

11.965, Reflective Practice, Or, How to Give Global Relevance to Local Knowledge  
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**Lecture 3: Ways of Knowledge Generation**

**Powerpoint presentation, Sebastiao Ferreira**

I will explain what Cycle SECI is. Besides this list, there may be other ways of generating knowledge.

Most of the time in human history, we have learned and generated knowledge through experimentation. For example, a peasant in his work, generating maize or other crops – he plans his activity, takes care of the crop during the year, and then harvests. He tries to analyze whether the productivity was higher or lower. The main effort is to get results (the productivity of the crops), not to learn or discover things. The main purpose is not to learn, but to get concrete results. Learning is something that happens in between. The construction of an abstract model is not a phase in the process.

The other great way of generating knowledge is speculation. The most important part was the invention of the theorem, five centuries before Christ. The Greeks organized a method for speculating: if A, then B. They created a method for proving B. This made possible the development of mathematics and philosophy. If our knowledge is incomplete, then we are speculating. We invent something that we think exists.

Imagination was the main method used by Einstein. His main idea was to try to figure out what the world would look like for a photon. There are two ways of using imagination. Feynman (an American physicist) explains this. One way is to invent worlds, for writing stories. The other way is to imagine something concrete that can be verified by experiment. In this case, the person is doing science. He can make an experiment to verify if it is working or not.

IDEO is the most famous company in the United States for designing products. The idea is how to generate more ideas in less time. The best way to have a great idea is to generate a lot of ideas. Great ideas are not the result of genius, but the result of many ideas generated. Edison: at the end of five thousand attempts, he created the lamp. For most of our work, being able to generate lots of ideas is very important. Then we can have a portfolio of ideas that combines all of these ideas.

Scientific method: before Galileo, people used experiments to verify concrete ideas, but not theories. I believe it is the most important cognitive innovation someone has made. It enabled people to do a lot of different things by themselves. Our lives now are organized by this method, in many ways. It was so powerful that some people started to think it was the only way to generate knowledge, and devalued other methods.

In statistical analysis, we design a model and look at how things are, without any change by us. We are just observing what is happening.

The Cycle SECI is a very different approach. In this case, we have no experiment. This method is an approach developed by Nonaka and Takeuchi. They developed cognitive tools for managing companies. For example, the best way to learn to drive

is to sit at the side of someone who is driving. When we are learning by doing something with another person, there is a transference of knowledge. It is useful to talk, but we can learn without talking, just looking at how the other person works. We can transfer knowledge from one to another.

*Doesn't it matter what the tasks are? Those examples are more physical. If the task is writing a paper, it may not be done the same way.*

*Does the intention of the teacher matter?*

If someone explains to me the rules for what he is doing, that is explicit knowledge. That makes it easier. It is hard to assimilate tacit knowledge without context.

When I construct representations of my knowledge – to identify knowledge and express it – I am making tacit knowledge explicit. For example, when I tell a story. The first exercise in this course was about making tacit knowledge explicit. You had to remember and reconstruct your experience, and put it in symbols on the paper.

If I only have tacit knowledge, I need to be with the other person to transfer what I know. If I can put it in writing and symbols, on paper, it can be shared with many more people. Being able to use symbols to express the ideas in our minds was a great leap forward. The second leap was being able to write about the ideas. Transferring knowledge from tacit to explicit improves our knowledge capital.

Most of what we know, in general, is at the tacit level.

You are processing what I am saying, and combining it with your background in the field.

The final component is internalization. After I have received instructions, I go to the snowboard and try to apply the instruction.

Stephen Wolfram's work (New Kind of Science) shows how much we can go forward with modeling. Also, we can use models to forecast (economy, weather). Or we can use modeling for experimentation. We make a model and then go into the field to verify. If we find differences, we go back to the model, change the equations, go back to the experiment.

Reframing is when I understand things in another way. For example, the rate of crime in New York suddenly began to go down. A new wave of explanations arrived about why the crime declined. The mayor of the city explained that he had very good strategies with the police, and this was very effective. But the authors of Freakonomics studied the connection between abortion and crime rates. This is a very good way of reframing. It is a different way of understanding the same problem. It is not always easy to do this. It generates chaos in our mind for a while.

