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EAS 550/STRATEGY 566: Systems Thinking for Sustainable Development and Enterprise

Individual Homework 1: Explore a System

Instructions:
The goal of this assignment is to practice systems thinking in a context you are familiar with. You can pick any system (and kind of system) for this exercise, but it should be a system you understand well. For example, maybe you did a course project on water systems, or worked for an energy distributor. You can also choose a social/political system like a local government or social network. Be creative! As long as it *is* a system, there is no wrong answer. Do not do any additional research for this assignment – you should be pulling from information you already have. It is totally fine (and expected!) to not know everything about a system.

Questions:

1. **Description:** Provide a short description of the system (~5 sentences). What is the context and what makes it a system?
2. **Nodes:** Identify the different elements/pieces of the system. At this point, this can be a list.
3. **Edges:** Think about the different connections between the elements. Sketch out the system elements and draw connections between them. Insert an image of that sketch below.
4. **Edge Type:** For each connection, describe the kind of connection. Is this a relationship? Information flow? Physical material flow? Etc. *Suggestion:* You could write the kind of relationship on your sketch, depict it with colors, or number the connections and describe the relationship in a numbered list.
5. **Uncertainty:** Consider uncertainty in this system. What elements or connections are more uncertain? What is the source of the uncertainty? (i.e. is there uncertainty because you're not sure about the relationship, is the process complex and difficult to determine the exact relationships, etc.)
6. **Complexity:** Identify at least two places where there is complexity – this could be in the form of a feedback loop or delay. How do these complexities influence system behavior?
7. **Reflection:** In ~5 sentences, reflect on this exercise. What parts were simple or challenging? How did mapping out your understanding of a system make you feel? Did the exercise change your perspective on the system?

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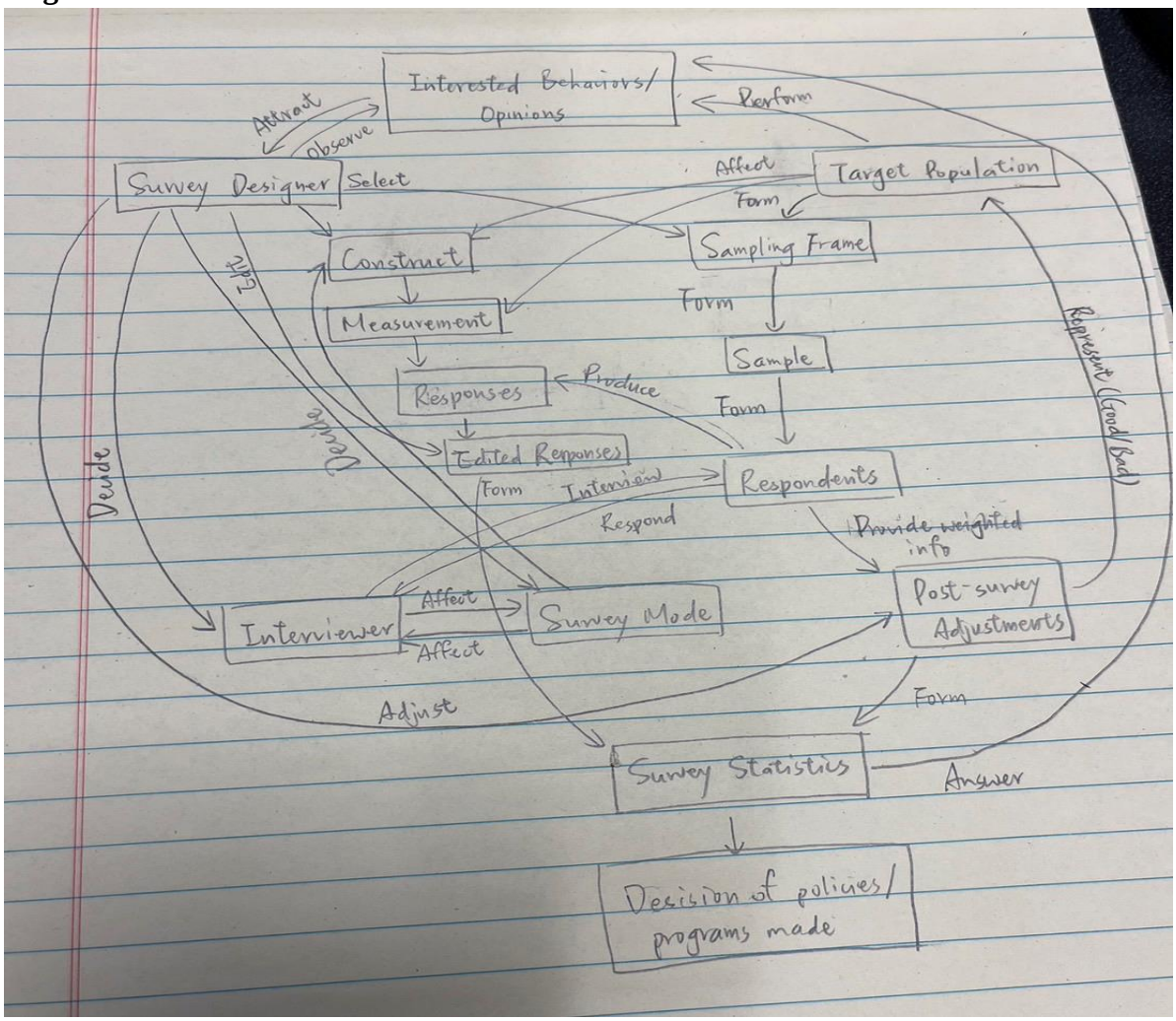
System: Fundamental of Survey Life System

