

Exploring the Benefits of a Model Building Case Study Database

Workshop prepared for submission to:

The International 2017 System Dynamics Conference in Cambridge, MA,
Submitted: March 21, 2017

Workshop Presenter: Warren Farr

Requested Workshop Time: 3 hours

Requested Room Requirements:

Internet Connectivity and Participant Provided computer/laptop

Expected Attendance: 12 people

Max Attendance: 36 people

Preferred Participants:

Members of the system dynamics community that are practicing some form of group model building exercises are preferred. The more experience with group model building that a participant has, the more they will understand the challenges of collecting, storing, and recalling the kinds of information artifacts created and the more they will be able to exercise the provided database solution.

Abstract for Proceedings (200)

System dynamics is used to tackle 'messy' problems rich in feedback and accumulations. System dynamics group model building scripts have been developed to add structure and repeatability to the group model building process. Group model building scripts describe, among many other things, the information required as input to each group model building process as well as information that will become the output of each group model building process. Examples of artifacts include: variable lists, behavior over time graphs, causal loop diagrams, etc. While many different informational input and output artifacts are described in detail, little attention has been paid to how a collection of such artifacts should be organized and stored for optimal use and recall.

This workshop provides hands on experience with system dynamics case study database software designed for this purpose. During the workshop, participants will experience a small group model building project while using the case study database to enter and manage the resulting group model building artifacts. While time will be spent learning how to use the database, the focus of the workshop will be on discussing the advantages and disadvantages of using such a case study database for system dynamics group model building engagements.

Workshop Description (250)

The system dynamics group model building process creates many information artifacts critical to the creation of a well-informed system dynamics model (variable lists, behavior over time graphs, causal loop diagrams, etc). Group model building scripts specify the form and function of several informational artifacts; however, little attention has been paid to the organization and storage of a large collection of artifacts. In practice, capturing, storing, and efficiently recalling multi-media artifacts is a difficult task. To simplify this task, system dynamics case study database software has been created for the purpose of storing, organizing, and easily recalling group model building artifacts.

During the proposed workshop, attendees will participate in prepared group model building scripts for the purpose of using the database software to capture, store, and organize the resulting informational artifacts. After some practice with the software, participants will be asked to discuss the advantages and disadvantages of using this kind of software tool. The goal of the workshop is to give participants first-hand experience with such a tool for the purpose of exploring the advantages and disadvantages through interactive discussion. This workshop represents an opportunity for group model building practitioners to explore a new innovative way to manage their data while discussing their observations with peers. The resulting discussion will be noted and used as input to database refinements and possible future system dynamics papers for publication.

Example Database Screenshots

The following pictures represent the interactive screen designs used to organize and recall group model building information. Each picture is briefly labeled with its purpose.

