



International Society for the Systems Sciences

University, Pomona

California State Polytechnic



ntroduction

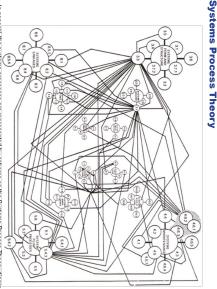
My thesis is focused on the cultural aspects of how people make decisions, what influences/motivates one to act in an environmentally friendly manner; and how can decision and policy makes capillatize on this knowledge to gain support, via opinion and action, for stricter environmental policies, regulations, and programs that would result in improved processors small quality in the striction of the control o sack is used during the creation and implementation of the environmental policies would be important to humans' con-

Feedback is widely used in systems to stabilize certain actions or functions, such as housing stock or thermostats; or for the direction of actions towards a goal (such as saving \$100 n a month) where the frequiently from that goal (such as having pared only \$50 in three weeks) is fed back, as information, till he goal or target is reached. Once a goal has been obtained, maintenance of the goal, called homeostasis is required. Most people consider feedback when making decisions, whether it is consideration of their own past experiences or others. In addition, before a policy is enacted feedback is received from several different across and then the policy is regularly analyzed to see if the goals of the policy are being met and maintained. As such, the application of feedback from a systems wewpoint could be helpful to understand how feedback is successfully used in other systems and could be applied to environmental policies.

Features of Feedback

- Identifying features include: Mechanism "black box" interactions among subsystems within the subject system and enable the system to function
- Output the product of the system over a certain time or under certain conditions.

 System that Senses Output The sensory portion of a system is usually only a small quantity relative to the output of the system. It measures relevant variables output in order to provide information about the output in the system it measures relevant variables output in order to provide information about the output in Section 1. Section 1.
- regulation (positive feedback) leads to rapid growth or decline or divergence
- Discinyms include: regulation/Homeobox, control, up-regulation, down-regulation, positive feedback, negative feedback, and Circular causality, Coupled Feedback Processes.



- In general, the systems processes are represented by spheres on the Systems Process Theory diagram (on the left) and the lines represent inkage propositions.

 Feedbacks are found within the "System Maintenance" functional cluster in the upper righthand corner of the diagram at the left. Hete, the lines represent the interrelations and mutual influences between feedback mechanisms and other systems processes (somorphies).
- tems Process Theorists can gain a better understanding of system dynam Linkages related to feedbacks in the Systems Process Theory diagram are By obtaining a better understanding of what influences feedback and how feedback influences other processes Sys-

1,000 1,200 1,400

- 4.1 Station States
- 4.3 Metastability
 4.4 Steady State/ Dynamic Equilibrium
 4.5 Transtemporal Stability
 4.6 Control/ Regulatory
 4.6 Control/ Regulatory
- 4.6.2 Positive Feedback
 4.6.3 Coupled Feedback

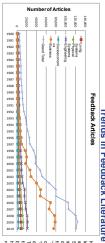
- 4.6.6 Single Loop/ Multiple Loop Feedbach

Systems Processes Theory (SPT) and Sustainability: VI. Application of Feedback as a System Process to Regulatory Decision Making

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Systems Science and Sustainability

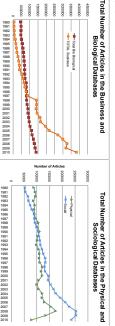
Trends in Feedback Literature



dalabase.

The amount of articles were obtained by using the word "feedback" as a key word search, not by searching in the tife or abstract, which would have likely revealed fewer, concise, and more relevant articles.

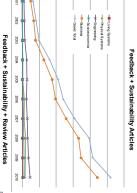
- The average number of annual "hits" for feedbacks was 39,879. "eedback" appears most often in the Abi/Inform database, which includes s Abi/Inform database is followed by engineering, physical systems, living sy. scholarly business publications, trade & industry and regional business news. stems, and so doeconomics databases, which suggests feedbacks are discussed the
- mitter of featured his gradually increase over this 30-year period with the exception of the Business database articles, which stone exponen-ted 1997. This is considered with the tends of the buil number of articles in each distabase, as shown in the graphs below. If of articles in each database related to "feedback" were not restricted to peer reviewed strickes or carbolarly articles, which would have likely
- esulted in fewer total articles. Synanyms and discinanyms were not searched, which would have revealed more articles related to "feedback".



