System Dynamics Society
Publications Strategy

The System Dynamics Society Publications Strategy Development Team is:
Pal Davidsen (Vice President of Publications)
David Ford (team leader)
Peter Hovmand
Susan Howick
Len Malcynzki
Sara Metcalf
Rebecca Niles
Krys Stave

This report was authored by:
David Ford
Sara Metcalf
Krys Stave
Susan Howick
Len Malcynzki

June 23, 2016

System Dynamics Society
Publications Strategy

Table of Contents:

System Dynamics Society
Publications Strategy

1. Context and Introduction

The primary purpose of the System Dynamics Society's Publications Strategy is to provide a plan for leveraging publications to support the Society's overall vision. To that end, this document reviews the Society's vision, discusses the potential role of publications in promoting the Society's aims, and presents a gap analysis comparing what publications currently exist with what is envisioned. This analysis is used to organize recommendations for addressing the gaps identified. A second purpose of the Strategy is to move the ongoing discussion of publications in the System Dynamics Society forward in ways that will lead to constructive actions. As a plan for all types of publications, the Strategy is not intended to address or resolve all significant publication issues or design specific strategies, but rather to identify, describe, and discuss the most important challenges, issues, and approaches to improving system dynamics (SD) publications.

This Publications Strategy emphasizes the impact of published system dynamics work on society at large. The development of this Strategy is broadly motivated by the perception that a gap exists between the potential impact of system dynamics and its present realization. Therefore, a major objective of this Strategy is to increase the impact of system dynamics in terms of scientific as well as societal advancement. In the analysis that follows, we seek to clarify and address this gap. In doing so, we ask: what kind of impact do we want the Society's publications to have in the coming years?

Publication, as used here, is a subset of communication, where communication, broadly, means conveying information in a variety of contexts and formats. The term publication comes from the Latin publicare, which means "make public." This Publications Strategy uses the term publication broadly, to mean making information about system dynamics publicly available in any of a variety of forms, including, but not limited to, printed forms. The Strategy distinguishes publishing from private communication, such as communications by email, conference calls (video or audio), or written letters.

The vision of the System Dynamics Society (the Society), as described in the latest version of its strategy, is:

> *System Dynamics will transform society by making improvements to decision-making in government, commerce and other organizations. Powerful examples of its impact will be widely known amongst the general public, and people with authority will be aware of how system dynamics can raise the effectiveness of the organizations they lead. Organizations will employ or seek support from large numbers of experienced professionals with deep skills that are defined, recognized and valued. Those professionals will emerge from Universities and other training institutions that provide high-quality training, drawing on an extensive resource of accessible and rigorous teaching materials. The topic will be understood and respected in the academic community. System dynamics will feature in all parts of the education system, leading to public understanding and demand for better policy-making throughout society.*

Publications can support and facilitate the realization of this general vision by providing a variety of high quality examples of how system dynamics improves organizational effectiveness, clearly defining and demonstrating the value of system dynamics skills, and making teaching resources available. Publications should also serve several key audiences—decision-makers, academics, a variety of learners, and the general public.

A vision for system dynamics publications that supports the overall Society vision can be framed as:

> *The body of work represented by system dynamics publications will serve as a medium for exchanging information about system dynamics theory, methods, applications, and pedagogy among people who produce it and those who use it. System dynamics professionals, other scholars, decision-makers, and the general public will use system dynamics publications to improve decision-making in organizations and throughout society. Publications will provide convincing explanations and examples of how system dynamics has been and can be valuable for decision-making. They will be read widely and used to improve organizational and policy effectiveness among all audiences. Rigorous resources for learning will be accessible for a wide variety of learners to help them build the skills to use system dynamics appropriately. System dynamics publications will be respected and sought by people outside the field because they are rigorous, persuasive, and accessible.*

This vision statement implies two kinds of publication issues:

1. The need to provide publications for the exchange of information between people who produce it and people who use it for a range of purposes.
2. The need to consider several qualitative dimensions of system dynamics publications, specifically:
   - **Persuasiveness:** communicating the value and use of system dynamics for effective decision-making in a manner that is compelling for various audiences.
   - **Rigor:** adhering to system dynamics standards (i.e. using the methods and tools correctly).
   - **Appropriateness:** using the right methods and tools for the right purposes
   - **Accessibility:** being available to the range of audiences.

These issues are used to structure this System Dynamics Publications Strategy.

SD Publication Audiences, Purposes, and Types

The audiences for system dynamics publications can be described in a number of ways. One is by professional constituencies, which include decision-makers, academics researchers, industry professionals, educators and learners at all levels of formal and informal educational contexts, and the general public. Another is by level of awareness of and engagement in system dynamics. Audiences who are highly engaged in and aware of system dynamics have different needs for publications than those who are partially engaged in or not at all aware of the field.

Another distinction is in the way publications are used. SD publications serve different purposes for authors seeking to reach these different audiences. These publication purposes include, but are not limited to, the following:

- Share theoretical and methodological system dynamics insights, such as those that are produced by research
- Share new system dynamics experiences, such as those produced by the successful application of system dynamics
- Share new tools and methods for use in teaching system dynamics and the use of system dynamics in teaching other topics
- Discuss, evaluate and critique system dynamics with others
- Promote awareness of system dynamics among those in other fields and the public at large through outreach
- Develop basic and advanced SD skills to:
    - Provide a basis for the application of existing system dynamics principles, concepts, lessons, and tools to improve the design and management of systems, such as the application of system dynamics in industry and for the development of public policies
    - Provide a basis for the application of existing system dynamics tools and methods to improve teaching
    - Learn about the norms of system dynamics research, teaching, and practice as a means of becoming "socialized" into the field
- Promote individual careers, businesses, educational programs, or other enterprises
- Document system dynamics work as a basis for performance evaluations

Differentiating between these publications purposes in consideration of audiences as well as authors is important for developing an informed Publications Strategy. Toward this end, Table 1 below shows a matrix of potential types of SD publications that could be used to serve different publication purposes as indicated in the leftmost column. Audiences for these publications are considered at three levels of engagement with SD and in terms of whether they are members of the general public, educators or learners, practitioners, and/or scholars or researchers.

