

Week 6 - Project dynamics in ISDM

I. Conceptualizing a model of a project

A. Stages in problem definition and conceptualization

*Problem focus

*Problem dynamics

*Context

*Audience

*Model purposes

Model boundaries

Temporal - what's the time horizon?

Conceptual - what's included and what's excluded?

Causal - what's endogenous and what's exogenous?

Aggregation

Reference modes

Initial policy options

Model sectors

Important processes in each sector

Important levels and associated rates in each process

1.

B. Problem focus

1. Project overruns in cost, people, and time

C. Problem dynamics

1. Graph of cost overrun

2. Graph of overrun in personnel

3. Graph of schedule overrun

D. Context

1. Imagine a client with lots of experience in cost overruns in R&D projects

2. Data on overruns available

E. Audience

1. Project managers; administrators and staff in an R&D group

F. Model purposes

1. Policy analysis to minimize overruns

2. Ongoing guide for project management

3. Teaching modeling

G. Model boundaries

1. Temporal

a) Life of the project -- assume about 4 years (48 months)

2. Conceptual

a) Included

(1) Workforce planning

(2) Making and reporting progress

(3) Scheduling

b) Excluded

- (1)Funding
- (2)Changes in the project definition (“ECO’s”)
- (3)Unforeseeable disruptions
- (4)Distinctions between managers and project personnel
- (5)Difficulty of hiring sufficiently skilled workers

3.Causal

a)Endogenous

- (1)Workforce planning, hiring, and quits
- (2)Making and reporting progress
- (3)Schedule changes from schedule pressure

b)Exogenous

- (1)Project definition
- (2)Tendency to make errors (assumed constant)

H.Aggregation

I.Reference modes

J.Model sectors

K.Important processes in each sector

L.Important levels and rates in each process and/or sector

M.Apparently important feedback loops

II.Formulating a project model - a sector view

A.Workforce sector

- 1.Workforce; hiring policy

B.Progress sector

- 1.Making and monitoring progress

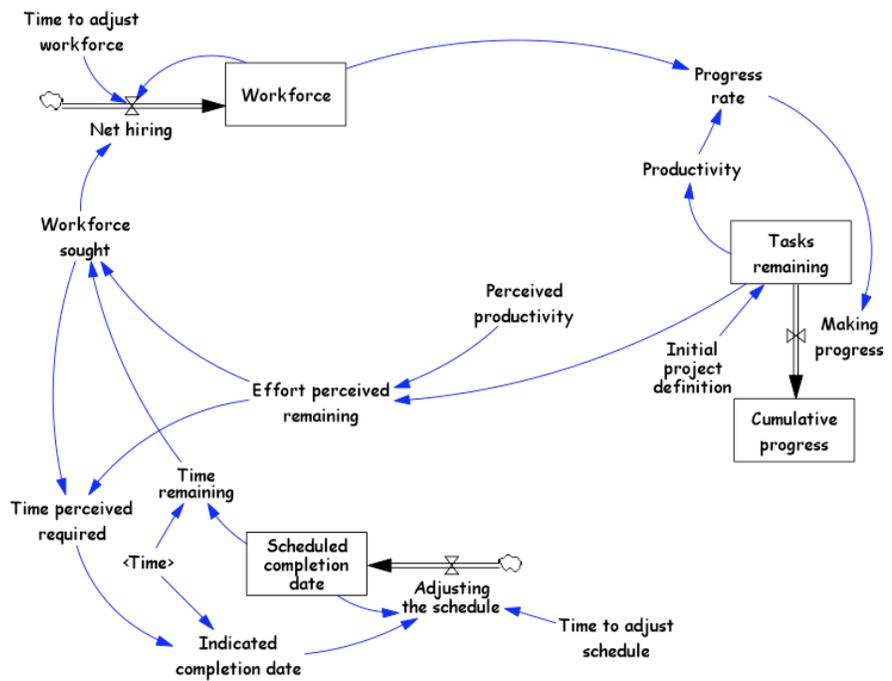
C.Scheduling sector

- 1.Setting the schedule; perceiving and acting on the need to change the scheduled completion date

III.Project model without rework

A.Project 1a: A concept model.