350000 350000 250000 150000

*Restricted to two largest domains i.e. "turing systems" and "business/industry to better allow discrimination of trends in smaller domains. *Note gradual and sleady increase in ill of bio domain; any jumps in target lift searches indicates distinction from baseline. tricted to two largest domains i.e. "living systems" and "business/ ter allow discrimination of trends in smaller domains.

The article search was restricted to two smallest article activity domains physical systems" and "social systems" to better allow discrimination to it smaller domains are small record two years, amonally of databases in the physical sciences only represented by geology pending obtain Note that physical sciences only represented by geology pending obtain 1980 1981 1982 1983 1984 1985 1986 1987 1998 1990 1991 1992 2000 2001 2004 2005 2007 2008 2009 2000 2000 2007 2008 search was restricted to two smallest article activity domains i.e. stems" and "social systems" to better allow discrimination of trends



- - As shown in the table to the left, the business da-tabase has significantly more articles on feedbacks tabase has significantly impreeding, accor-and sustainability, followed by engineering, accor-e conomic, physical systems and living systems. This is slightly different than the "feedback" only search.
- - and sustainability.

 As shown, in the graph below, the search for "feedback," sustainability, and "review" is primarily dominated by the business database. search.

 The search using "sustainability" did not result in very many hits. It may have been better to search "sustainab" which would have included sustainable.

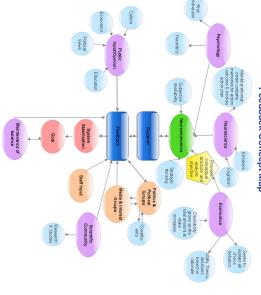
- 5,292 82,233 59,564 102,189 822 16,793

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California State University, National Science Foundation



Feedback Concept Map



- In the conceptual map in the associated poster attempts to show the influences and the dynamic process whereby one makes a decision and how feedback is used in the decision and policy process.

 I deas from neurobiology, economics, and psychology have combined to create the area of neuroeconomics which is studies decision-nations behavior.

 I deur consistent combing subavior.

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 I deur consistent combing subavior desirability and strategic thinking to analyze decision-making behavior, however, two areas of decision-making behavior that have yet to be reconciled are the economic theories of utility leach person makes only rational decisions) and Nash equilibrium. (In game theory, Nash equilibrium is strategies of the other players and no player can benefit by changing only his own more players know the equilibrium strategies of the other players, and no player can benefit by changing only his own
- strategy while the other players keep their strategy unchanged.)
 Therefore, neuroeconomics assists in understanding decision-making and influences the feedback process.

Application of Feedback to Sustainability

- Feedback is important in all systems and is is necessary for sustainability.
 Feedback can be seen in many different environmental systems.
 For example, the current dimate change can be understood as feedback from the environment that too much green.
- house gas emissions exists in the atmosphere, which is likely from anthropogenic uses
- Another example, is animal exinction and evolution.

Conculsions

- Feedbacks are already present in the environment, however, humans have primarily ignored these feedbacks from the
- There is a need for further research about feedbacks and a systems approach to applying feedbacks from other sys-
- terms of neuroeconomics and feedbacks, further research needs to be done to resolve the utility theory and Nash
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Incose-ISSS Collaboration

EEEXplore

- The International Council on Systems Engineering (hoose) and the international Society for the Systems Science (ISSS) have formally agreed to cooperate in exploring and developing systems science as a knowledgebase for both engineering and system science fields. Both organizations have had meetings in Canada, Arizona, and England to plan these joint efforts.

 John these joint efforts.

 This Systems Seance Working Group (SSWG) has identified four or five official projects, two of which focus on SPT and Systems Pathology (which are also SIGs of the ISSS).

 This poster is an example of one of the joint SPT projects to enable several graduate students in systems science systems engineering, or related fields to share their extensive literature survey on the large number of systems processes.

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- By cooperating in search and analysis of the diverse literature and especially by integrating, preserving, and making