Table 1. Examples of types of existing and potential publications by purpose and level of audience engagement with SD.

	Audience for SD Publications by Level of Engagement										
	Potentially, but Not Yet Engaged				Moderately or Minimally Engaged				Highly Engaged		
Publication Purpose:	**General Public**	**Educators and Learners**	**Practitioners**	**Scholars and Researchers**	**General Public**	**Educators and Learners**	**Practitioners**	**Scholars and Researchers**	**Educators and Learners**	**Practitioners**	**Scholars and Researchers in SD**
Share theoretical and methodological SD insights				peer-reviewed journals and conferences in other fields			SDR, domain journals	peer-reviewed journals and conferences in other fields			peer-reviewed SD journals, conference proceedings
Share SD application experiences		websites, education conferences, newsletters		domain journals, applied books				domain journals, applied books		conference proceedings	applied books, conference proceedings
Share SD teaching resources		CLE, Leveraged Networks, Waters				journal, repository, websites			repository		journal, repository
Discuss SD work						CLE listserv	blog		CLE listserv	blog	conference presentation, blog
Promote SD awareness	games, apps	SD conference brochure	SD conference brochure	SD conference brochure	blog	blog	newsletter, trade publication	SD conference brochure			blog
Develop basic SD skills	SBLEs, apps	books, videos, blogs, courses				books, videos, blogs, courses			books, videos, blogs, courses		
Develop advanced SD expertise									books, videos, blogs, courses		
Promote SD-related enterprises	popular books, news articles		trade shows		firm websites		firm websites, case repository		advertisements, seminars	advertisements, seminars	advertisements, seminars
Document SD work					websites	SDS conference proceedings, CLE	conference proceedings, case repository	SDR, journals, conference proceedings	SDS conference proceedings, CLE	conference proceedings, case repository	SDR, journals, conference proceedings

Table 1 gives an indication of the types of publications that might best serve the purposes for each type of audience. It can be used to frame and facilitate addressing the first publication issue described above, i.e. what publications serve what purposes for whom.

In the broadest sense, publications can be used by information producers to disseminate information about system dynamics or by information consumers to receive information. Publications thus serve the explicit purpose of transferring information from people who produce it to people who use it. They also have at least two other effects. One effect is the accumulation of public knowledge about system dynamics. Another is the potential increase in engagement and expertise of various people associated with system dynamics. Figure 1 shows a conceptual model of how publications affect the stock of knowledge about system dynamics, and how the stock of knowledge can further influence the engagement of different stakeholders.[1] People engaged in the field raise and answer questions through publications that further raise awareness, engagement, and expertise in system dynamics. The accumulation of knowledge and the effect of publications on stakeholder engagement and expertise are also affected by the quality of publications, where quality includes both how well the content adheres to standards in the field and the persuasiveness of the presentation. High quality publications can attract people to the field, but low quality publications, or publications that readers do not perceive to be useful, can also drive people away from system dynamics.

[1] We recognize that there are likely to be different ideas about how to construct such a diagram. The intent of this diagram is to organize our thoughts about the context and function of SD publications and to frame discussion in the remainder of this analysis.

