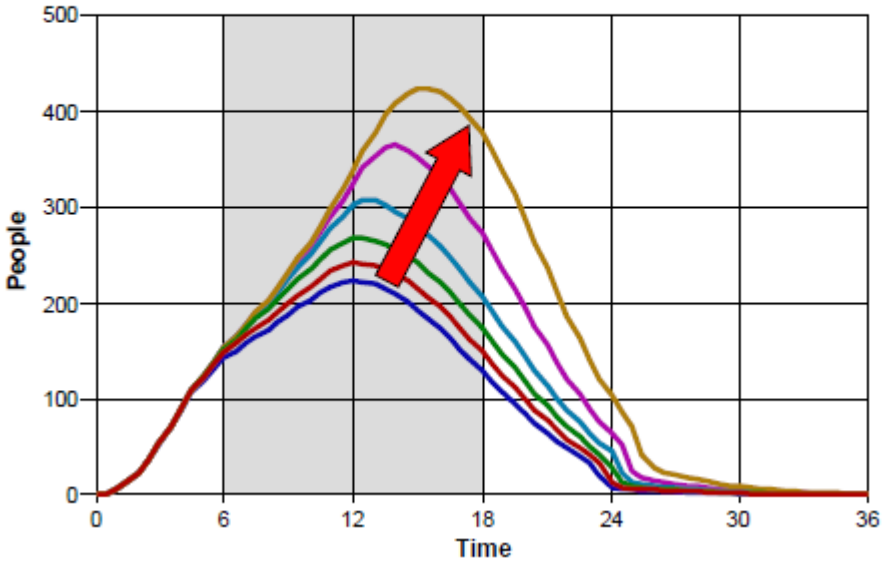
Product Development Recitation

Why does this happen, and how can we improve this?

Projects overrun — a real project plan, and subsequent plans



Product Development

- Success in the market often depends on being on schedule and budget.
- This assignment builds your understanding of the feedback structures driving success or failure in projects.
- Cost and schedule overruns, Late, Expensive and Wrong (LEW).

Deliverables

- Brevity is a virtue in your write up.
- Unless specifically requested, it is not necessary to hand in complete sets of output (graphs, tables) for each test and simulation you do. A summary table will suffice.
- For example, you might construct a table showing the date of project finish and cumulative effort expended.
- However, as always, you must explain the changes you make in the equations so that an independent third party can replicate your simulations.

A. Step 1: The Rework Cycle

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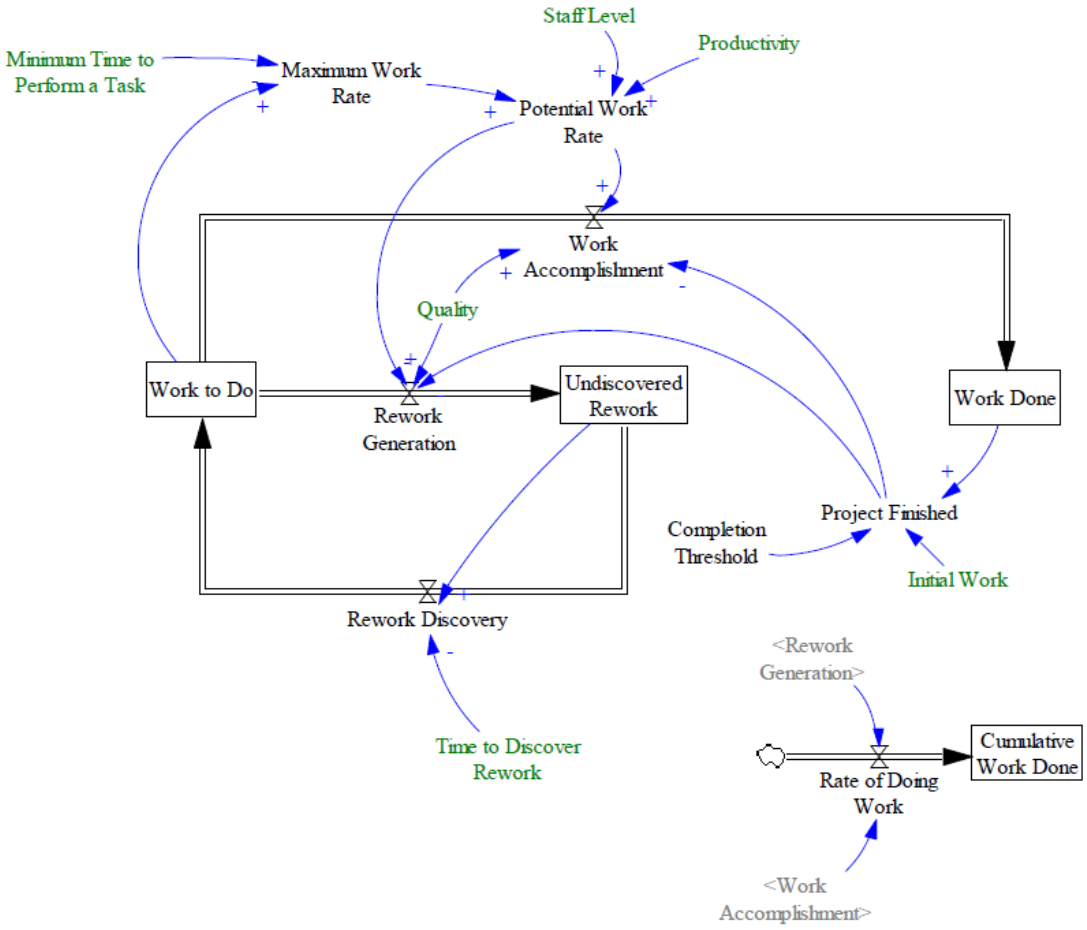
To begin your analysis, you hypothesize that the "rework cycle" is likely to be at the heart of the IT department's project problems. You therefore construct a rework cycle model of a typical department project, as illustrated in the following figure. Your interviews indicated the following:

- A typical project involves 100 tasks
- Under optimal conditions, each programmer accomplishes 1 task per month
- Normally, programming error rates are 25%
- It takes about 4 months to discover design errors
- A typical project starts with 4 staff

- Define the completion of work (Project Finished) when work done is 99% of original work to do. Use Vensim's IF THEN ELSE function. Stop further work accomplishment and rework at this point.

A. Step 1: The Rework Cycle



A. Step 1: The Rework Cycle

- ❑ A1. Create your model from scratch based on the diagram above and complete the equations for the rework cycle. You do not need to add any variables to the diagram. Select a sufficiently long time horizon for simulation and adequately small TIME STEP (See Appendix A in *Business Dynamics*). Hand in your fully documented and dimensionally consistent model (.mdl file).

- ❑ A2. Which factors do you think are more important in determining project completion -- productivity, quality, or rework discovery time? Why? (*Please answer this before simulating your model.* Your grade is not affected by your answer to this question)**.**

- ❑ A3. As an extreme test case, if programmers did not make any errors, when would the project finish? What happens to work to do, work done, and undiscovered rework?

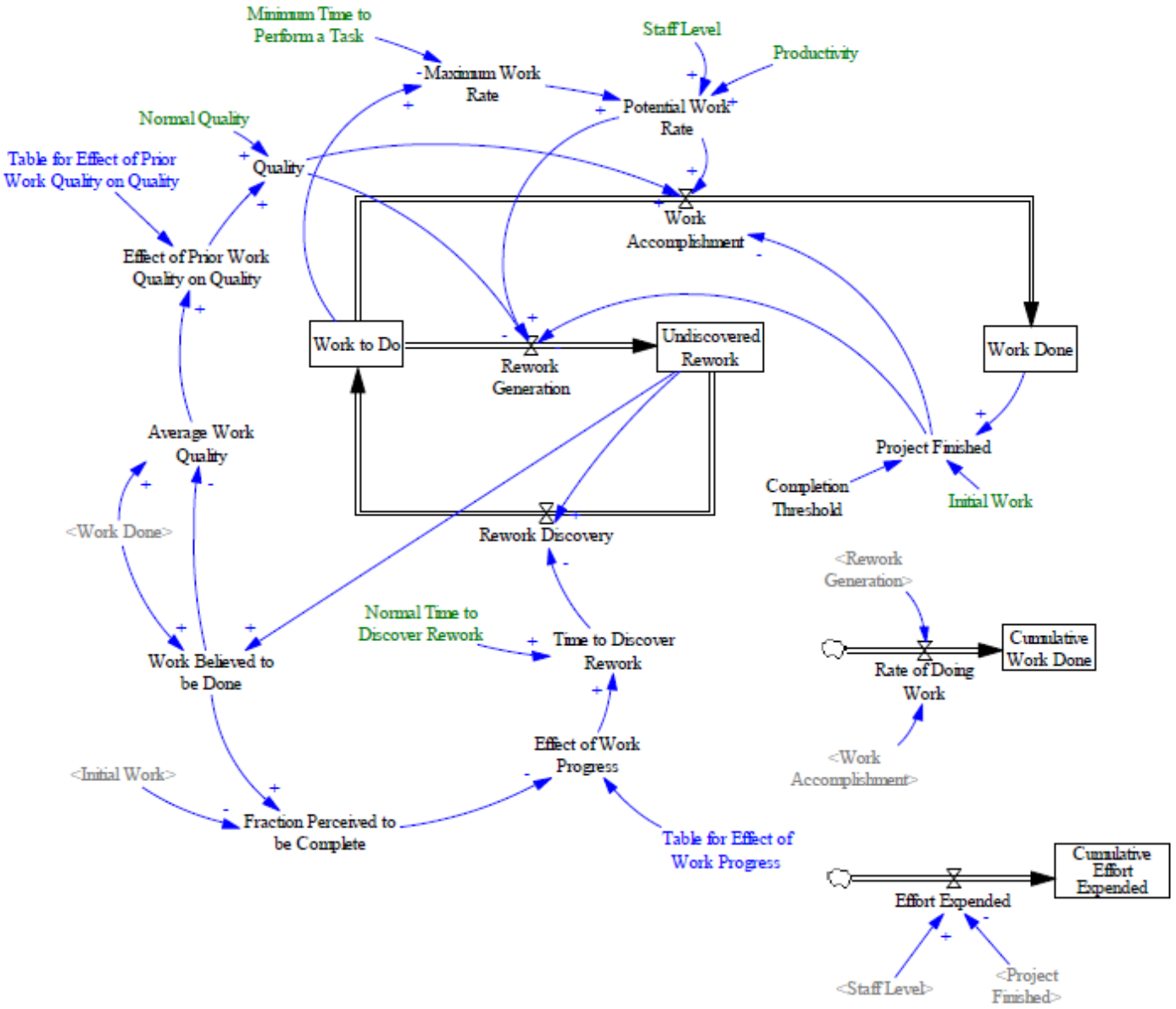
* You will want to create custom graphs to show all the important variables.

- ❑ A4. Now, set the value for normal quality to the value indicated in your interview notes. When does the project finish? What happens to undiscovered rework in this situation?

B. Step 2: Extending the Model: Adding the Quality on Quality Feedback and Variable Rework Discovery Time

- Time to Discover Rework is not likely to be constant, but falls as progress on the project progresses

