Littlefield Simulation Overview Presentation

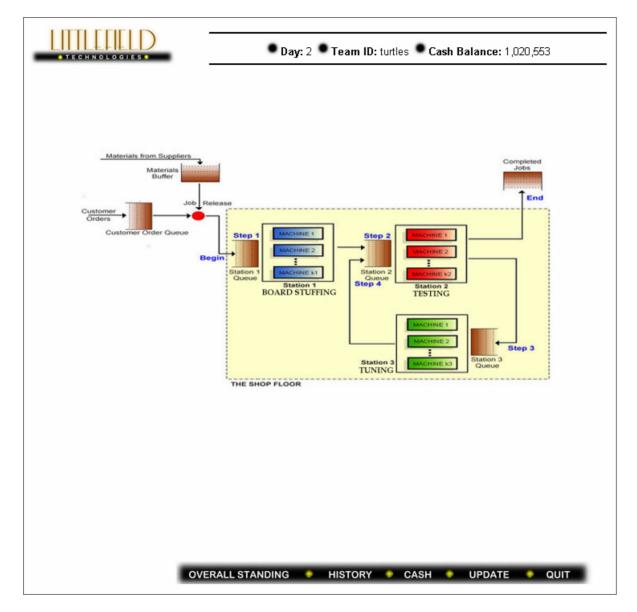## 15.760 Spring 2004

Accessing the Simulator

- Simulation begins:

  6:00 pm on Friday April 30th

  and ends one week later

- Access now online

- Enter team name and password

- Will see the following screen

Screenshot from: Littlefield Technologies Factory Simulator by Sunil Kumar and Samuel C. Wood, Assistant Professors at the Stanford University Graduate School of Business, http://littlefield.responsive.net:8000/littlefield/littlefieldHome.html (accessed June 7, 2004).

Some starting advice…

- Read the "Littlefield Technologies: Overview" and the "Assignment Description" document on the Sloan class server

- Relax
  – You do <u>not</u> need to constantly monitor the system (although it might be tempting to…)
  – This game should be fun!

The idea of the game

- Factory with three stations
  - Note that one of the stations is reentrant
- Materials flow through the factory by station
- Factory receives customer orders
  - Each order is a batch of 60 kits
  - Note the difference between kits and orders!

The processing stations…

- Each station takes a different amount of processing time
  - Processing times are deterministic
  - Processing times for steps 2 and 4 are different even though both use station 2

When the game begins…

- 35 simulated days have already passed
- Every team is in the same position
- There is data about:
  - Past orders
  - Machine utilization
  - Finished products
  - Queues in front of machines
  - Inventory

As the game progresses…

- Each hour of real time is one day of game time

- It takes a while to observe the results of your changes, so do not worry too much

- Keep notes on why you make changes!

At the end of the game…

- Access to the simulator ends one week later (total number of simulated days is 203).
- Results are available right away

How to make money

- Customer orders processed within 1 day make $1000

- Customer orders that take over 3 days make no money

- Between 1 and 3 days revenue is a decreasing linear function

A more aggressive contract

- In the fast lead time contract, jobs completed within 6 hours earn $1500.

- Late jobs incur a penalty of $250 per hour (prorated by fractions of an hour).

- Jobs that take longer than 12 hours to complete earn no revenue.

Customer Orders

- Customer orders arrive each day

- Order quantity unknown
  - stochastic

- Average orders are
  - Increasing until about four months elapsed
  - Constant average for about 70 days after this
  - Decreasing from then until day 194

**Demand rate
(orders / day)**

0   Day 120   Day 194   Day 201

Part I: How to gather data and what's available

Overview

- Can gather data on almost every aspect of the game
    - Customer orders
    - Materials inventory
    - Queues in front of stations
    - Machine utilization
    - Completed orders
    - Average revenue per day
    - Everyone's current cash position
    - History of your moves

Overview (2)

- Do not have access to
  - Historical cash balances
  - Competitors' inventory position
  - Competitors' factory configuration
  - Competitors' lead times

Customer Orders

Littlefield Technologies -
ORDERS MENU

Name: turtles
Number of kits in 1 job: 60
Lot size: 60 kits, or 1 lot per job
Current contract: 1
        Quoted lead time: 0.5 day(s)
        Maximum lead time: 1.0 day(s)
        Revenue per order: 1000.0 dollars

Please click on a button...