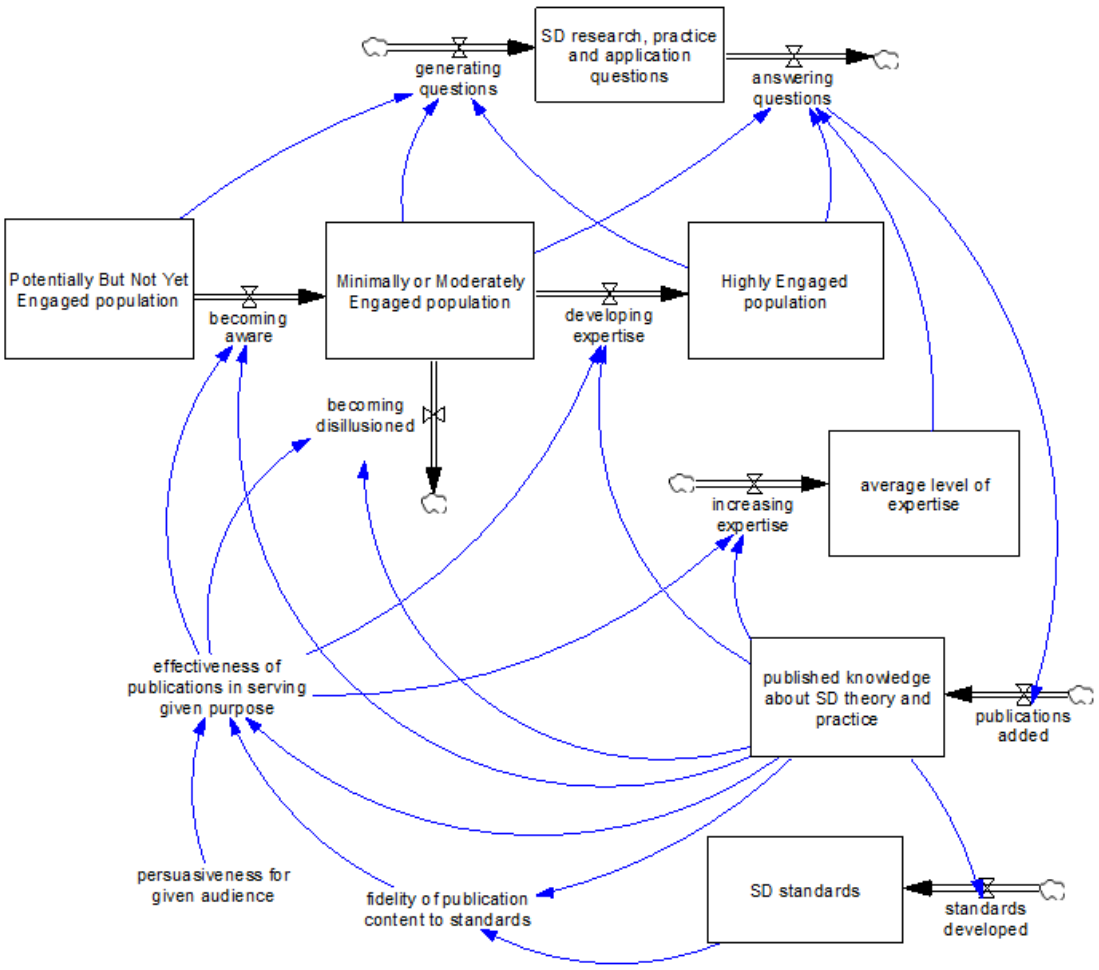

Figure 1. Stock-and-flow diagram of the role of publications in changing the level of engagement in system dynamics, the level of expertise of people engaged in the field, and the overall stock of knowledge about methods, practices, and applications in the field.

2. Overview of Existing System Dynamics Publications

The following is a brief review of the types of English language system dynamics publications grouped primarily by format, with examples to illustrate the breadth and level of use of those formats. A significant number of SD publications have also been authored in other languages. No attempt to be all-inclusive or exhaustive has been made.

Books

Methods and Methodology-based Books

At least ten books have been published specifically about the system dynamics methodology, including titles authored by Forrester, Goodman, Coyle, Randers, Roberts et al., Richardson and Pugh, Ford, Kirkwood, Sterman, and Pruyt. Earlier books were in paper only, with more recent texts including digital support. Kirkwood's publication is electronic and Pruyt's text is an e-book.

Application-based Books

At least twelve books have been published about the application of system dynamics. They can be grouped into those that address the application to a single type of system and collections of applications. Examples of the former include titles authored by Forrester, Meadows et al., Meadows, Lyneis, Meadows and Meadows, Abdel-Hamid and Madnick, Williams, and Warren. Examples of the latter category include titles edited by Roberts, Meadows, Morecroft and Sterman, and Richardson.

Other Books

Books about system dynamics that do not easily fall into the two categories above but have significant portions dedicated to system dynamics or have had a significant impact on the field have also been published. Examples include Forrester's "Principles of Systems", Richardson's "Feedback Thought in Social Science and Systems Theory", Senge's "The Fifth Discipline", Meadows' "Systems Thinking" and many others with narrower foci (e.g. model analysis).

Many more books have been published about system dynamics if the term is defined more broadly to include systems thinking. Examples include "*The Shape of Change including Stocks and Flows"* by Quaden and Ticotsky and "Critical Thinking Using Systems Thinking and Dynamic Modeling" by the Creative Learning Exchange.

There are many more books that address systems approaches that are related to system dynamics, such as soft systems methodologies (some of which also use the term "systems thinking"), soft operations research methods, and design structure matrices.

System dynamics is treated as a single chapter in many books about social science modeling.

Academic Journals

Systems-Focused Journals

System Dynamics Review is the premier journal about system dynamics and is the Society's leading publication. The Review is peer-reviewed and currently focuses on methodology. It and its predecessor *Dynamica*, are the publications-of-record for system dynamics work. The Review is published in paper and is available electronically. The Review's most recent impact factor is 1.026. The majority of the authors of papers in the *System Dynamics Review* are academics.

Systems Research and Behavioral Science explicitly includes system dynamics as a methodology and regularly publishes papers that apply system dynamics. It is a peer-reviewed journal with a primarily academic audience but also includes application articles. The journal also publishes papers that use other systems approaches. The journal's most recent impact factor is 0.474.

Other journals focus on the systems thinking aspects of system dynamics. The Society of Organizational Learning Journal and Applied Systems Thinking are examples.

Non-Systems-Focused Journals
Many other journals publish system dynamics articles. Among the simulation-oriented journals these can be classified as methodology-based journals (e.g. Management Science, European Journal of Operational Research) or domain (application)-based journals (e.g. Interfaces, ASCE Journal of Construction Engineering and Management). Most of these journals have predominantly academic readerships. These articles typically adopt the focus of the journal (versus system dynamics) and use system dynamics modeling as a means to another end (e.g. domain insights).

Conference Proceedings

The System Dynamics Society publishes proceedings of papers submitted and presented at its annual conference.

The Creative Learning Exchange publishes the materials from its annual conferences on its web page. The Creative Learning Exchange focuses on K-12 education using system dynamics.

Newsletters, Newspapers, and General Readership Magazines

Newsletters related to the system dynamics methodology are published by the System Dynamics Society (several times a year, for internal consumption), Leverage Networks (The Systems Thinker for general readership), and The Creative Learning Exchange (for K-12 education audience).

Newspapers and magazines occasionally publish articles that mention system dynamics.

Internet-Based Publications

There are many web pages about system dynamics. They vary greatly in quality and how often they are updated. These provide descriptions and access to downloadable publications, including papers, videos, teaching materials, and (importantly), in some cases system dynamics models.

One web page is sponsored and controlled by the Society (http://www.systemdynamics.org/). Wiley hosts the web page for the System Dynamics Review (http://onlinelibrary.wiley.com/journal/10.1002/(ISSN)1099-1727), which the Society largely controls.