- 1.Develop main workforce-progress-effort remaining-hiring loop with class.
- 2.Provide schedule loop.



3.

4. Go through equations in detail.

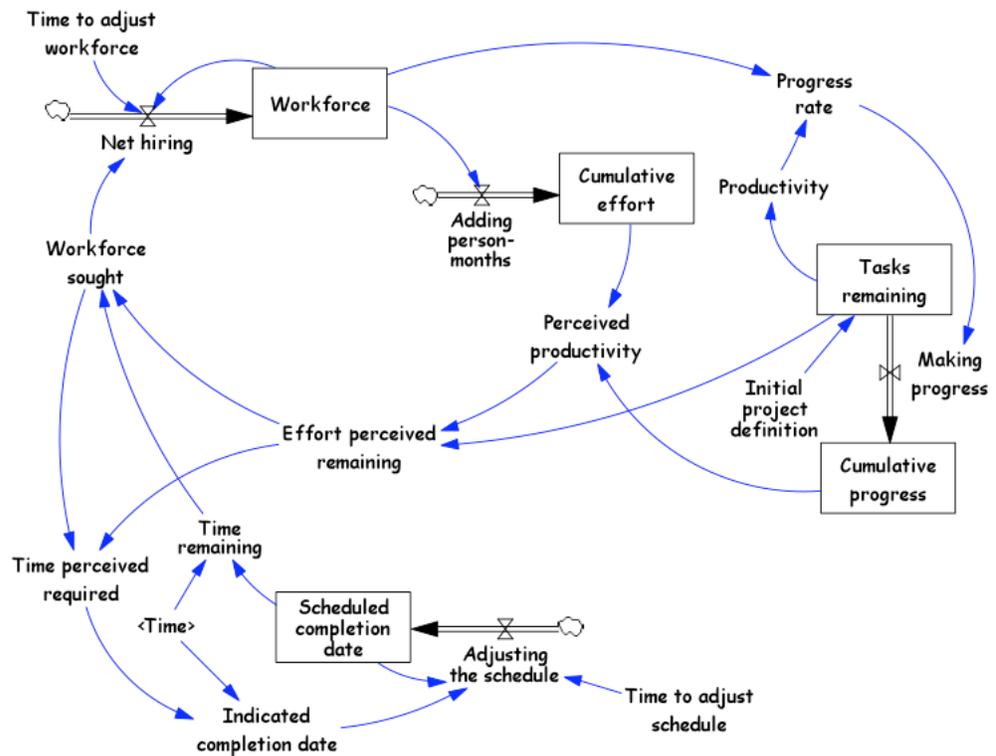
B. Project 1b: Accurate perceived productivity.

1. Elicit process for monitoring productivity (cum progress / cum effort).

2. Go through new equations in detail.

3. Note the technical necessity to set the initial value of Cumulative Progress to a tiny positive number to prevent division by zero in Perceived Productivity.

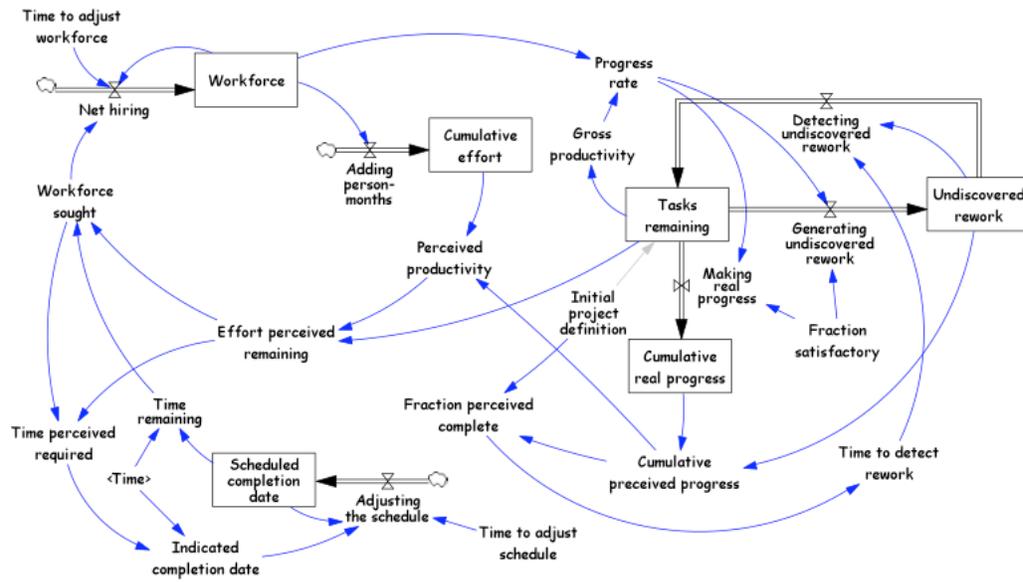
a) Note that such a technical fix usually means that we have formulated something that could not be done exactly that way in the real system. Here we have formulated a method of monitoring productivity that people evidently could not do at the beginning of a project. So they must be getting their early estimates of productivity some other way (guessing?) and then gradually moving to this monitoring method as the project develops. But we're ignoring that transition for the moment.



