GSA Webinar Series

Moving From Linear to Reciprocal: Conceptualizing Productive Engagement Using System Dynamics

SUPPORTED BY THE GSA INNOVATION FUND: THE GENERATIVITY EFFECT
Panel

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Innovation in Aging
An Interdisciplinary Open Access Journal of GSA

Publishes innovative, conceptually sound, methodologically rigorous research on aging and the life course that has high potential for translating scientific knowledge to improve older adults’ health, functioning, and well-being.

Studies may present results from community, clinical, or laboratory settings and should focus on issues directly relevant to aging and the life course. Journal content reflects the wide-ranging research interests of GSA members.

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Contributions are welcome from scholars from many fields, including technology, engineering, architecture, economics, business, law, political science and public policy, education, public health, social and psychological sciences, biomedical and health sciences, and the humanities and arts.
Objectives

We intend for participants to:

- Understand the rationale for bringing system dynamics to the study of productive engagement in later life.
- Learn the methods and outcomes of this particular effort.
- Be able to think about the potential of a system dynamics perspective in their area of research.
Please refer to our *Innovation in Aging* paper, *Conceptualizing Productive Engagement in a System Dynamics Framework*, to help in your understanding of the concepts we present today.

Online: https://doi.org/10.1093/geroni/igx018
Acknowledgments

- **Peter Hovmand**, PhD, Social System Design Lab, Washington University in St. Louis
- **Carmen Lee**, MPhil, Faculty of Social Sciences, System Dynamics Group, University of Bergen, Norway
- **Ellis Ballard**, MSW, MPH, Social System Design Lab, Washington University in St. Louis
Background

PRODUCTIVE AGING AND SYSTEM DYNAMICS
Productive aging (I)

- Concept introduced in 1985 by Robert Butler and Herbert Gleason.
- Objective: Shift the focus from the dependency of older adults to their contributions to families and communities.
- Since then, the potential contributions of this growing population have been widely noted.

Sources: Butler & Gleason, 1985; Rowe & Kahn, 1997
Productive aging (II)

Productive engagement: *Any activity*, paid or unpaid, that generates goods and services of *economic value*.

Usually operationalized as:
- Working
- Volunteering
- Caregiving

Source: Sherraden, Morrow-Howell, Hinterlong, & Rozario, 2001
Productive aging (III)

- Existing conceptual models:
  - Focus on **antecedents** and **outcomes** of productive engagement.
  - Are **linear** in nature.

Productive aging (III)

- Existing conceptual models:
  - Focus on antecedents and outcomes of productive engagement.
  - Are linear in nature.

- Influential factors include:
  - Social policies (e.g., government and employer policies)
  - Environment (e.g., demographic changes)
  - Situation (e.g., socioeconomic status)
  - Individual factors (e.g., motivation)

Productive aging (IV)

System dynamics (I)

- Roots in feedback control theory in engineering.
- Aims to understand the **behavior of a system** as a result of how two or more **feedback mechanisms** interact.

Sources: Fallah-Fini et al., 2014; Forrester, 1961, 1969, 1980; Hovmand & Ford, 2009; Munar et al., 2015; Sterman, 2000; Tobias et al., 2010; Wakeland et al., 2011
System dynamics (I)

- Roots in feedback control theory in engineering.
- Aims to understand the *behavior of a system* as a result of how two or more *feedback mechanisms* interact.
- Widely applied in the social sciences:
  - Domestic violence
  - Infant mortality
  - Obesity
  - Smoking cessation
  - Prescription medication abuse and overdose deaths
  - Urban decline
  - National economy

Sources: Fallah-Fini et al., 2014; Forrester, 1961, 1969, 1980; Hovmand & Ford, 2009; Munar et al., 2015; Sterman, 2000; Tobias et al., 2010; Wakeland et al., 2011
System dynamics (II)

Examples:


System dynamics (III)

- Argues that *circular causality is central to social reality*.
- Blurs the distinction between antecedents and outcomes.
- Uses informal causal maps and formal mathematical models with simulation.
- Attempts to find *leverage points*, or places in the system where high-impact interventions are possible.

Sources: Hovmand & Chalise, 2015; Richardson, 2011
This project

- **Aim**: To propose a new conceptual model of productive engagement in later life using a system dynamics framework.

- **Purpose**: To spur innovations in research, theory development, and teaching.
Methods

PILOT SEMINAR AND GROUP MODEL BUILDING
Pilot seminar (I)

- “Seminar in System Dynamics and Productive Engagement in Later Life”
- A pilot seminar to investigate incorporating the method of system dynamics with the field of productive aging:
  - Fall 2015: 10+ hours of face-to-face meetings over five weeks.
  - Early 2016: Ad hoc meetings to finalize the model over two months.
  - Three faculty, one postdoctoral fellow, and three doctoral students that included international visiting scholars.
Pilot seminar (II)

Seminar structure:
- First, discussed *weekly readings* with assigned facilitator. Readings included foundational and exemplary texts from both system dynamics and productive engagement.
Pilot seminar (II)

Seminar structure:

- First, discussed *weekly readings* with assigned facilitator. Readings included foundational and exemplary texts from both system dynamics and productive engagement.