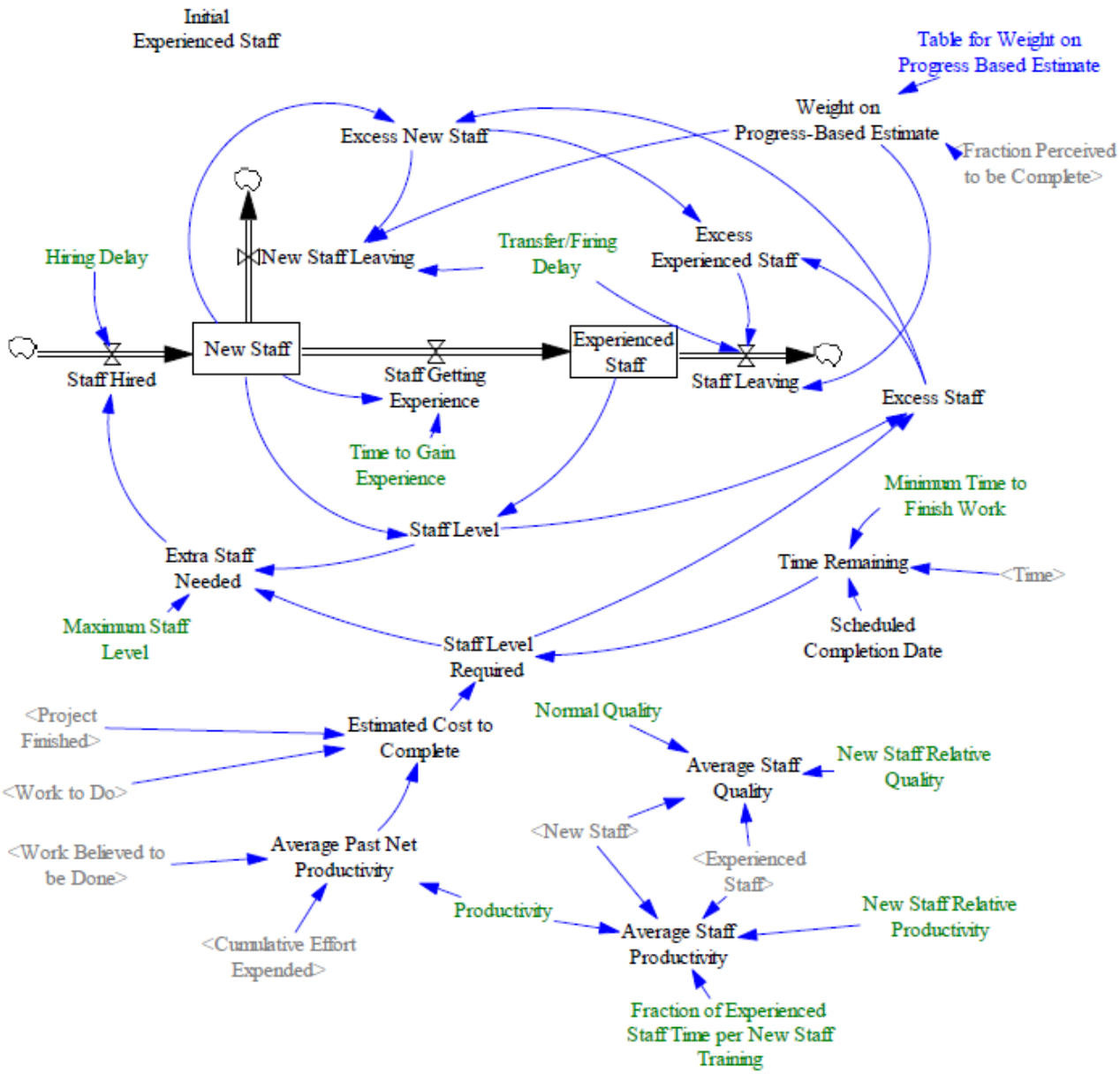
Fraction Complete	Effect on Rework Discovery
0	1
.1	1
.2	1
.3	1
.4	1
.5	1
.6	.95
.7	.8
.8	.45
.9	.2
1.0	.1


Minimum Time to Perform a Task
Maximum Work Rate
Staff Level
Productivity
Potential Work Rate
Normal Quality
Quality
Table for Effect of Prior Work Quality on Quality
Effect of Prior Work Quality on Quality
Work Accomplishment
Work to Do
Rework Generation
Undiscovered Rework
Work Done
Average Work Quality
Project Finished
Completion Threshold
Initial Work
<Work Done>
Rework Discovery
<Rework Generation>
Normal Time to Discover Rework
Time to Discover Rework
Work Believed to be Done
Cumulative Work Done
Rate of Doing Work
<Work Accomplishment>
Effect of Work Progress
<Initial Work>
Fraction Perceived to be Complete
Table for Effect of Work Progress
Cumulative Effort Expended
Effort Expended
<Staff Level>
<Project Finished>

C. Step 3: Extending the Model: Allowing for Increased Staff

- The weight on progress-based estimate is a function of the fraction perceived to be complete:

Fraction Complete	Weight
0	0
.1	0
.2	0
.3	.1
.4	.25
.5	.5
.6	.75
.7	.9
.8	1
.9	1
1.0	1


Initial Experienced Staff
Table for Weight on Progress Based Estimate
Weight on Progress-Based Estimate
Excess New Staff
<Fraction Perceived to be Complete>
Hiring Delay
New Staff Leaving
Transfer/Firing Delay
Excess Experienced Staff
New Staff
Experienced Staff
Staff Hired
Staff Getting Experience
Staff Leaving
Excess Staff
Time to Gain Experience
Minimum Time to Finish Work
Staff Level
Extra Staff Needed
Time Remaining
<Time>
Maximum Staff Level
Scheduled Completion Date
Staff Level Required
<Project Finished>
Estimated Cost to Complete
Normal Quality
Average Staff Quality
New Staff Relative Quality
<Work to Do>
<New Staff>
<Work Believed to be Done>
Average Past Net Productivity
<Experienced Staff>
Productivity
Average Staff Productivity
New Staff Relative Productivity
<Cumulative Effort Expended>
Fraction of Experienced Staff Time per New Staff Training

15.872 System Dynamics II
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