

Developing a Society Strategy to Promote Growth of the Field

Presidential Address

James M Lyneis, 2008

[Note: this is a slightly expanded version of the talk given at the 2008 Conference in Athens, Greece.]

Introduction

It is a great honor and privilege to speak in Athens this morning as the president of the System Dynamics Society. As some of the Society's old-timers may recall, the presidential address became a part of the conference program in 1991. It is aimed at providing a reflection on the state of the Society and its direction for the future.

Over the past two years, the Society has been undertaking considerable reflection. Last year in Boston, we celebrated the 50th anniversary of field, and published a special 50th Anniversary double-issue of the *System Dynamics Review*, with many presentations and papers on our accomplishments. We noted considerable successes:

- The Society has grown to almost 1200 members in nearly 80 countries, with 18 Chapters and 9 SIGs.
- The number of entries in System Dynamics Bibliography continues to grow significantly each year.
- System dynamics is increasingly used in corporations, government and other organizations. It is taught in a growing number of universities and schools, including secondary, middle, and even primary schools. It is applied to issues from organizational change to climate change, physiology to fiscal policy [John Sterman, Introduction to *System Dynamics Review* Special Issue, Volume 23(2-3)].

Over the last two years, for better or for worse, there has also been considerable list serve discussion bemoaning the status of the field, and we recognize that our successes may have fallen short of our potential. While exhibiting solid and steady growth, the rates of growth have been slow, seemingly slower than those of other fields. Our teaching has focused on spreading system dynamics widely, but few universities teach it in depth. Finally, our "real world" impact has not been apparent:

- While publications are growing, we remain primarily an academic field – nearly all of the "hits" for system dynamics are in academic publications (93.5%) [see "Diffusion of System Dynamics in Academia" by Switbert Miczka and Peter Milling in the 2008 Conference Proceedings].
- As Bill Killingsworth's talk on Monday highlighted, 50 years after the publication of Jay's *Harvard Business Review* article, "real world" supply chain dynamics have not improved [see "The Dynamics of Multi-Tier, Multi-Channel Supply Chains for High-Value Government Aviation Parts" in the 2008 Conference Proceedings].

- As further evidence of this shortcoming of practical applications, a search conducted by Kim Warren found these results:
 - Number of mentions in the *Financial Times*, 2003-2008: 3 for “system dynamics”, 6 for “systems thinking”, 64 for balanced scorecard (as an example of a popular business method)
 - Mentions in the *Economist*, 1997-2008: 2 for system dynamics, 4 for systems thinking
 - Mentions in *New York Times*, 1981-2008: 4 for system dynamics, 8 for systems thinking
 - Mentions in *Harvard Business Review* since 1979: 5 for system dynamics, 10 for systems thinking, 50+ for balanced scorecard¹
 - Mentions of system dynamics in a 100-page bi-annual survey by Bain and Co. of tools used by management: zero. (In an earlier ranking around 1992, “systems thinking” ranked 23rd, used by less than 5% of respondents).
- While there was a surge in interest among businesses and consultancies in the mid-1990s following the popularization of the “Beer Game”, the People Express (and other) Management Flight Simulators, and *The Fifth Discipline*, Society membership seems to have become more “academic” and less “practitioner” based (corporate and consulting membership has dropped about 10 percentage points in the last 5 years). This seems consistent with anecdotal evidence of the loss of system dynamics practices in several big consultancies.

In short, there is relatively little public recognition or apparent business use of system dynamics. It is not clear how much of this reflects a real lack of successful applications, and how much is a lack of publications about applications (a “perception problem” as Jack Homer calls it). Clearly we are doing good work, as demonstrated by (1) Kim Thompson’s Forrester Award speech at this conference, (2) the CDC work by Jack Homer, Drew Jones, and others, and (3) the General Motors OnStar work by Mark Paitch, Nick Pudar, and others, which won the Society’s 2007 Applications Award. I am sure there is other such good work, but I suspect that the volume is modest and, more importantly, few people know about it, particularly among decision-makers and the general public.