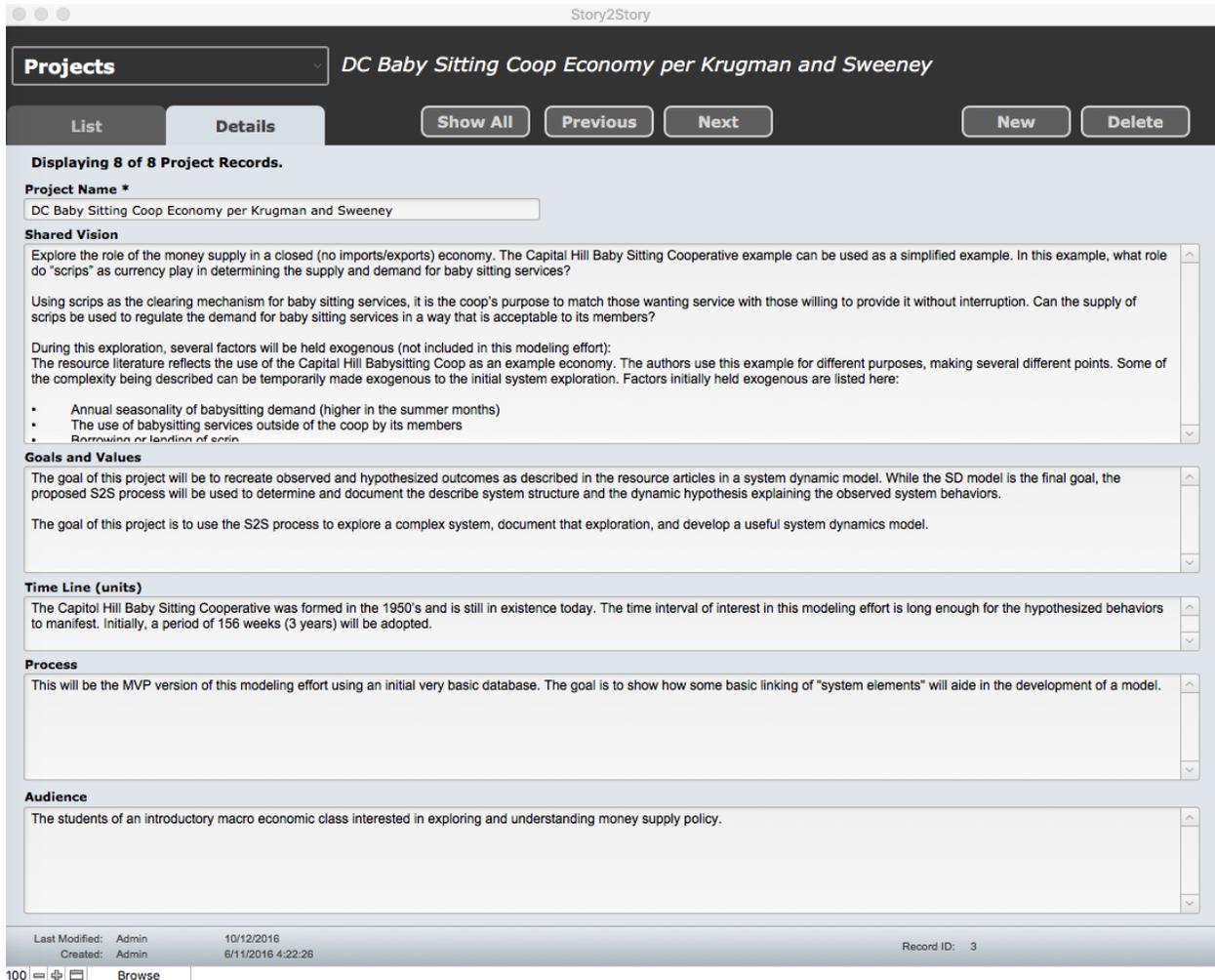


Figure 1: Overview of a GMB "Project" record showing information unique to each project.

Story2Story

Participants *WU Social System Design Lab Story2Story Introduction*

List Details Show All Edit Find Organization New

Displaying 18 of 18 Records.

Nickname	Role	Organization	Created	Modified
Ellis Ballard	Expert	Social System Design Lab	12/12/2016	12/12/2016
Saras Chung	Expert	Social System Design Lab	12/12/2016	12/12/2016
Patrick Fowler	Expert	Social System Design Lab	12/12/2016	12/12/2016
David Habif	Expert	Social System Design Lab	12/12/2016	12/12/2016
Peter Hovmand	Expert	Social System Design Lab	12/12/2016	12/12/2016
Irum Javed	Expert	Social System Design Lab	12/12/2016	12/12/2016
Danielle Metzger	Expert	Social System Design Lab	12/12/2016	12/12/2016
Kyle Pitzer	Expert	Social System Design Lab	12/12/2016	12/12/2016
Sarah Pritchard	Expert	Social System Design Lab	12/12/2016	12/12/2016
Mary Jo Stahlschmidt	Expert	Social System Design Lab	12/12/2016	12/12/2016
Erin Stringfellow	Expert	Social System Design Lab	12/12/2016	12/12/2016
Sicong Sun	Expert	Social System Design Lab	12/12/2016	12/12/2016
Lynda Tolley	Expert	Social System Design Lab	12/12/2016	12/12/2016
Diane Wittling	Expert	Social System Design Lab	12/12/2016	12/12/2016
Arya Yadama	Expert	Social System Design Lab	12/12/2016	12/12/2016
Koko Zhou	Expert	Social System Design Lab	12/12/2016	12/12/2016
Yiqi Zhu	Expert	Social System Design Lab	12/12/2016	12/12/2016
Warren Farr	Facilitator	Informed Dynamic Systems	12/12/2016	12/14/2016

Last Modified: Zevon 12/12/2016
 Created: Zevon 12/12/2016
 Record ID: 158

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Figure 2: List of a GMB “Participant” records that can be searched and sorted different ways.

Story2Story

Participants *WU Social System Design Lab Story2Story Introduction*

List **Details** Show All Previous Next New Delete

Displaying 18 of 18 Records.

Last Name * 

First Name *

Nickname Combined Full Name

Role Organization

Description

Warren is currently working with businesses to understand and improve the issues that "never seem to get resolved". As a part of his work, Warren is discovering robust ways to help people understand the endogenous behavior of complex systems. During his career, Warren spent 20 years as President/CEO of Refrigeration Sales Corporation, a midwest wholesaler of heating, ventilating, air conditioning, and refrigeration equipment, parts, and supplies.

Prior to RSC, Warren held various product design and technical sales positions in the growing computer networking industry of the 1980's and 1990's. Warren obtained his MBA from the Fuqua School of Business at Duke University, his Master of Science in System Dynamics from Worcester Polytechnic Institute, and his Bachelor of Science from Duke University.

Warren's career has been spent designing and operating complex systems: mechanical, electrical, and social. Since 2000, System Dynamics has provided him a robust way of describing, analyzing, and improving those systems. Warren is an active member of the International System Dynamics Society's Policy Counsel.

Participant Session(s) **Session Date:**

▶ Initial Hopes and Fears 12/14/2016

Participant Artifact(s) **Artifact Type:**

▶ Hope: Wide audience Media

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Figure 3: Overview of a GMB "Participant" record showing information unique to each participant.