C.

IV. Project 1c: Addition of undiscovered rework -- a dynamic hypothesis for overruns

- A. Introduce the concept of a dynamic hypothesis
- B. Elicit from class potential reasons for overruns.
- C. Settle on Undiscovered Rework as the one to develop.
- D. Provide the following structure. Be sure they can write the new equations, especially Time to Discover Rework.

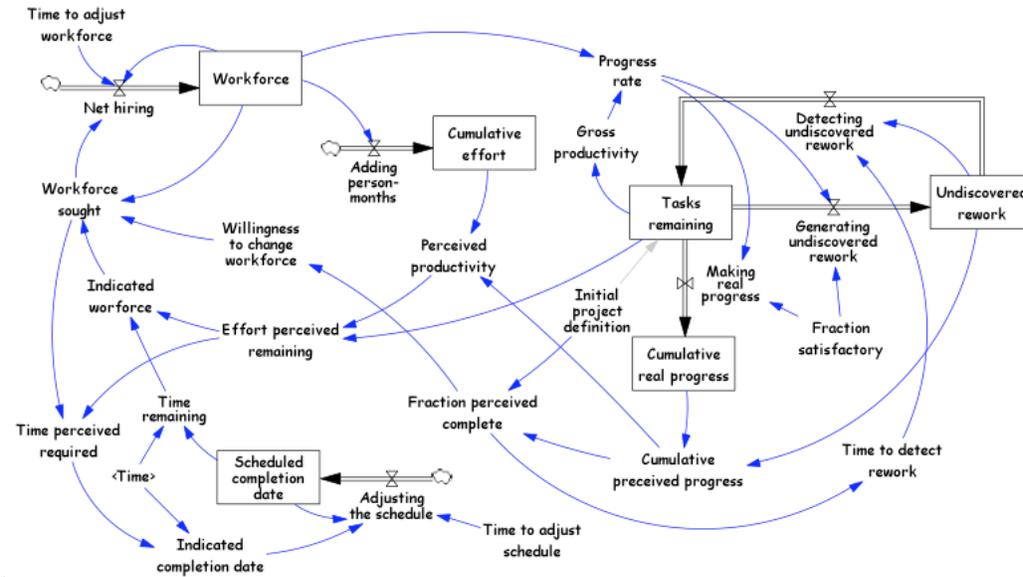


E.

F. Simulate this model (Project 1c).

1. Note sharp increases in Workforce near the end.
2. Motivate Willingness to Change Workforce.

G. Project 1d: including Willingness to Change Workforce



H.

1. Simulate. Note we have reproduced the reference behavior mode.
2. Change FSAT

I. Conclusions at this point

1. Undiscovered rework can generate project overruns.

- a) Again, experiments with the model in the assignment should indicate that there are problems with a constant fraction of the workforce in testing.
 - b) The best formulations here will capture what real people could and would do to set the fraction of workforce in testing.
4. Hand in documentation (figures, table functions) and representative runs, with commentary.