- Then, designed increasingly complex, non-linear models with participant input using the *group model building* method.
  - Early meetings incorporated white board drawings.
  - Later meetings incorporated computerized modeling (via Vensim).
  - Ad hoc meetings held to finalize the paper.
Group model building

- A form of *participatory research*.
- *Qualitative, interactive*, and *iterative* method to engage participants to create system dynamics models.
  - Participants simultaneously discuss and model social phenomena and causal relations.
  - Concepts of system dynamics are introduced throughout.
  - The models developed are used to *spur discussions on system-level interventions*.

Sources: Luna-Reyes et al., 2006; Richardson, 2013; Vennix, 1999
System dynamics model legend (see paper):

- **Stocks** (accumulations) of specific variables
- **Flows** that increase or decrease a stock
- Variables that regulate the **rate of flows**
- **Auxiliary variables** that change with their antecedents
- **Polarity** of association between variables
- **Reinforcing feedback loop** that accelerates change
- **Balancing feedback loop** that counteracts change
- The system boundaries, called “**sources**” and “**sinks**”
Simple example of a stock and flow model

Results

A NEW PERSPECTIVE ON PRODUCTIVE ENGAGEMENT IN LATER LIFE
A system dynamics model of productive engagement in later life

Please see paper for a:

- Clearer image
- Description of system dynamics modeling conventions
- Fuller description of background, methods, findings, and implications

Stocks include:

- **Human capital** (e.g., health and education)
- **Social capital** (e.g., social network)
- **Family resources** (e.g., family financing or caregiving ability)
- **Organizational capacity** (e.g., ability to onboard volunteers)
- **Programs and policies** (e.g., Senior Corps financing)
- **Societal attitudes and expectations** about older adults (e.g., beliefs on the abilities of older workers)
Reinforcing (R) and balancing (B) feedback loops

- **R1:** *Building organizational capacity through productive activity*
  
  Capacity of organizations → productive activity → change in organizational capacity → capacity of organizations
Reinforcing (R) and balancing (B) feedback loops

- **R1**: Building organizational capacity through productive activity
  Capacity of organizations → productive activity → change in organizational capacity → capacity of organizations

- **R3**: Building human capital through productive activity
  Human capital → productive activity → building human capital → human capital
Reinforcing (R) and balancing (B) feedback loops

- **R1:** Building organizational capacity through productive activity
  Capacity of organizations → productive activity → change in organizational capacity → capacity of organizations

- **R3:** Building human capital through productive activity
  Human capital → productive activity → building human capital → human capital

- **B1:** Depleting family resources through family caregiving
  Family resources → family caregiving to older adults → depreciation in family resources → family resources

- See paper for complete list of exemplar feedback loops
This model illustrates:

- How changes in one factor can have **wide-ranging and reciprocal impacts** on other factors.
This model illustrates:

- How changes in one factor can have **wide-ranging and reciprocal impacts** on other factors.
- How productive engagement:
  - Is heavily influenced by **extra-individual factors** such as programs, policies, and organizations.
  - Has both **positive and negative effects**.
  - Is heavily influenced by the **human capital of older adults**.
Going Forward

IMPLICATIONS FOR GERONTOLOGICAL RESEARCH, TEACHING, AND PRACTICE
Implications for research

- **First step** in developing a more complex, accurate, and testable model of productive engagement in later life.
- We can next add *quantitative parameters* to this model while *operationalizing key concepts* (such as human capital).
- This work is inherently *transdisciplinary*.
- Ultimate goal: *Better articulate theory* while empirically testing leverage points for *future interventions and social change*.
Implications for teaching

- This effort can be *replicated in other fields* within gerontology, engaging students at all levels in group model building to identify and model circular causality.
- System dynamics and group model building enhance the teaching of theory, where models are traditionally linear in nature.
Implications for practice

- Group model building and the system dynamics perspective can be a part of *larger interventions* that involve stakeholders in:
  - Discussing and mapping an entire system.
  - Considering causes and effects of social phenomena.
  - Locating places in the system to intervene (“leverage points”).
- Stakeholders could include researchers, policymakers, clients, community members, persons of power, and practitioners, among others.
References

- For a complete list of references, please see our paper.
Contact

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Thank you!

- Today’s webinar will be posted on GSA’s YouTube channel: https://www.youtube.com/user/TheGerontologicalSoc
Questions?

- We will not be using the “raise hand” feature today.
- Please use the “questions” feature accessible on the right side of your screen.
- If we do not get to all of the questions today, we will email responses after the webinar.
Evaluation

- In an effort for continual improvement, we would like to hear your thoughts. Please provide feedback by clicking the survey link at the end of the webinar.

- Thank you again and we hope you enjoyed the program!
Thank You

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- Promote multi- and interdisciplinary research in aging
- Translate and disseminate research findings
- Promote/advocate for education/awareness on aging across disciplines
- Foster application of research into policy development

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