Story2Story

Sessions
Richardson "canned" Epidemic Model Exercise

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Displaying 9 of 9 Records.

Session Name *	Session Date *	Start Time (24h)	End Time (24h)	Duration (hr:min)
Modeling 1	10/27/2016	9:00	13:00	4:00

Abbr Session Name *

Modeling 1

Session Notes for Facilitators

I have identified the key accumulations and drawn their BOT graphs. I have also drawn the basic feedback mechanisms responsible for the epidemic dynamics. In addition, I have looked at the assignment carefully and drawn the causal math as well as listed what I think are the required model variables.

Now it is time to attempt a model. I will use Vensim while keeping S2S open for reference. My goal is to put down the variables that I have identified along with any equations that I have identified from the assignment.

Observations and things learned will be captured as new artifacts.

Session Notes for Participants

I have identified the key accumulations and drawn their BOT graphs. I have also drawn the basic feedback mechanisms responsible for the epidemic dynamics. In addition, I have looked at the assignment carefully and drawn the causal math as well as listed what I think are the required model variables.

Now it is time to attempt a model. I will use Vensim while keeping S2S open for reference. My goal is to put down the variables that I have identified along with any equations that I have identified from the assignment.

Observations and things learned will be captured as new artifacts.

Session Participant(s)

Participant	Participant's Role(s) during the Session:
Warren Farr (Warren)	Modeler

New Participant ...

Session Artifact(s)

Artifact	Artifact Type:
How People move thru Epidemic rev2	Media
Epidemic Model R1A	Simulation
Epidemic Model R1B	Simulation

New Artifact ...

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 Created: Admin 10/24/2016

Record ID: 50

Figure 4: Overview of a GMB "Session" record showing information unique to each Session.

Story2Story

Artifacts Richardson "canned" Epidemic Model Exercise

List **Details** Show All Previous Next New Delete

Displaying 21 of 21 Records.

Artifact Title *
The Mechanics of Becoming Infected 41

Source Session
The mechanics of becoming infected In-Session

Pre-In-Post

Abbreviated Title 1

Artifact Source Participant(s)
Warren Farr (Warren)

Type *
Media 

Author / Source **Publication / Title** **Pub Date**

Text Content

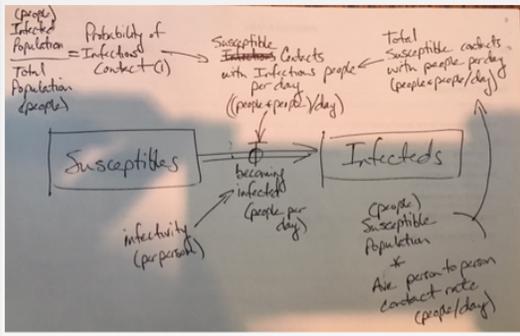
From the assignment (my drawing included here):

- A susceptible person makes contact with a number of people per day. For simplicity, assume the average number of people contacted per susceptible per day is constant throughout the epidemic (5? 10? 25?).
- Susceptible contacts per day is defined as the number of susceptibles times the average number of people contacted per susceptible per day.
- Some fraction of the susceptible contacts per day is with infectious people.
- The probability that a contact is infectious is the ratio of the infectious population to the total population.
- Finally, some constant fraction of the susceptible contacts with infectious people per day will result in transmitting the disease.

The infection rate is the number of susceptibles infected per day. It equals the number of susceptible contacts with infectious people per day times the fraction of contacts transmitting disease.

From the diagram:
 Susceptibles (Susceptible Population)
 Infecteds
 becoming infected
 infectivity
 Infected Population
 Total Population
 probability of infectious contact
 Susceptible contacts with infectious people per day
 Total susceptible contacts with people per day

Media Content & Type: Causal Link 



Inspect Media ...

Last Modified: Zevon 3/16/2017
 Created: Admin 10/24/2016

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Figure 5: Overview of a GMB "Artifact" record showing information unique to each Artifact.

Story2Story

Key Words Richardson "canned" Epidemic Model Exercise

List Details Show All Previous Next New Delete

Displaying 23 of 23 Records.

Key Word (Parent) *
Recoveredds

Type
Accumulation 

Priority
A - Now **Priorities ...**

Key Word Units
people

Definition
People who have previously been infected and who have successfully recovered from the infection such that they no longer have symptoms of the disease and such that they have (temporary) immunity to the disease.

Key Word Alias Information

Parent:
> n/a

Children:
> Immune
> Recovered Population

Families ... 2

Key Word Links to -

Artifact & Session:	Artifact Type & Media Type
> How People move through an	<input checked="" type="checkbox"/> Media
> Assignment Day	<input type="checkbox"/> Structure Map
> BOTG: Infected People	<input checked="" type="checkbox"/> Media
> Thinking about behavior over time	<input type="checkbox"/> BOTGraph
click to add/change linked Artifact	n/a
n/a	n/a

Select Artifacts ...

Last Modified: Zevon Nov 3, 2016
Created: Admin Oct 23, 2016

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Figure 6: Overview of a GMB "Key Words" record showing information unique to each KeyWord (variable name).