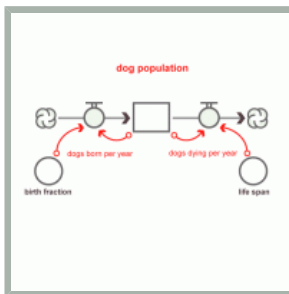


## system dynamics



### characteristics

author:	Forrester, Jay Wright
country:	United States
period:	1961
type:	model
role:	consultant and change agent
activity:	analyse and design
topic:	strategic management and org. design & development
abstr. level:	environment
perspective:	transformational
status:	final
module:	classics I
comments:	2

### description:

In the 1960's, MIT developed System Dynamics as an offshoot of the broader discipline of Systems Thinking. Systems Thinking detected structures underlying complex problems and allowed individuals to become aware of the mental models they used to perceive reality.

System Dynamics simulated interactions between objects in dynamic systems in order to understand how complex systems changed over time. Its modelling technique was based on two building blocks:

1. STOCKS that could be thought of as a bathtub where flow accumulated;
2. FLOWS that could be thought of as a faucet that filled or a drain that emptied the stock.

In the business context, a stock is a balance sheet and a flow is a profit and loss sheet.

Central to System Dynamics are feedback loops that allow nonlinear behaviour. Feedback refers to factor A affecting factor B and B affecting A through a chain of causes and effects. The system as a whole must be studied in order to determine the effects of a change in one variable: if A = B then A means B and B means A making it impossible to determine the cause from the effect.

System Dynamics can be used as a modelling technique as well as a metaphor for organisational development. As a technique, it modelled two aggregation levels: the market and the organisation. Its common applications are:

- market behaviour;
- supply chain optimisation;
- logistics and material requirements planning;
- business planning;
- project planning.

As a metaphor, System Dynamics maintained that feedback in the form of external financial audits, customer surveys and personal performance reviews helps companies adjust appropriately and improve their performance.

### assets:



syntax system dynamics

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### pros:

- The technique strongly emphasised dynamics of studying the whole system to understand its behaviour. The technique was more far-reaching and profound than System Thinking whose only aim was to understand a system's components.
- Human perception has difficulty grasping non-linearity. Modeling complex behaviour on computers dealt well with dynamic systems.
- System Dynamics provided System Thinking with a firm methodology tested by computers.

### cons:

- System Dynamics was derived from an electrical engineering perspective that divided a system into sub-components. Determining a useful set of objects and relations is difficult and prone to error. Furthermore, the approach is flawed when the whole is more than its parts.
- The individual behaviour of a system's sub-components was described by their most likely (average) interaction parameters. This assumption eliminated the effects of luck, noise and randomness in a complex system.
- The modeling technique should be used only for complex situations whose outcomes lead to great impact. The problem needs to warrant the time consuming modeling effort. Often a simpler modeling technique provides enough insight to constructively deal with the problem.

### references:

- Business Dynamics: Systems Thinking and Modeling for a Complex World  
<http://www.amazon.com/gp/product/007238915X?ie=UTF8&tag=provenmodels-20&linkCode=as2&camp=1789&creative=9325&creativeASIN=0072389159>  
John D. Sterman • 2000 • McGraw Hill • United States • ISBN 978-0072389159
- System Dynamics  
<http://www.amazon.com/gp/product/1883823366?ie=UTF8&tag=provenmodels-20&linkCode=as2&camp=1789&creative=9325&creativeASIN=1883823366>  
Jay Wright Forrester • 1961 • Pegasus Communications • United States • ISBN 1883823366
- System Dynamics Society  
<http://www.systemdynamics.org/>  
United States
- The Fifth Discipline

<http://www.amazon.com/gp/product/0385260946?ie=UTF8&tag=provenmodels-20&linkCode=as2&camp=1789&creative=9325&creativeASIN=0385260946>  
Peter M. Senge • 1990 • Currency • United States • ISBN 0385260954

• **Visible Thinking: Unlocking Causal Mapping for Practical Business Results**  
<http://www.amazon.com/dp/0470869151?tag=provenmodels-20&camp=14573&creative=327641&linkCode=as1&creativeASIN=0471691895&adid=14573>  
John M. Bryson, Fran Ackermann, Colin Eden and Charles B. Finn • 2004 • Wiley • United States • ISBN 978-0-470-86915-4