Many other web pages directly support system dynamics and are relatively close to the Society in that they are operated by persons or organizations with close connections to the Society. Examples include the Creative Learning Exchange pages, MIT Sloan School of Management System Dynamics page, the program and courseware pages of MIT, WPI and the European Master's in System Dynamics Program, the education-based web pages by the Waters Foundation, and the MetaSD page run by Tom Fiddaman. Additional web pages provide

information and publications by system dynamics software vendors, their user groups, and consulting firms that apply system dynamics. Individuals also post system dynamics information about courses and applications on the internet.

Even more web pages include system dynamics in some significant way as part of fulfilling their particular mission which is not system dynamics-focused. As just one example, the Association for Computing Manufacturing web pages include a web page specifically dedicated to system dynamics, describing it as a method "which uses a model representing cause-and-effect relationships in terms of causal-loop diagrams, flow diagrams with levels and rates, and equations. The equations are used for simulating system behavior." and provides links to system dynamics resources. The quality of these web pages varies widely.

Online news and magazine sites occasionally publish articles that mention system dynamics. One example is Paolo Gaudiano's "Of Wolves and Sheep" that uses the classic SD predator prey model as an analogy for internet business. (http://www.mediapost.com/publications/article/273537/of-wolves-and-sheep.html).

System Dynamics Videos

At least two award-winning films highlight System Dynamics, *Earth Days* and *The Last Call*.

Relatively short videos about system dynamics that are available online can be a very effective form of publication for meeting several publication objectives (e.g. education, reporting results, and promotion of the field). As an example, some system dynamics instructors at universities include them in their courses. Many such videos are available about system dynamics and systems thinking through channels such as the YouTube web page.

3. Gap Analysis: A Comparison of the Publication Vision and Existing System Dynamics Publications

The content of system dynamics publications is not evenly distributed across the spectrum of uses. Table 2 below uses the structure of Table 1 along with a color scheme to assess the relative degree to which different purposes are currently served by system dynamics publications. Green cells indicate areas where the purpose is well-served, light green cells indicate areas where the purpose is partially served, and yellow cells indicate areas where the purpose is not served, reflecting the largest gaps. For example, as indicated by the green cells for scholars and researchers sharing theoretical and methodological insights, research about the system dynamics method is relatively well represented in publications, primarily through the System Dynamics Review. In contrast, as indicated by the yellow cells, gaps exist where the purpose of sharing SD application experiences with a range of audiences is not met by existing publications. These gaps arise because publications about the SD applications are much less common than publications on the system dynamics method. Publications about the application of SD can be categorized as addressing the SD application process (i.e. how to apply SD rigorously and for the greatest impact) or providing examples of SD application. In many cases cells in Table 2 must be disaggregated to reveal specific gaps. For example, there are many publications that illustrate the application of causal loop diagramming in consulting or teaching settings. In contrast there are fewer publications that describe the use of system dynamics simulations to specific business circumstances.

Table 2. Gap Analysis of Extent to which Current Publications Serve Specific Purposes

Legend: Purpose not served / Purpose partially served / Purpose fully served	Audience for SD Publications by Level of Engagement										
N/A	Potentially, but Not Yet Engaged				Moderately or Minimally Engaged				Highly Engaged		
Publication Purpose:	**General Public**	**Educators and Learners**	**Practitioners**	**Scholars and Researchers**	**General Public**	**Educators and Learners**	**Practitioners**	**Scholars and Researchers**	**Educators and Learners**	**Practitioners**	**Scholars and Researchers in SD**
Share theoretical and methodological SD insights				peer-reviewed journals and conferences in other fields			SDR, domain journals	peer-reviewed journals and conferences in other fields			peer-reviewed SD journals, conference proceedings
Share SD application experiences		websites, education conferences, newsletters		domain journals, applied books				domain journals, applied books		conference proceedings	applied books, conference proceedings
Share SD teaching resources		CLE, Leveraged Networks, Waters				journal, repository, websites			K12 / non-K12		journal, repository
Discuss SD work						CLE listserv	blog		CLE listserv	blog	conference presentation, blog
Promote SD awareness	games, apps	SD conference brochure	SD conference brochure	SD conference brochure	blog	blog	newsletter, trade publication				blog
Develop basic SD skills	SBLEs, apps	books, videos, blogs, courses				books, videos, blogs, courses			books, videos, blogs, courses		
Develop advanced SD expertise									books, videos, blogs, courses		
Promote SD-related enterprises	popular books, news articles		trade shows		firm websites		firm websites, case repository		advertisements, seminars	advertisements, seminars	advertisements, seminars
Document SD work					websites	SDS conference proceedings, CLE	conference proceedings, case repository	SDR, journals, conference proceedings	SDS conference proceedings, CLE	conference proceedings, case repository	SDR, journals, conference proceedings

Table 2 describes the gaps in meeting the needs for information exchange for different purposes and audiences. It indicates key places where publications are not meeting publication needs, and therefore can facilitate the focusing of efforts and development of specific strategies. These gaps may not all be of equal importance for serving the greater vision of the SD Society or the SD field. Some may have a greater potential benefit to the field than others.

A review of Table 2 suggests the following types of gaps in providing vehicles for exchanging information:

Audiences: There is limited reach to both those stakeholders who are potentially, but not yet engaged in SD and those who are moderately or minimally engaged in SD. In addition, publications are not adequately meeting many of the needs of highly engaged users of SD.
Content: There are many different types of content where publication purposes are not served, particularly publication of research into the application of system dynamics to practice or education and publications that describe the application of system dynamics to specific business circumstances. There is also a lack of publications to promote SD and to document work for educators, practitioners, and students.
Outlets: There are insufficient outlets for the diverse content that is required from the wide range of stakeholders. These include a limited number of publication routes over which the System Dynamics Society has control.

In addition to the gaps in what publications exist for information exchange, the publications vision includes a set of qualitative objectives, as described by the four bullets in the Context and Introduction section. They include making publications compelling, appropriate and engaging for various audiences, rigorous, and accessible to the range of audiences. Table 3 evaluates gaps in meeting these qualitative dimensions.