Conceptual Innovation is much more powerful than reframing. Reframing uses basically the same concepts, put together in a different way. Conceptual innovation is when I invent a new concept, which happens to produce a reframing. Examples: scientific method, creating chemistry as a science, the idea of tacit knowledge (changing our definition of knowledge), the concept of reflective practice.

Design is something with a lot of knowledge embedded in it. For example, a building design has a lot of knowledge about structures, spaces, light... Design is a way to aggregate knowledge around an object. The effort of Schon was to apply this approach of reflective practice to designing, in architecture and in general.

*When you talked about socialization – I think all the other ways you explained are also ways of socialization.*

Yes, I don't know why he chose that name. It was translated from Japanese to English, and people who did the translation found the word "socialization". But I understand that socialization is for many more things.

*Compared to the others, which are much more systematic, I think socialization is not as systematic as science. It happens in the way you interact with others, not necessarily what they say. That's why they say media is very powerful for socialization. I think one example is parents and kids, like kids doing what you're doing, not what you tell them to do.*

*Even if they don't know how to speak, they get something from what you're saying.*

*It's almost like mimicry, or a fad.*

### **Participant Exercise**

The idea is to create groups and analyze some of these ways of knowledge generation. All of you have had contact with many of these forms of knowledge generation. Separate in groups of four and choose one that is of interest (scientific method, design, modeling...).

*What if we create groups based on what people are interested in discussing?*

Written on the board: Design, Modeling, SECI (either one component or the cycle), Scientific Method

*The task will be to discuss, or come up with reflection?*

Describe its main characteristics, in which cases it may apply, in which cases it cannot apply this method. For people who work in developing countries, requirements for using the method is very important.

*How can you think about reframing without thinking of conceptual innovation?*

I can reframe while using the same concepts I'm working with.

(Reframing and Conceptual Innovation are also written on the board as topics of interest.)

Instructions:

- 1) Choose concrete example and describe

- 2) Analyze the method based on concrete case. What were the strengths? What were the limitations? Whose power was amplified or minimized because of the choice of method?
- 3) In which situations is this method useful?
- 4) In which situations is this method NOT useful?
- 5) Other observations about the method?

Students organize into three groups, discussing reframing, design, and SECI.

## **Presentations**

We only have 15 minutes left today, so we will finish this part of the exercise tomorrow. But it would be good if each group could talk about their experience – not to describe the exercise, since that will take some time, but talk about the experience. Tomorrow each group will talk about the exercise itself.

### ***Reframing Group***

*We were talking about the issue of reframing. We wanted to tease out what reframing meant in a situation presented by Yuma, in Framingham, where there is a Brazilian community in the center of town in what had been a ghost town. Soon there was a community of immigrants with shops, etc. But developers saw this area as undeveloped, and wanted to develop it. What would reframing have done in this situation?*

*We have a problem, and there's some disconnect between the two communities. What about looking from the perspective of common goals, getting the stakeholders to talk together? The exercise was useful for talking about how the situation changed, or could have changed. Then we could evaluate the other questions. Reframing is useful in a situation with multiple stakeholders.*

### ***Design Group***

*It was interesting because Rene was interested in policy design, but Ezra and I come from a more traditional design background. In some ways that was our context – if we're in Rene's shoes, trying to design some intervention in Latin America, how would we go about it? But we also discussed the architectural example that was provided.*

### ***SECI Group***

*We looked at the example of learning a language. It wasn't really a question of tacit knowledge, since you're born neurologically capable of learning language. Musa's son, his first language is Turkish and he's learning English now – he's eight – and he's starting to figure out linguistic constructs, how you pre-empt the sentence changes.*

## Wrap-up

Sebastiao: We only have a few minutes. How do you see this day, from the beginning? Can someone describe their experience today?

*I think it's always interesting to look at different models of how people are thinking. When you're trying to solve a problem, it's always useful to look at it different ways. What am I missing, where is the schism in this? I also want to argue with the powerpoint – I think what's amazing is not that we learned to write in caves, but that they had the resources that they were not just surviving, but had the fifteen minutes to think about it and scratch it out. The other thing that would be interesting – I think one of the examples that is missing is Descartes, it's a combination of all those things coming together.*

Should we describe the exercise tomorrow? [General assent.]