From...Systems Innovation.

Complexity Theory Overview.

[10:51] May 17, 2017
LINK: https://www.youtube.com/watch?v=i-ladOjo1QA&feature=youtu.be

THE APPLICATION OF SCIENTIFIC METHODS TO URBAN ISSUES.

CharacterTowns.org, from time to time, has injected descriptions of scientific methods and theories into the discussion of city planning. The purpose is twofold: first, planners need to be aware of a bigger world of science and "big data" analysis in a general sense as it affects city sustainability. The theories and activities described in this video reveal new ideas about how to analyze the complex systems and issues planners address - housing, transportation, ecologic, social and economic systems, among others.

The second purpose is to introduce planners to the world of theories and the analytical methods employed by scientists and technological explorers that are directly applicable to issues and opportunities faced by all types of communities. In previous discussions found in the CharacterTowns.org archives, we have provided overviews of critical thinking, systems analysis, "wicked" problems, uncertainty theory, and the application of dashboards to city resource management. Authors have been presented from Heisenberg, Kahn, Toffler and Fuller to more contemporary thinkers like McDonough, Friedman and Kurzweil. There are certainly many other thinkers out there with ideas and techniques that can add intellectual power to city building.

The video in the YouTube link above gives a great overview of Complexity Theory in 10:51 minutes. You may think this train of thought is too far afield for city planners, but hang tough, this short video will enhance the way you approach complex problems.

COMPLEXITY THEORY OVERVIEW.

"Follow along with the course eBook: https://systemsinnovation.io/books/ Take the full course: https://systemsinnovation.io/courses/ Twitter: http://bit.ly/2JuNmXX LinkedIn: http://bit.ly/2YCP2U6 In this video, we will be giving an overview to the area of complexity theory by looking at the major theoretical frameworks that are considered to form part of it and contribute to the study of complex systems. For full course see: http://complexitylabs.io/courses

"Transcription excerpt: Complexity theory is a set of theoretical frameworks used for modeling and analyzing complex systems within a variety of domains. Complexity has proven to be a fundamental feature to our world that is not amenable to our traditional methods of modern science, and thus as researchers have encountered it within many different areas from computer science to ecology to engineering, they have had to develop new sets of models and methods for approaching it.

"Out of these different frameworks has emerged a core set of commonalities that over the past few decades has come to be recognized as a generic framework for studying complex systems in the abstract.
"Complexity theory encompasses a very broad and very diverse set of models and methods, as yet there is no proper formulation to structure and give definition to this framework, thus we will present it as a composite of four main areas that encompasses the different major perspective on complex systems and how to best interpret them.

1. **Self-organization theory.**
2. **Complex adaptive system theory, cybernetics.**
3. **Network theory.**
4. **Next nonlinear systems and chaos theory.**

"Nonlinearity is an inherent feature and major theme that crosses all areas of complex systems. A lot of nonlinear systems theory has its origins in quite dense and obscure mathematics and physics. Out of the study of certain types of equations, weather patterns, fluid dynamics and particular chemical reactions has emerged some very counter intuitive phenomena in the form of the butterfly effect and chaos.

Chaos theory, which is the study of nonlinear dynamical systems, was one of the first major challenges to the Newtonian paradigm that was except into the mainstream body of scientific knowledge.

"Our modern scientific framework is based upon linear systems theory and this places significant constrains upon it, linear systems theory is dependent upon the concept of a system having an equilibrium, although linear systems theory often works as an approximation, the fact is that many of the phenomena we are interested in describing are nonlinear and process of change such as regime shifts within ecosystems and society, happen far-from-equilibrium they are governed by the dynamics of feedback loops and not linear equations."

CONCLUSION: THE REAL WORLD IS NON-LINEAR.

"Trying to model complex systems by using traditional linear systems theory is like trying to put a screw into a piece of wood with a hammer, we are simply using the wrong tool because it is the only one we have. Thus, the areas of nonlinear systems and their dynamics is another major part to the framework of complexity theory that has come largely from physics, mathematics and the study of far-from-equilibrium processes in chemistry."

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