In sum, while we have made great strides, there remain significant challenges if system dynamics is to attain its full potential in helping to solve important **real world** problems in business and public policy, and in improving the public’s insights into the complexities of dynamic systems. With all this in mind, last year’s President Qifan Wang initiated a formal strategy development exercise for the Society. This effort is just getting started, and I’ll elaborate more on this later.

Actions Needed to Develop a Society Strategy and Promote Growth of Field

¹ This comparison is not completely fair in that system dynamics is a methodology more comparable to say econometrics or discrete simulation than to a process such as balanced scorecard.

I don't want to prejudge the results of the strategy effort, but before I proceed to give you an update on the status of that initiative, let me give you my personal thoughts on actions or decisions that are required for the Society to promote the growth of the field. These actions are fourfold:

1. Focus our efforts on "rigorous" system dynamics
2. Clarify our educational markets and offerings
3. Define our constituencies
4. Resolve Society constraints on continuity of effort

Focus Efforts on "Rigorous" System Dynamics

I believe that a significant barrier to further progress of the field and of the Society is ambiguity in the definition of "system dynamics:" exactly what are we promoting? Specifically, does the field encompass "systems thinking?" Is "system dynamics" any use of the various software packages? Or is the field the current incarnation of "classical" system dynamics (which I will define as "rigorous" system dynamics in a moment)? This ambiguity is a barrier to growth primarily because it generates confusion in the marketplace – what's the difference between systems thinking and system dynamics? Why pay for an expensive system dynamics model when I can get the answer with a much cheaper systems thinking analysis? In the academic community, this confusion gives the impression the field lacks scientific rigor; and in business it raises the risk of being seen as a "fad."

While there is some confusion and perhaps disagreement within the Society, there is even wider ambiguity outside. In Europe I am reminded not to use the term "systems thinking," but "feedback systems thinking." And the term "system dynamics" is used by many others. While a Google search of "system dynamics" primarily returns links to the field we know and love, you also get hits that are completely unrelated. For example:

- **JPL Solar System Dynamics**

This site provides information related to the orbits, physical characteristics, and discovery circumstances for most known natural bodies in orbit around our ...

- **Multibody System Dynamics**

- **Home | Human Systems Dynamics Institute**

Promoting human **systems dynamics** through research, training, and certification of organizational development professionals for leadership in change ...

- **System Dynamics: Modeling, Analysis, Simulation, Design - Google Books Result**

by Ernest O. Doebelin - 1998 - Technology & Engineering - 774 pages
Addressing topics from system elements and simple first- and second-order systems to complex lumped- and distributed-parameter models of practical machines and...

- NETL: Energy **System Dynamics** Focus Area

The Energy **System Dynamics** Focus Area seeks to conceive, analyze, and develop pre-commercial energy technology that minimizes the environmental impact of ...

While I think it is probably a little too late to rename our field to avoid confusion with others who use the term, I strongly suggest that we in the System Dynamics Society need to define system dynamics as a rigorous methodology and focus our efforts on promoting that methodology. In the 1990s we broadened the field to include systems thinking, and tried to bring system dynamics to the masses with easy-to-use software. It has been useful to experiment with other approaches and to try to be inclusive, but I believe it is time to focus our attention in order to generate strategies for our next phase of growth.

Proposal #1: The System Dynamics Society needs to define system dynamics as a rigorous methodology; the Society should focus on promoting **system dynamics**.

Toward this end, system dynamics is **not** (1) Stella modeling or Vensim modeling (i.e., any model that uses “system dynamics software,” for example only as a programming, graphing or spreadsheet application without system dynamics theory or method.); (2) nor is it “systems thinking”(i.e., qualitative modeling uninformed by quantitative modeling). In fact, I would prefer that we drop the use of this latter term for the reasons discussed above. While we use software packages and the tools of feedback systems thinking (causal diagrams, archetypes, mental simulation) in our work, they are only tools to help develop, use, and explain the results of formal computer models. Note that I am not suggesting that people should not “do” systems thinking, or use the software for whatever they like; nor am I suggesting that there is not value in the other uses. What I am suggesting is that the System Dynamics Society focus on system dynamics.

