System Dynamics for Development and the World Bank Operations

Organizer:
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Roundtable Description:
The recent financial and economic crisis in the world's richest economies has exposed developing countries, already affected by the lingering impact of the fuel crisis, to an economic slow-down. Moreover, emerging economies continue to face exacerbated challenges in providing adequate nutrition and care to its poor populations. The devastating consequences of weather-related disasters deterred governments' efforts to contain the food crisis and undermined the need for a holistic approach to poverty alleviation agenda.

In view of these unprecedented events, it is essential to facilitate nutrition and health efforts and implement effective disaster-risk management strategies. It is also vital to look for new drivers of growth within the hard-hit economies, such as developing information and communications technologies (ICTs). The later are increasingly used as a transformational tool to foster economic growth, accelerate knowledge transfer, develop local capacities, raise productivity, and alleviate poverty in a variety of sectors. In that respect, in the last decade, ICT development has become a key strategic area for policy engagement in emerging economies.

National governments, NGOs, and many private sector companies are undertaking a vast array of international development projects with the goals of enhancing infrastructure, strengthening institutions and furthering sectors including health, agriculture, and education. Choosing amongst policy alternatives and between different project paths is a great challenge in these efforts which have many and varied participant roles; and complex economic, institutional and cultural considerations. Indeed international development efforts are characterized by dynamic relationships and strong feedback loops.

To support policy-makers in designing optimal development strategies, this Roundtable aims at bringing together development experts and system dynamics modelers. Although very little known and used by large international organizations, such as The World Bank, system dynamics modeling technique is increasingly proving its applicability and relevance to developing work. Policy-makers need to look for innovative approaches that offer guidance on improving the design and implementation of development programs, and help identify critical activities, knowledge gaps, as well as the highest payoffs to filling those gaps. System dynamics seems to be a good candidate in addressing these challenges.

During the Roundtable, the potential of system dynamics for international development will be reviewed including presentations by a panel of development experts who use system dynamics in support to policy-making activities and an open discussion by Roundtable attendees.

PRESENTATIONS

John Newman, The World Bank

"Tools to Help Scale Up Interventions that Can Make a Difference to Nutritional Outcomes"
Developed at The World Bank, the Multisectoral Simulation Tool (MST) helps countries understand how different types of interventions at varying scales are likely to affect the impact on nutritional outcomes and the cost of reaching their goals. At the heart of the MST is a causal model that links multisectoral interventions to nutritional outcomes.

The MST allows users to determine what time, money, and effort is required to operate a given intervention at a desired scale. The MST to Scale Up Nutrition is based on an approach grounded in the well-established System Dynamics field that offers several important advantages over Excel-based simulation approaches.

Matthew Strickland and Walter Jansen, Booz Allen Hamilton

Household Food Security Analysis in a System Dynamics Paradigm

Abstract:
To examine the issue of food security within developing countries we incorporated Household Economy Analysis with data from several sources into a System Dynamics model. Given the importance of local crops to food security in developing countries, we initially focused on crop production. This method can also examine longer-term impacts of the multiple feedback mechanisms within such a system, particularly in response to certain shocks. Additionally, the simulation lays the groundwork for combining HEA with markets and trades analysis into one analytical paradigm. This pairing takes advantage of the extensive data collection and analysis performed by the food security community in developing countries, as well as the extensive econometric analysis performed concerning those regions.

The model calculates crop production and household trends (expenditures, income, and consumption) and examines how changes to those parameters evolve in the presence of user defined shocks and mitigation strategies. The population is examined across four wealthbands and the geography is divided into Livelihood Zones within which all households of the same wealthband exhibit similar patterns of economic behavior. Users are able to investigate alternative future scenarios by altering agricultural inputs as well as aid mitigations (both magnitude and timing) to examine the impacts.

Mariana Dahan, The World Bank

"Putting "Laggards" in the Driver's Seat : Modeling the Ways to Speed-Up the Diffusion of Innovations"

Abstract:
Evidence shows that information and communications technologies (ICT), especially mobile telecommunications services, can lead to sustained economic growth and human development. Mobile technologies are increasingly used as a transformational tool to foster economic growth, accelerate knowledge transfer, develop local capacities, raise productivity, and alleviate poverty in a variety of sectors. In that respect, in the last decade, ICT development has become a key strategic area for policy engagement in emerging economies. To support policy-makers in designing optimal telecommunications sector development strategies, an increasing research

focus is now being placed on the impediments to implementing ICT solutions in the developing world.

As a contribution to this field of research, this study aims at (i) identifying the economic and socio-cultural determinants affecting the capacity of developing countries to adopt new technologies and innovations, and at (ii) defining relevant policy principles likely to foster the diffusion of ICT solutions in emerging economies that are characterized by strong income inequality and uncertainty avoidance.

Once fully calibrated using available mobile phone diffusion data for 17 countries, our system dynamics model is used to explore various ICT development policy options and quantify their impact on diffusion speed and extent in both developed and developing countries.

Jean-Pierre Auffret (GMU), Chrisitine Qiang (The World Bank)

"Mobile Apps and Mobile Ecosystems: Applying Systems Dynamics to Mobiles for International Development"

Abstract:

There are currently over 5 billion mobile phone subscribers worldwide and Gartner projects sales of more than 23 billion mobile apps in 2013. Mobile initiatives are having an impact in fostering economic development and contributing to sector specific development in healthcare, banking, education and agriculture. There are great challenges though in scaling and replicating these initiatives and in developing financially sustainable business models. In turn, policy makers have many alternatives to consider and evaluate in order to contribute to the development of vibrant mobile ecosystems that result in successful mobile initiatives. The paper reports on the development of a Systems Dynamics model for representing mobile ecosystems and the introduction and adoption of mobile apps. The paper presents Influence and Stock and Flow Diagrams representing mobile ecosystems and presents preliminary results of simulations using Vensim. The potential benefits of utilizing the model in analyzing mobile ecosystem development and possible policy interventions are described for Philippines, Ghana, Indonesia, India and Colombia.