Table 3. Gap Analysis Comparing Current with Envisioned SD Publications

Qualitative Components of SD Publications Vision	**Current State of SD Publications**	**Gap Analysis**
Persuasiveness: Publications should communicate the value and use of system dynamics for effective decision-making in a manner that is compelling for various audiences.	There is a preponderance of academic publications. Some SD publications have had a compelling impact on decision-making, such as Limits to Growth and The Fifth Discipline. Many areas of SD do not have compelling SD publications. Current publications do not serve all audiences equally: - Few outlet(s) for SD applications. - Few (one SD focused) outlets for K-12 education. - Few outlets for advanced education (mostly low quality videos). - Few, if any, outlets for practitioner training. Most videos about system dynamics do not contain information that is inaccurate, and some provide useful information (e.g. recordings of an instructor lecturing, instructions on how to use specific software).	More SD publications are needed to influence decision-makers and the general public. Broad outreach of publications into non-SD public outlets is needed. Many more SD publications are needed in general-readership outlets. However, responses to backlash and misunderstandings may be needed as public awareness of the field grows. Many more SD publications are needed in high-impact practice outlets. More SD publications are needed in leading application journals. The quality of the content and lack of production values in most of the currently-available videos do not accurately and effectively portray system dynamics as the valuable, interesting, applicable, and fun methodology that most system dynamicists understand it to be. Few high-production-value, quality content, promotional videos about SD
Rigor: Publications should adhere to system dynamics standards	SDR publishes high-quality work. The quality of the SD Society conference papers is mixed. There are many model quality publications (e.g., papers in SD Review and the SDM Docs tools). There is no accepted, documented, and disseminated SD body of knowledge, standard of work, or standard of publication quality. There are very few publications on SD publication quality. There are few, if any, publication quality metrics and no formal SD publication standards.	Formal and widely disseminated SD modeling and practice standards are needed to define, encourage, and improve the rigor of SD work. Formal and widely disseminated SD publication quality standards are needed to define, encourage, and improve SD publication rigor.

Qualitative Components of SD Publications Vision	Current State of SD Publications	Gap Analysis
Appropriateness: Publications should use the right tools and methods for the right purposes.	There is no accepted, documented, and disseminated SD body of knowledge, standard of work, or standard of publication quality. There are few, if any, publication quality metrics and no formal SD publication standards.	Formal and widely disseminated SD publication quality standards are needed to define, encourage, and improve SD publication appropriateness.
Accessibility: Publications should be available to the range of audiences.	SDR and SRBS are available to those who have access to university libraries with subscriptions to those journals. They include an open-access option for authors for a fee. Systems is an open access journal. The SD Society Conference Proceedings is open access, as are many documents on web pages such as those available through the Creative Learning Exchange. There is a guide to paper-publications (the SD Bibliography). However, there is no comprehensive guide to the breadth of SD publications. Books are available to those who can buy them. Few high-production-value, quality content, promotional videos about SD exist.	Access to SD publications is limited or difficult for many. For example, one must be able to perform atypical internet searches and/or have library access. Easy and affordable access to the breadth of SD publications is needed to grow the field. Easier access to skill building tools (e.g. courses) is needed.

This gap analysis is also confirmed through a survey and group exercise undertaken with the Policy Council in July 2015 (see Appendix A and B for further detail). The objectives as derived from the vision statement, and the results of the survey and group exercise, are consistent and mutually support each other. Participants highlighted the need not only to reach a wide range of audiences through showing good SD modeling work to other academics in other fields through journals in other fields, but also to create better outlets for teaching material, publication of successful applications, and writings about people and ideas in system dynamics that are not just technical pieces for academics.

Summary of Publication Gaps

Publications about system dynamics are plentiful and provided using all of the major currently-available formats. The topics and focuses cover the breadth of system dynamics, from basics of the method to applications to how-to instructions. The authors and owners of those publications vary widely and include large educational organizations (e.g. universities), firms (e.g. vendors

and consultants), special interest groups, and individuals. In general, most of the major portions of the system dynamics methodology are addressed in the currently available literature, albeit not all content areas in all formats. Some (e.g. causal loop diagramming) are covered extensively. In general, the diversity of content is very high and outlets cover all current media (text, video, audio, electronic) and all current delivery points (libraries, bookstores, the internet).

The comparison of existing publications with the SD publications vision above reveals gaps that can be grouped into the issues identified in the Context and Introduction section:

Providing Information Exchange Vehicles:
Few publications reach far beyond the SD community to bring SD to target audiences (e.g. leading decision-makers) and the public. Promoting SD through publications requires the Society to look beyond the System Dynamics Society and the SD community and reach out to a much wider audience in a designed and focused effort.

Persuasiveness: More high-impact publications are needed to expand and increase the influence of SD. New technologies may provide means for increasing the persuasiveness of SD publications.

Rigor: The quality of SD publications ranges from excellent to abysmal. The amount of poor quality work seriously degrades the stature and growth of the field. One possible cause of the low quality of some work is that there are few standards and no known system of quality assessment or control of SD publications beyond the peer review system for academic journal papers. Other factors, such as the availability of quality training, also contribute to this problem. Effectively and efficiently improving the quality of SD publications requires investigating the causes, identifying high leverage points for intervention, and targeting improvement efforts.

Appropriateness: The lack of clear and widely disseminated and used SD standards allows many inappropriate applications of SD concepts, tools, methods, and the term "system dynamics". Developing and disseminating SD standards is a first step in improving SD publication appropriateness.

Accessibility: Many people who would be interested in SD and join the field do not have easy access to SD publications. For example, researchers and practitioners in many developing countries do not have access to peer-reviewed literature through university libraries and costs of buying articles or books as an individual are prohibitive. They may only have access to SD publications through open access channels, or pirated material. Thus, the number of SD publications and their content may far exceed their availability to people we want to expose to SD. Those untapped audiences include some of the core portions of the SD community and the SD Society (e.g. practitioners and educators). Improving access to SD publications requires a critical look at the primary audiences for different publications and an assessment of these kind of barriers that might exist. New technologies may provide means for increasing the accessibility of SD publications.