What we should be promoting is the development and use of **formal computer models** that:

1. Apply the accepted system dynamics theory of structure (endogenous behavior, feedback loops, accumulations and delays, representation of decision-making);
2. Are constructed following the scientific method (reference mode of problem behavior, dynamic hypothesis, formal model, testing of the hypothesis against data, extensive analysis, and policy design); and
3. Use best practice tools and techniques (system dynamics software, units checking, standard formulations, generic models and building blocks, graphical functions, etc.).

These three components collectively define rigorous **system dynamics**. Further, in real world applications:

4. Models should be developed so as to achieve client confidence and acceptance (using various approaches including “group model building”).

We can and should further define and develop these four areas, and learn from other disciplines. However, any **system dynamics** application must include all of the first three components, with the fourth for practical applications. Once the basic system dynamics

component of a study is achieved, one can involve other disciplines and approaches as the problem warrants.

I do believe that “qualitative modeling” can be valuable in rigorous system dynamics. Specifically:

- In developing and explaining quantitative models;
- By itself in appropriate situations if informed by extensive experience in the use of quantitative models;
- As a way of codifying and explaining dynamic insights.

I recognize that, especially in consulting, firms may have reasons for not using the term “system dynamics” and using a different descriptor. However, I would urge practitioners, especially in publications, to at least mention system dynamics as this would help promote growth of the field.

Clarify Our Education Markets and Offerings

A second area where I detect significant ambiguity, and perhaps disagreement, regards the ability of everyone to “do” system dynamics, and how much training is required to learn to properly build, analyze, and use system dynamics models. System dynamics training seemingly ranges from short workshops to PhD level training. Often the impression given is that you can take a couple-day workshop, often focusing on software, and be able to build system dynamics models to solve problems. And while semester-long courses introduce more dynamic concepts, again the impression is that one semester is all you need to build good system dynamics models. Is this really the case? In my mind, it gives the impression that the field has no professional standards – attend a workshop or get a PhD, it doesn’t matter, you are a trained system dynamicist! A part of the “quality” problem we have may in large part stem from people with too little training attempting to build system dynamics models.

In my personal view, everyone cannot “do” system dynamics (i.e., build and use system dynamics models from scratch to effectively address real problems). Just as in music, where everyone cannot expect to be a professional musician but can learn to appreciate music and even play an instrument, I think that everyone can be taught to develop better instincts about dynamic behavior, to build simple models, and to use more complex models that have been developed by professionals. Further, I believe that building good models is not something one can learn in a short workshop or even a one-semester course. While these workshops and courses can be useful and appropriate, we need to make sure that students have the proper expectations for their capabilities after such a workshop or course.

Proposal #2: We need to state very clearly, on our web site, in our teaching materials, etc. that **learning to build good system dynamics models to understand the behavior of complex systems is hard**. It cannot be done in a workshop or even in a semester-long course, and given the current state of teaching materials, even be self-taught.

Proposal #3: We need to carefully rethink our education programs, and refine and develop them further (sharing as much as possible). Specifically:

1. We need to distinguish between teaching to the “general public,” to practitioners in specific application areas, and to those learning the full methodology; we need to set expectations appropriate to each group, and use materials tailored to each.
2. We need to support the development and dissemination of training materials for professional system dynamicists. This involves: determining the required skills and learning sequence; finding and/or developing materials to teach the skills; and making these materials available and training instructors. We should consider accrediting programs, and revisit the idea of establishing a “System Dynamics Institute.”
3. We need to develop “dynamic complexity appreciation” courses and materials for the “masses,” similar to music appreciation courses or first-aid training in medicine. For example, a “dynamic complexity appreciation” course would include understanding accumulation, positive and negative feedback, what a model is and how to evaluate one, and the “characteristics of complex systems.” In addition, we might have specific curricula units for K-8/12, or even business schools, that fit into normal courses and bring out these dynamic insights.
4. We need courses (and curricula units) developed to instill understanding of dynamics in specific application areas (e.g., project dynamics or strategy dynamics) and in the use of models specific to those applications.
5. To facilitate 3 and 4 above, we need to clarify what if any role “black-box simulators” play in education. In my view, this should be none – we should be looking to understand how to use models to teach insights into dynamics, not present black box games.