[plot job arrivals]   [plot queued jobs]

[update]

[close]

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Plot of daily average number of jobs waiting for raw materials

drag mouse over region of interest to zoom in plot

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Downloading data

- Recommend downloading data into Excel
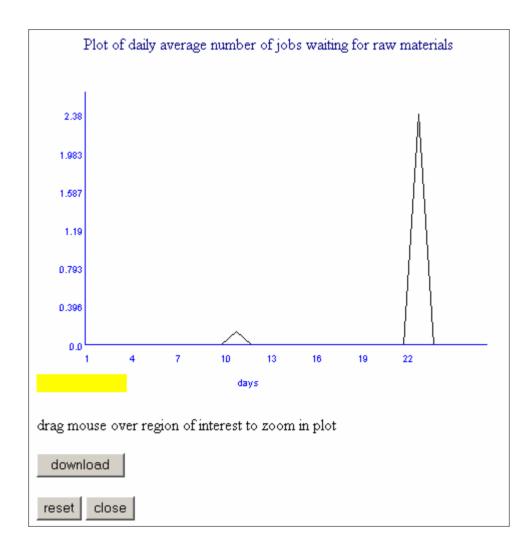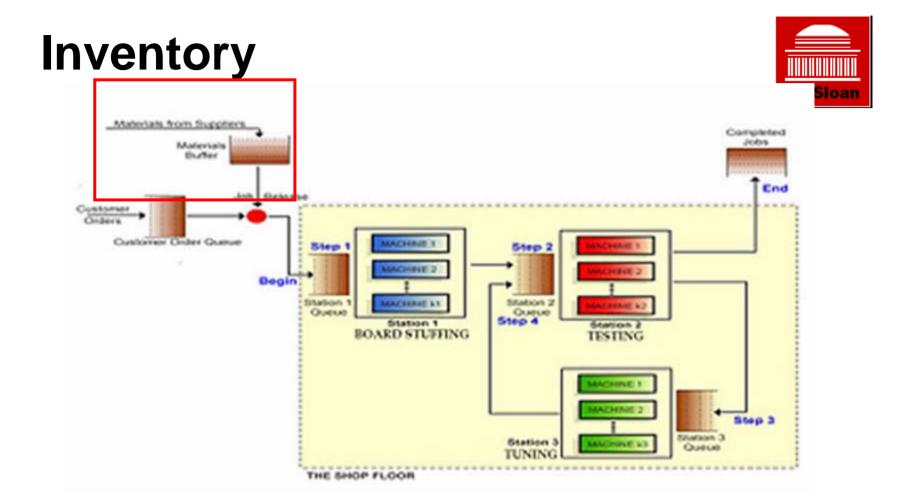 - Can perform data analysis
  - Easier than looking at the graphs

Inventory

Littlefield Technologies -
MATERIALS MENU

Name: turtles
Unit Cost: $ 10.0
Order Cost: $ 100.0
Lead Time: 4 day(s)
Reorder Point:
   1800 kits (30 batches of 60)
Reorder Quantity:
   6000 kits (100 batches of 60)

There are no outstanding materials orders

Please click on a button...

[plot inventory]

[update]

[close]

Plot of inventory level in kits (not an average)

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Processing Stations

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Littlefield Technologies -

STATION 1 MENU

Name: turtles

Number of Machines: 2
Scheduling Policy: FIFO
Purchase Price: $ 10000.0
Retirement Price: $ 2000.0

Please click on a button...

[plot utilization]

[update]

[close]