Each of the categories of SD publication gaps above include several issues. Those issues are too numerous to identify and describe here. However, as one example, a goal of the Society is to provide broad and easy access to quality SD publications. Some of the related issues facing the publishing industry in general are reflected in the SD community. They include broad affordable

(often free) access through the internet and the unauthorized reproduction and distribution of published works (i.e., piracy and copyright infringement). The former helps meet a Society goal (broad affordable access), but also reduces the attractiveness of traditional paper-based publishing. Issues such as these should be identified and considered in the design of specific SD publication strategies.

In summary, the gap analysis highlights two kinds of needs. First, we need to promote particular types of publications to address the gaps identified in Table 2. Some of these gaps could be filled with new publications under the auspices of the SD society; some could be better addressed by reaching out to the broader universe that publishes SD work. Second, we need to address the gaps in the qualitative dimensions noted above, namely quality/rigor, access, and persuasiveness.

4. Publications Strategies

Based on the gap analysis in the previous section, here we present general strategies to address the gaps identified in Tables 2 and 3.

4.1 Strategies for addressing gaps in providing information exchange vehicles

4.1.a Add new SD Society publications

New system dynamics publications can help fulfill the publication strategy goals. The content and format of these new publications must be customized to its audience (content consumers) and author / participants (content suppliers). Table 1 describes where publications are currently being used by the SD community. Table 2 describes some of the possible uses of new SDS publications. Two examples are described next.

There is a need for more high-quality resource exchange outlets for teaching work in SD, particularly for teaching resources that serve higher education needs for basic and advanced system dynamics teaching, and resources for informal learning outside of the formal education system. Educators and learners could benefit from a repository of high-quality materials, refereed by professionals in the SD community, as well as from a peer-reviewed mechanism to exchange experiences and research about teaching. This could be a journal (perhaps in an electronic or multiple formats) about system dynamics teaching that would address audiences not already served by the good materials available for K-12 educators and learners, or a resource that uses new kinds of technology available online. We recommend, however, that the Society consider how to exert an influence on or impose some kind of peer-review quality control on the resources published in this forum.

Similarly, practitioners have a need for an outlet (perhaps blog-like) to promote the widest possible dissemination of high quality SD application work as a means of promoting SD and building their reputations in the field. This outlet would also benefit from a rigorous quality assurance, quality control process.

4.1.b Improve the broader universe of system dynamics publications

The System Dynamics Society should reach beyond the publications that the Society controls to influence the broader universe of system dynamics publications. This can both improve the quality of system dynamics publications and increase access to system dynamics publications.

As described above, publications about system dynamics are plentiful and available in all the major currently-available formats. For many within the SD community and others seeking SD information, it can be difficult to identify and locate good system dynamics publications within the universe of SD publications. But, the System Dynamics Society directly controls a very small fraction of the system dynamics publications, albeit one of those (System Dynamics Review) is the leading publication in the field. The creation of one or a few new publications by the Society will not significantly change this due to the large number of SD publications.

The Society currently has little or no influence over the wide variety of other system dynamics publications. The volume and wide variety of system dynamics publications and authors preclude the Society from controlling publication in the field. Indeed, attempts to exert control would likely fail and stifle much of the positive energy and creativity that many of those publications bring to the field. However, this does not prevent the Society from taking a much

larger and stronger role in system dynamics publishing in general, thereby strengthening the Society and growing the field. The Society is a logical agent for improving access to and the quality of system dynamics publications by reaching beyond its historical boundaries due to its central role in the field, its dedication to quality system dynamics work, and it potential to make a significant difference.

To maximize its influence over system dynamics publishing, the Society should adopt a new role within the system dynamics community, as a collaborator and organizer of one or more networks of a diverse groups of system dynamics organizations and individuals. The Society should partner with other like-minded organizations to provide infrastructures, products, and services that improve access to and the quality of system dynamics publications regardless of what organization or person owns or controls the publication. An example of a possible project is the development of an electronic "one-stop" tool for finding system dynamics publications. The field lacks an organization or tool that facilitates access to the wide variety of good SD work from among the many disparate and diverse system dynamics publications. This tool could be combined with other SD publication improvements by only including publications that have been assessed using a quality standard or only publications that have a minimum quality level. The diverse system dynamics organizations that are members of these collaboratives could actively promote the use of the tool within and outside the system dynamics community, thereby increasing its effectiveness and value. One core objective of such collaborations should be to create sustainable improvement in system dynamics publications. The members of such a collaborative should represent a diverse set of stakeholders from around the world. An incomplete list of potential members includes: System Dynamics Society, Universitetet in Bergen (University of Bergen), Leverage Networks, Radboud University, Creative Learning Exchange, Universidade Nova de Lisboa, Society for Organizational Learning, Universita Degli Studi di Palermo (University of Palermo), Washington University in St. Louis Social System Design Lab, Climate Interactive, SUNY Albany System Dynamics, Waters Foundation, WPI System Dynamics program, Donella Meadows Institute, MIT System Dynamics Group.

4.2 Strategies for addressing gaps in qualitative dimensions

This section considers strategies for addressing the gaps in qualitative dimensions of the Publications Vision that were articulated in Table 3.

4.2.a Persuasiveness

The persuasiveness of SD publications contributes to their potential impact on science and society at large. Such impact reflects the reputation of the field and both the quantity and quality of system dynamics work. These factors contribute to the visibility of the field beyond the SD community. For example, publications can serve to elucidate how SD intersects with and complements research in areas of inquiry like systems science, complex systems, and agent-based modeling.