Until we resolve these issues, we cannot develop effective curriculum. A Society curriculum committee was established in 2000 to address these issues. Like many other initiatives, it went dormant. I have asked Khalid Saeed to restart this committee, in consultation with the strategy initiative we are undertaking.

Define Our Constituencies

In 1997 George Richardson identified four constituencies and argued that the “system dynamic community” must include all to reach its full potential:

1. Academic researchers
2. Consultants
3. Practitioners in public and private sectors
4. School educators

He suggested that our annual conference and our journal need to reflect work from all constituencies.

Inclusiveness and cross-fertilization has worked well in the past. However, as noted earlier, consultants and practitioners are declining as a share of Society membership. And clients are notably absent from this list of constituencies, and from recent conference attendance. I believe

that one conference and one journal may no longer adequately satisfy the needs of each constituency. For example, the “quality” or acceptance standards for papers may differ for different constituencies; certainly interests differ; teaching materials do not qualify as research; and access to underlying models will differ.

While the Society as a whole may be able to be inclusive, we may need to adopt product and services that meet the needs of individual constituencies. For example, some things we might do to better serve practitioners include setting up a practitioners journal ala *Interfaces* (the TIMS/ORSA practitioners journal), establishing an accreditation and/or credentials program, setting up a practitioners-oriented web site, publishing best practices course material that can be used in MBA programs to increase awareness potential future clients, etc.

Proposal #4: Carefully define our constituencies and determine if different initiatives, even organizations, are required to meet their individual needs. How we can gain the advantages of cross-fertilization, while adequately serving the needs of each constituency, needs further discussion and experimentation.

Resolve Society Constraints on Continuity of Effort

A final barrier to successful strategy development and implementation results from the fact that the Society is largely a volunteer organization:

1. Management is all done by volunteers who have relatively short terms of office.
2. The paid home office team is stretched thin.
3. The Society President serves a one-year term (with some duties one year before and after), and this may be one of the reasons we have difficulty with long-term initiatives.
4. Other officers tend to serve longer terms, but have focused portfolios and limited time, so they tend to concentrate on the tasks in those portfolios. At the current time, no officer is responsible for strategy/planning (other than any financial and conference planning).
5. In the past, we have not had the financial resources to undertake any initiatives.

Proposal #5: Perhaps one of the concrete recommendations we can make in the short-term is to either add a new Vice President, or redefine the role of the current VP At-Large, to be VP for Strategy/Planning, and to establish a budget for strategy development (for example to cover travel and meeting expenses of a core strategy group, and/or to engage a consultant). (We might also consider a longer term for the President, but I’m not sure this is wise and may have unintended consequences, beneficial and otherwise.) Also, we will likely need to add a budget and new revenues to support implementation of a strategy, for example to support development of educational materials, generic models, etc.

These are my views. Some will agree; some will disagree. In either case, express your views over the next few months to the strategy team by emailing me at jmlyneis@alum.mit.edu.

Status and Plan for the Current Strategy Initiative

As I mentioned above, earlier this year we started a strategy initiative to address some of these issues. That initiative stalled in part because we tried to be inclusive in a list serve discussion. We have now regrouped under the guidance of Kim Warren. We have formed a core team to develop ideas and interim work products, and will use targeted interviews and surveys to involve the membership and other constituencies. We hope to have preliminary results early in 2009, and build from there.

The purpose of this initiative is to develop a 5-year strategy for the **Society**, informed by all stakeholder groups, agreed to by the Policy Council and supported by the membership, to drive adoption and impact of **system dynamics** in the years up to and beyond 2013. We expect this effort will have a vision for the status of the field and Society well into the century, and actions to carry the effort forward beyond the next 5 years.

Conclusions

In summary, while we have made great strides over the last 50 years, we now need to focus our efforts and devote attention to promoting the field as a rigorous methodology and to spread its practical use. I look forward to working with you on this endeavor. Thank you.