Structured Abstract Examples

Note – these are intended only to help show how to present your abstracts for different types of work. They should be helpful even if your work does not fall into one of the categories, or spans multiple categories.

In the future we will use examples from past conferences. Right now, they are NOT real examples, and are NOT taken from the conference proceedings.

# Application

| Introduction | The use of AI is improving aircraft reliability through better prediction of part and assembly failure. In this study we try to understand the implication of this for demands on the supply chain as the improved analytics are implemented for an aircraft fleet. |
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| Approach | We develop an aggregated deterministic model representing the failure process on average to look at fleet reliability and parts consumption. Using maintenance records the model is calibrated to past experience with performance improvements from AI given a range to allow scenario analysis. |
| Results | Depending on the effectiveness of the AI prediction techniques and the speed with which they are rolled out, there can be a significant short-term strain on the supply chain as the parts stock is substantially updated to get to the new steady state. There are also steady state outcomes in which the overall fleet performance is only marginally improved with a substantial increase in overall maintenance cost. |
| Discussion | The advent of AI increases the solution space for human endeavors which makes the tools of system dynamics that much more important in understanding what is happening around us. Tools inspired by the behavior of servomechanisms are again demonstrating their value in the age or knowledge. |
| Use of AI | None |

# Application

| Introduction | The increasing availability of health data has the ability to substantially improve healthcare, but at the same time creates numerous privacy concerns. Understanding how people respond to these privacy concerns can improve the design of information systems and specification of best practices. We used a system mapping approach to better balance privacy and clinical outcomes. |
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| Approach | We did a series of group model building (GMB) sessions with clinicians, IT professionals, and patients. In them we developed maps of benefits and concerns, including the way in which perceived benefits could alleviate patient concerns. Based on the mapping done there we developed several scenarios related to the rollout of new health information collection and sharing innovations. These scenarios were then shared with the GMB participants in a follow-up session. |
| Results | Based on the map, scenarios, and discussion, a number of areas where slowing the adoption of data collection and sharing seemed to be beneficial. These areas seemed largely to be related to behavioral risk factors of individuals. In contrast, speeding the rollout of IT systems related to environmental risk factors seemed advantageous. |
| Discussion | One of the most interesting discussion points that came up during this work was the role of centralization in managing health care data. Though beyond the scope of our research, it was a common topic of discussion that under a single payer system with centralized oversight of all IT activities the level of comfort related to information sharing would be higher. It would be interesting to repeat this study in a single payer system such as that in the UK. |
| Use of AI | None |

# Methodology

| Introduction | Starting a model in equilibrium is a challenge faced by modelers at all skill levels. We develop a set of steps to aid in this process by creating a set of dependency relationships among the stocks in a model. This allows model developers to specify some stock values and automatically compute the remaining values necessary for equilibrium. |
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| Approach | We run models millions of times from randomly assigned starting conditions. For those that reach a steady state, we record the associated stock values. We then create a distribution of all attainable steady states. |
| Results | For strongly convergent models with a single steady state we simply report the equilibrium values found. For weakly convergent models which reach steady state, but at different stock values, we report the distribution of stock values attainable. For partially convergent models we report the distribution of stock values attainable, and the distribution on stock values that do not achieve steady state. |
| Discussion | Though we set out to develop a tool to determine stead state, we have found that the application of our tool actually tells us more about the nature of the model under investigation, identifying them as strongly, weakly, partially, or not convergent. Extending the tool to do the same type of analysis on models that has balanced growth where the relative values of stocks are unchanging, would be even more insightful. |
| Use of AI | None |