The importance of impact is not only acknowledged but also codified in the academic sphere with the use of impact factors for journals that reflect the extent to which published articles are cited elsewhere in the literature. Impact factors are used to determine relative ranking of journals within a discipline. While the System Dynamics Review is the flagship journal of the discipline, its modest impact factor (noted above) renders it less likely to be targeted on the basis of this impact measure alone. Therefore, scholars using SD typically need to publish their work in other

disciplinary-specific higher-impact outlets to achieve their particular professional goals of promotion and tenure. Raising the impact factor of the SDR would undoubtedly make it a more attractive outlet for aspiring academics. Doing so would require wider readership and citation of SDR publications. A careful consideration of the incentives and barriers that exist for authors to publish in SDR is warranted, in terms of impact factor as well as disciplinary recognition. Likewise, we would do well to consider what incentives or barriers exist for authors to publish SD work in different outlets such as application domain journals.

Another issue in terms of the persuasiveness of SD publications is how accurately the discipline is represented through publications to the general public versus different academic fields. For example, some have suggested that the field is ripe for another popular book like Limits to Growth or The Fifth Discipline to have an impact upon the broader public. However, unintended consequences from the success of reaching diverse audiences through widespread dissemination can include the potential for misrepresentation or backlash in audiences who do not appreciate the utility of the SD approach. Therefore, a comprehensive publications strategy might also encourage SD practitioners to respond to critics of SD work, leveraging the opportunity to clarify the value of the approach through commentary. In other words, we would do well to manage the backlash that may arise in the wake of success. Building a wider base of SD practitioners should ease the challenge of addressing concerns raised by critics of SD work. More broadly, the impact of system dynamics publications is also experienced in the process of refereeing, reviewing, and otherwise engaging with products emerging from SD research and practice.

4.2.b Rigor

To meet the objectives above the System Dynamics Society should create and apply one or more quality standards for system dynamics work. This would include a review and potential inclusion of existing standards. When compared with many rigorous modeling approaches the basics of system dynamics are easy to understand, adopt, and use. This makes the field accessible, widely attractive, and supports the growth of the field. But this characteristic also creates a quality problem for the field. Many people with inadequate training and/or commitment to quality SD use (or claim to use) system dynamics and do so very badly. This generates a plethora of poor system dynamics publications, as evidenced by the seemingly innumerable papers titled "XYZ, A System Dynamics Approach" which use system dynamics-based software to simulate but do not include feedback or do not use structure to explain behavior. The field and the Society are severely harmed by the proliferation of publications with poor quality system dynamics and publications that claim to use system dynamics, but do not[2].

Current system dynamics publishing lacks a benchmark for system dynamics publishing quality that readers can use as a guide through the plethora of available publications. Therefore, the Society and field can greatly benefit from improved quality assurance (building in quality) and quality control (finding and correcting quality problems) in system dynamics publication across the scope of SD publications. The Society is a logical source for improving the quality of system dynamics publications by establishing a quality standard due to its central role in the field, its dedication to quality system dynamics work, and its potential to make a significant difference. In addition, by taking a leading QA/QC role, the Society can increase its influence and generate benefits for both the field and the Society.

[2] One team member also noted "At the opposite extreme, there are also many instances in which well-trained SD practitioners have done work that, despite their best efforts, created a flawed perception of the field. These negative impressions can sometimes have much longer and damaging effects than poor-quality work."

Therefore, a first step in improving the quality of system dynamics publications can be for the Society to develop an objective, rigorous, and balanced standard for system dynamics publication quality. No new knowledge is required. The basis for such a standard already exists in leading system dynamics publications and is exemplified by leading system dynamicists. What is needed is the transformation of the existing information about quality system dynamics work into one or more forms that can be used to assess publication quality. That standard can then be applied to existing and future system dynamics publications. Doing so would provide an easy and widely accepted means of distinguishing among levels of quality within SD publications and guidelines for individuals and organizations in improving their publications. In addition to establishing a standard from within the field of system dynamics, there should be a review of standards that exist in other fields to assess whether these should influence established standards for system dynamics publication. The diversity of system dynamics publications may warrant the creation of multiple quality standards.

There is a relationship between the quality of the model that provides the basis for system dynamics publications and the publication quality. Yet, good models can be poorly presented and poor-quality models can be cloaked in a convincing presentation. This situation creates an added challenge for quality management in the field, to carefully review and provide guidance on models as well as the papers in which they are presented. Of course this situation holds not only for publications in the Society's outlets but also system dynamics publications in outlets for other academic communities. Indeed, a key challenge is attempting to influence the quality of publications in these other communities. Identifying key communities/journals where system dynamics work is presented and ensuring good engagement with these communities including representation on editorial boards and acting as reviewers would help to disseminate good quality standards for system dynamics publications.

4.2.c Appropriateness

Appropriateness, as used here, means using the right tools and methods for the right purposes. As described, many publications inappropriately use SD tools and methods. Examples include simulation models claiming to use system dynamics which have no feedback and failing to use structure to explain behavior. The best way to improve the appropriateness of SD publications is to develop, widely disseminate, and stridently promote a clear description of good SD practice and to improve the education of system dynamics. A "System Dynamics Book of Knowledge", perhaps modeled after the very successful Project Management Book of Knowledge developed by the Project Management Institute could be a publication that can help attain this goal.

4.2.d Accessibility

Significant growth of the field requires that SD publications be available to a wide set of audiences. Availability includes access, affordability, and the reduction of language barriers. The Society should focus on publication formats and means that can dramatically increase SD publication accessibility.

