



System Dynamics

The Sloan School Executive Series on Management & Technology

System Dynamics Key Points and Action Steps

1. Develop a model to solve a particular problem, not to model the system.

A model must have a clear purpose, and that purpose must be to solve the problem of concern to the client. You must exclude all factors not relevant to the problem issue to ensure the project scope is feasible and results timely. The goal is to improve the performance of the system as defined by the client. Focus on results.



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2. Modeling should be integrated into a project from the beginning.

The value of the modeling process begins early on, in the problem definition phase of a project. The modeling process helps focus diagnosis on the structure of the system rather than blaming problems on the people making decisions in that structure.



3. Be skeptical about the value of modeling and force the 'why do we need it' discussion at the start of the project.

There are many problems for which system dynamics is not useful. Clients, other members of a team, and the modelers themselves must carefully consider whether system dynamics is the right technique for the problem of concern to the client. Modelers should welcome difficult questions from the client about how the process works and how it might help them with their problem. The earlier these issues are discussed the better.



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4. System dynamics does not stand alone. Use other tools and methods as appropriate.

Most modeling projects are part of a larger effort involving traditional strategic and operational analysis, including benchmarking, statistical work, market research, etc. Effective modeling rests on a strong base of data and understanding of the issues. Modeling works best as a complement to other tools, not as a substitute.



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5. Use expert modelers, not novices.

While the software available for modeling is easily mastered by a high school student or CEO, modeling is not computer programming. You cannot develop a qualitative diagram of a situation and then hand it off to a programmer for coding into a simulation model. Modeling requires a disciplined approach and an understanding of business, skills which are developed through study and experience.



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6. Modeling works best as an iterative process of joint inquiry between client and consultant.

Modeling is a process of discovery. The goal is to reach new understanding of how the problem arises, and then use that understanding to design high leverage policies for improvement. Modeling should not be used as a tool for advocacy. Don't build a client's prior opinion (or your own) about what should be done into a model. Use workshops where the client can test the model themselves, in real time.



7. Avoid black box modeling.

Models built in the 'back room', out of the sight of the client, will never lead to change in deeply held mental models, and therefore will not change the behavior of the client. Involve the clients as early and as deeply as possible. Show the the model. Encourage them to suggest and run their own test and policies, and criticize the model structure. Work with them to resolve their criticisms to their satisfaction.



8. “Validation” is a continuous process of testing and building confidence in the model.

Models are not ‘validated’ after they are completed, nor by any one test such as their ability to fit historical data. Clients (and modelers) build confidence in the utility of a model gradually, by constantly confronting the model with data and with the expert opinions of the clients. Through this process both model and expert opinions will change and deepen.



9. Get a preliminary model working as soon as possible. Add detail only as necessary.

Develop a working simulation model as soon as possible. Don't try to develop a comprehensive conceptual model prior to the development of a simulation model. Conceptual models are only hypotheses, and must be tested. Formalization and simulation often uncover flaws in conceptual maps and lead to improved understanding. The results of simulation experiments inform conceptual understanding and help build confidence in the results. Early results provide immediate value to the client, justifying continued investment of their time.