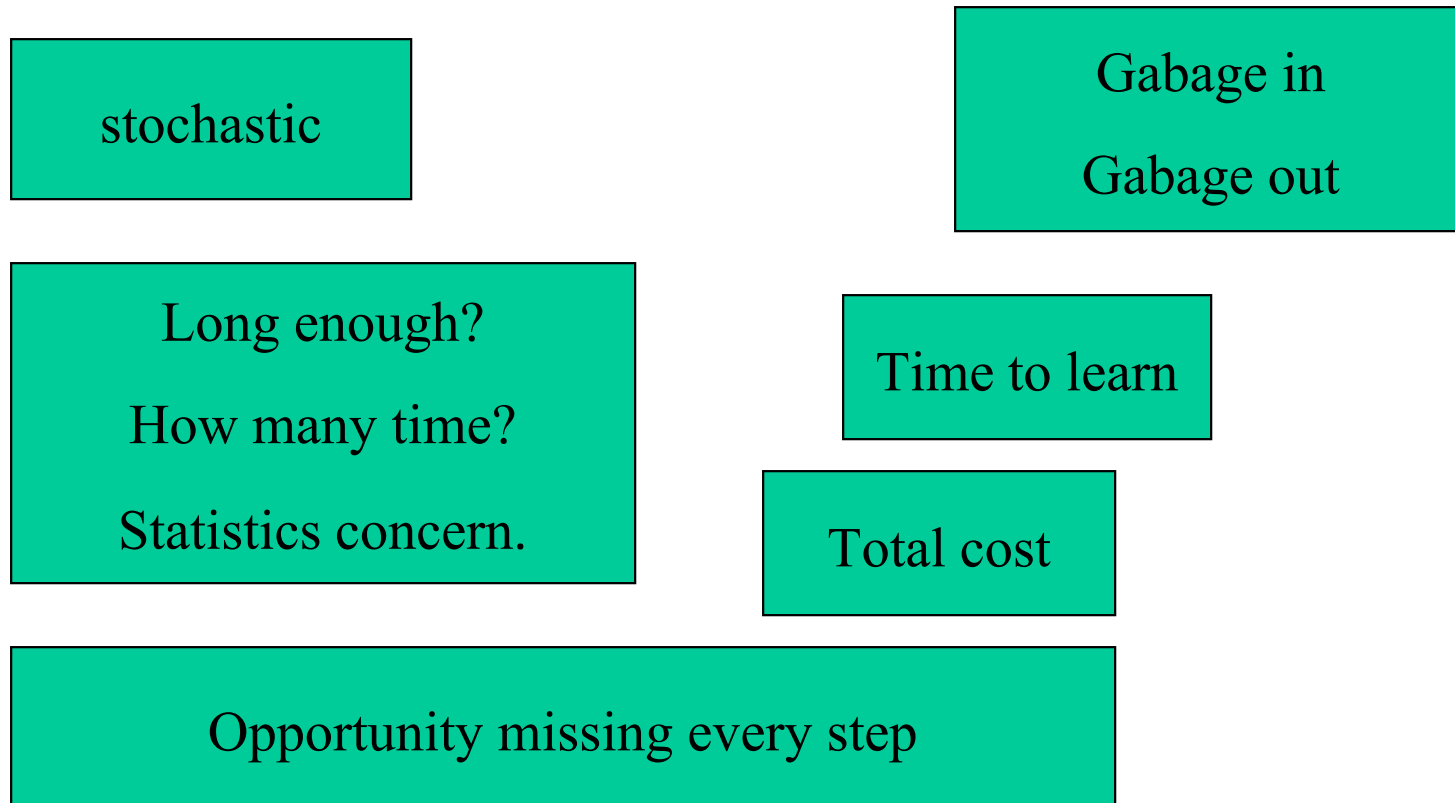
System



Just Play with simulation

Traffic System	Process of factory just in Plan.
Customer Service	Many time in same situation
Large Manufacturing	Serious effect (flighting plain(hospital))
Long Run	Spend Resource too much

Precaution , Unhappy



Pieces of Simulation

- Entity, Entities : Dynamic object, Change status, Move Around, Affect others entities, Affect output
- Attributes : Characteristic of entities, Different Between two entities
- Variables : information reflect characteristic of system
- Resources : things to process, transter, change Attribute of entities
- Queues :
- Statistical Accumulators :
- Event : Something happen at instant time and charge Attributes, variables, or statistical Accumulators such as Arrival, Departure, End, Change Resources etc.
- Simulation clock
- Starting and Stopping