1. **Description:** Survey is one of the research measurements that allows researchers to investigate behaviors/opinions of their interests. It is broadly used and seen in our daily life; however, survey design and methodology is an expertise that can create severe biases if used improperly, and affects the quality of analysis. Understanding the procedure of survey is the basis of getting rid of "evil analyses." In addition to the groups of people included, multiple steps affect the decisions made and, meanwhile, interact with the incorporated individuals. The interaction between the several groups of people, and the tools or techniques they use to relate with and affect each other, makes this procedure a system. Please refer to the following image for the fundamental of survey life system I explored.
2. **Nodes:**
   i. People: survey designer/experts, target population, sampling frame, sample, respondents, interviewers, post-survey adjustments (weights)
   ii. Procedure: interested behaviors/opinions, construction of survey, measurement of analysis, survey modes, responses, edited responses, survey statistics, decision of policies/programs
3. **Edges:**



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4. **Edge Type:** Due to the different relationships and time-series capturing of the elements in this system, there are many types of connections within it. For the target population, forming, producing, and representing are the most frequent relationships. For the steps of designing a survey, deciding, selecting, affecting, and editing are the most seen, where decisions, selections, and editions are usually made by survey designers/experts, and affections are usually made by target population of the survey.
5. **Uncertainty:** According to the complexity of human beings cognitions and the limitation of resources in the reality, financial and administrative feasibility are uncertain in this system. The uncertainty may impact to whom the research is able to reach out to, and to what extent each of the steps can produce the best quality. Interviewers can be the most out of control because they are basically outsiders in this research, seating between the survey designers and the respondents and powerfully altering the next steps and quality of data collected.
6. **Complexity:** Since the survey are intended to represent a large group of population with a relatively small group of samples, errors are frequently seen and are cautious to the results. Errors can be made in several sections in this system. One of them is the “measurements”, where the researchers foresee potential errors and optimize ways to work with this group of target population and co-workers. Demographic characteristics, availabilities, accessibility, and many other features that may not be recorded in current available data are required to be evaluated when making decisions about measurements. Another example can be “post-survey adjustments”, where the researchers try to align the results as close with the reality. With a plenty of information to consider, weighting samples, dropping wrong information, and eliminating the negative effects of outliers to form survey statistics with high quality for further analysis are very complex. Timing of each step taken in this system also make the system complex.
7. **Reflection:** Outlining the elements in a system is simple for me at the first stage; however, it became difficult to define the connections between elements because I wished to minimize the categories of relationship labels, which I failed to. It was specifically hard to include uncertainties into this system I explored because there seemed to be uncertainties everywhere in this system for it is highly related to the unstableness of individuals, or I may have misunderstood what the uncertainties meant in the prompts. I decided to mark the uncertainties of civils in this case at last for those were obvious and easy to illustrate. I excluded errors as uncertainties because I thought those were the expertise that survey experts were learning, developing, and addressing. Visually mapping out the system helps me better understand the system by including more and more relative elements into it. Nevertheless, I am still not sure about the distinguishers between uncertainty and complexity. I would like to know more about how to differentiate them.

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Example: To anchor the complexity of your assignment – you should include around this amount of detail (can do a bit more or a bit less) for your system.

System: Social network based on the soap opera-esque 2004 television show Veronica Mars.
Key: Blue are platonic relationships, Red are romantic relationships, and Grey are familial relationships. *Dashed lines* are relationships that have fallen apart, and *solid lines* are current relationships.