5. Discussion

Summary

The objective of this strategy is to provide general guidance and recommendations for improving system dynamics related publications. A publications vision for the System Dynamics Society was developed based on the Society's vision. This was followed by a description of the audiences for SD publications and purposes. Table 1 describes existing SD publications and which purposes they fill. Existing SD publications are described as a basis for a gap analysis that compares the goals for SD publications and current conditions. Table 2 is used to identify potential areas for improvement and Table 3 describes the nature of some of the identified gaps. The primary gaps found are related to access to publications, the quality of SD publications, and the use of publications to promote the field. The gap analysis is the basis for describing the primary goals of the SD Publications Strategy. The strategy itself recommends that the Society focus on several aspects of publications: 1) adding SD publications, 2) increasing the influence of SD publications, and 3) establishing quality standards for SD publications. Finally, recommendations for implementing the strategy are made below.

The impact of a successful Publications Strategy depends upon dissemination of best practices and demonstration of the relevance of SD to different stakeholder groups. The SD Publications Strategy aims to have an impact that is global in scope, given the international orientation of the Society and its need to reach diverse audiences. Furthermore, effective publication facilitates mentoring of SD modelers among different stakeholder groups by making good work available, steering aspiring SD practitioners toward it, and underscoring the importance of publishing for the advancement of SD as a science.

Issues for Discussion

The following questions may be useful in developing a focus for addressing SD publication challenges and developing specific strategies.

- Are new SD Society publications needed and if so, which ones?
- What outreach is needed to external publications? How can this outreach best be implemented?
- How can we make SD publications more persuasive? Persuasive to whom (what specific audiences)?
- How can the Society most effectively and efficiently improve the rigor of SD publications?
- How can the Society most effectively and efficiently improve the appropriateness of SD publications, especially in publications not controlled by the Society?
- How can the Society most effectively and efficiently improve the accessibility of SD publications?

Suggestions for Publication Strategy Implementation

This System Dynamics Society Publications Strategy should be integrated with the Society's overall strategy and with other specific Society strategies, such as those for Society communications and marketing and the development and welfare of special interest groups (SIGs). Such integration ensures all parts of the Society are working towards a common goal and are supporting and enhancing each other. It also increases opportunities to identify and exploit synergistic improvement efforts. As such, the publications strategy may require revision as other Society strategies are developed and implemented.

The Society should not attempt to implement the entire publications strategy at once. Led by the Vice President for Publications, the Policy Council and other stakeholders should read this strategy carefully, discuss the publications strategy, and identify portions of the strategy to be developed further and implemented next. Through those discussions the Policy Council should create a plan for which parts of the strategy to focus on in what order. Those discussions should identify issues not included in this Strategy that may impact the design, development, and implementation of specific, more focused, publications-related strategies. As an aid in doing so, Appendix A contains the Policy Council publication survey questions and Appendix B provides a summary of the responses as well as the group exercise conducted for the first question at the Policy Council meeting at ISDC2015. The Policy Council should then charge the Vice President of Publications with developing and implementing the portions of the strategy that are identified as best for the short term.

Appendices

Appendix A: Questions from Online Survey of Policy Council Members

1. In your view, what is the biggest gap between current SD publishing (writ large) and what it could or should be?

2. How satisfied are you with the current state of SD publications?
(5 = extremely satisfied; 1 = not at all satisfied)

3. What do you like most about SD publications as they now exist?

4. What is the biggest problem or limitation you see with SD publications as they now exist?

5. Which of the following changes would you like to see in SD publications?
- o more publication outlets
- o different types of publications
- o higher standards for publication quality
- o more standardization in published content
- o other:

6. Is there anything else we should consider in drafting the SD Publications Strategy?

7. Which of the following best describe the main focus of your SD-related work (select the top one or two)?
- o researcher
- o teacher/professor
- o practitioner
- o other:

8. Please indicate how you CURRENTLY use SD publications
- o to learn about SD research
- o to learn about SD teaching
- o to learn about SD practice or applications
- o to publish about SD research
- o to publish about SD teaching
- o to publish about SD practice/applications
- o other:

9. Please indicate how you WOULD LIKE TO use SD publications
- o to learn about SD research
- o to learn about SD teaching
- o to learn about SD practice or applications
- o to publish about SD research
- o to publish about SD teaching
- o to publish about SD practice/applications
- o other:

Appendix B: Input from Policy Council

I. From the summer PC meeting 2015

In response to the question: What is the biggest gap between current SD publishing and what it could or should be?

Responses from members of the Policy Council were written on note cards and collected at the meeting. Upon analysis, these responses fell into seven major categories:

- Presence
- Visibility
- Relevance
- Quantity
- Quality
- Diversity
- Access

Presence, visibility, and relevance are closely related aspects of a perception that SD information should be but is not present in many outlets and domains outside of the SD community, of a type and in a form that would be highly visible to many people outside SD, and in which the relevance of SD is clear to people outside the field.

Quantity refers to a desire for more publications.
Quality refers to the rigor of the publications.

Diversity refers to a desired increase in the types of publications, but also in the types of outlets, and for publications that speak to different types of audiences.

Access includes improving consumer access to SD publications, but also author access to other outlets.

II. PC responses to PubStrat Survey

A summary of comments is provided by code below, highlighting key points that were raised by members of the Policy Council.

Presence, Visibility, Relevance (30/53 comments)

There should be more effort to reach a wider audience with SD publications. This is both a call to reach other disciplines by publishing SD work in other fields and to publish more books like Limits to Growth and Fifth Discipline that appeal to the general public in ways that are highly relevant, discussed broadly, and possibly controversial. There is a sense that SD publications should aim to reach more broadly and communicate in ways that are clear, relevant, and understandable to those audiences.

Diversity (29/53 comments)

Respondents expressed a need for a greater diversity of publications, targeting a more diverse audience, with different types of content in a wider variety of publication outlets. These include showing good SD modeling work to other academics in other fields through journals in other fields, but also creating better outlets for teaching material, publication of successful applications, and writings about people and ideas in system dynamics that are not just technical pieces for academics. Suggestions include tutorial articles, case studies including teaching cases, career stories, and articles on how to get grant funding, among others.