# Insights

| Introduction | The World3 model has an equation for life expectancy that makes a sudden jump in 1940. While the reasons for this formulation are clearly stated, it begs the question of whether a more endogenous formulation would change any of the results significantly. We introduce such an endogenous formulation and rerun several of the books scenarios to answer this question. |
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| Approach | We took the 1993 version of the World3 model and changed the formulation for the lifetime multiplier for health services to be the same before and after 1940 but to have a component of technological change. The resulting formulation gives largely similar, though not identical, results in the historic period to 1972 (and to 1993). |
| Results | Though the results were different, and the magnitude of the difference grew after 2000, they were not substantially different. Population, the thing most directly affected by the change, altered only about 3% relative to the original runs, and the timing of the peak by less than 5 years. More importantly, running the alternative scenarios and comparing them to the new base run showed the same changes in behavior. |
| Discussion | Revisiting some of the classic models from the past is an interesting learning exercise. It is so much easier to do this type of analysis today than when the original work was done, that exploring some of the pathways never taken in the classic work can help us better understand the strengths and weaknesses of the past work. |
| Use of AI | None |

# Learning Assessment

| Introduction | A systems perspective is well integrated into most college ecology courses, but few ever introduce the students to formal modeling. Based on a standard undergraduate ecology course, we compared student performance for sections that included or excluded a module on system dynamics to determine its value in the curriculum. |
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| Approach | There were four sections a course offered. For each of them, the same material was covered except for one week during which either a specialized topic was covered, or basic system dynamics was taught. A voluntary exam was used to measure the value of the special week. |
| Results | There were 212 students overall and 160 participated in the exam. Students in sections that received a module for a specific topic area did significantly better on questions related to that topic area, but not significantly different on other questions. Students that were taught System Dynamics did significantly better on the general questions. They did better (not significantly) on specific questions than students who did not take the related module. |
| Discussion | Systems literacy has value in learning about many things, though the amount that can be learned in a week is limited. It would be interesting to see if a one semester course on system dynamics would make an even more significant difference. The design of such an assessment is straightforward, but getting a large enough sample size to generate meaningful results is likely difficult. |
| Use of AI | None |

# Pedagogy

| Introduction | Describing the motion of a pendulum is a standard part of high school physics curriculum. We introduced a system dynamics model, and to some extent system dynamics modeling, as part of teaching the pendulum. |
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| Approach | The class is first given a lab in which they measure period under different lengths and initial displacements. Then they are given the standard theory and analytical solution and asked to compare those results to their lab measurements. They are then introduced to a system dynamics model that includes both friction and the nonlinearity resulting from larger displacements. Then we repeat the mathematical solution. |
| Results | After conducting the lab and going over the formal solution only the top 20% of the students really seem to understand. When the simulation is introduced, most of the class is engaged, and can see the direct connection between the model and the experiment. Going back to the analytic solution is easy at this point. More understand it, and there is a clearer understanding of its limitations. |
| Discussion | System dynamics provides a fun and effective way of teaching the pendulum. Based on this material we are extending the use of system dynamics to other parts of the curriculum. The work is additive, and students don’t think of it as learning system dynamics so much as an alternative to formally derived solutions. We are also working on developing more labs that only use the simulations where a physical lab would be impractical, but still keeping as many physical labs as possible as that work is foundational to good science. |
| Use of AI | None |

# Commentary

| Introduction | Building models and presenting results has become far too easy and is impeding our ability to really think about the problems we are working on. Compounding this, the focus on attractive and colorful presentation material prevents the proper communication of what insights there are. |
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| Approach | System dynamics is all about building an understanding of how parts of a system come together in order to generate behavior. The ability to internalize that comes from repeated attempts to capture problem behavior, with each attempt being refined or discarded. The quality of modern software with all its guard rails and fancy graphics makes it look like things are “good enough” far to soon. Worse, when the final presentation is judged on how pretty it is the need to getting things right disappear. |
| Results | We need to go back to DYNAMO. Diagrams should be sketched by hand, or using drawing software, but should not be integrated into the modeling process. That step, from a diagrammatic representation, whether stock and flow or causal loop, to equations is where the magic happens. It is hard, and making it seem easy just makes it less likely that it is done right. |
| Discussion | Ultimately, if we are striving to have more people who can truly understand systems we need to give them the rigorous training they need to do it right. Shortcuts are not helpful. They build confidence without building competence. |
| Use of AI | None |