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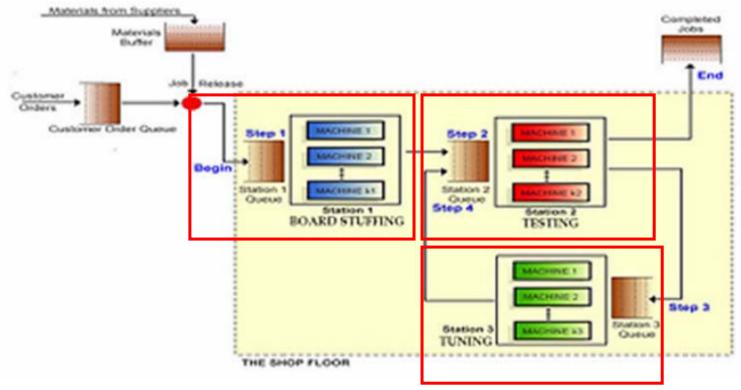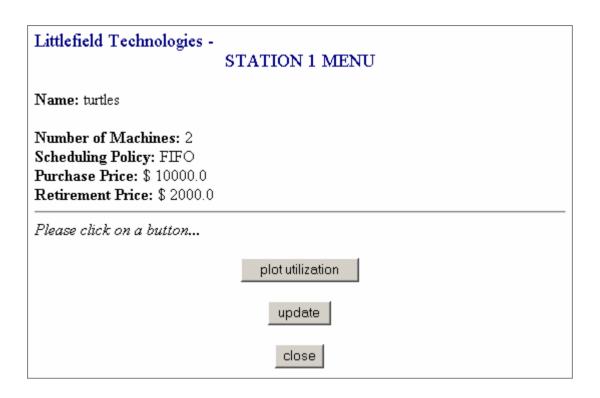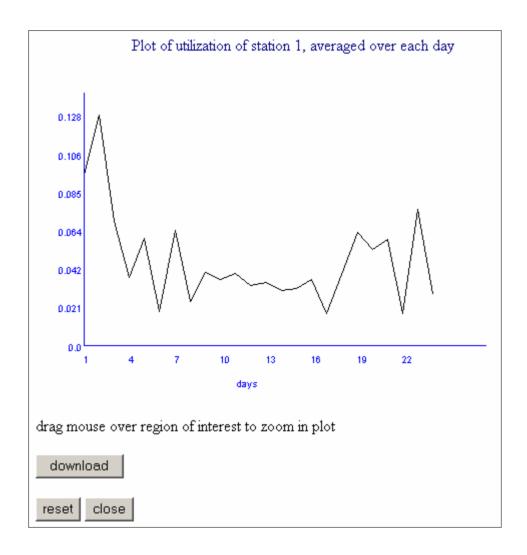
Processing Station 2

- Materials pass through station 2 twice
  - First pass takes less time than the second
  - Both passes take a fixed amount of time
- Can choose the scheduling on station 2
  - FIFO = First item in queue is first processed
  - Or give priority to work from station 1 or 3
  - Step 4 takes longer than step 2

Part II: The different levers
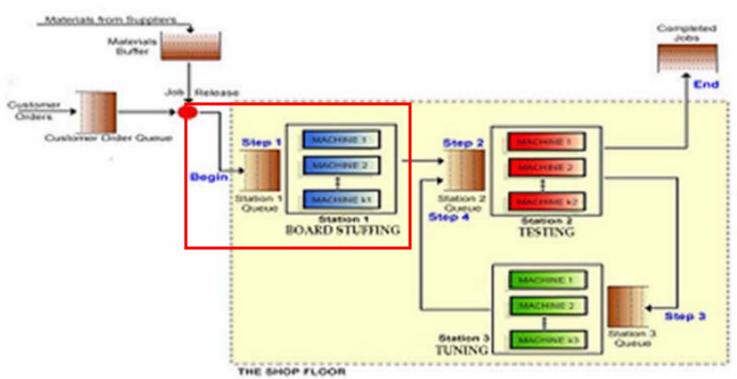
Playing the game

- You can do the following
  - Buy and sell station machines
  - Change the number of kits that you order
  - Change the reorder point for the kits
  - Change scheduling policy at station 2
  - Change the lot size
  - Change the customer lead-time contract
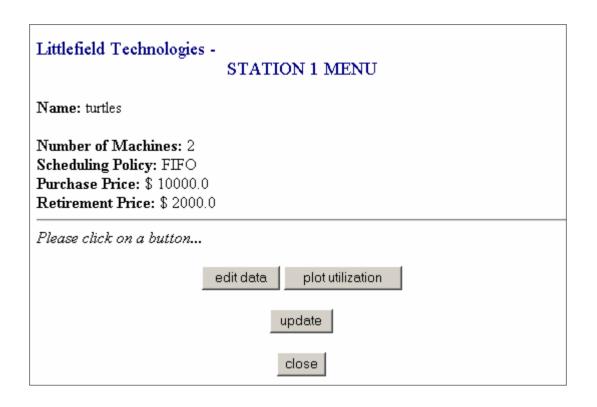- Keep notes on what you do and why

Buying and selling machines

- Click on the machine station
- Choose "edit data"
- Enter the desired number of machines
  - Greater than current is a purchase
  - Less than current is a sale
- Click "ok" & "confirm"
- Cash goes up/down by cost/sale price

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Littlefield Technologies -
STATION 1 MENU

Name: turtles

Number of Machines: 2
Scheduling Policy: FIFO
Purchase Price: $ 10000.0
Retirement Price: $ 2000.0

Please click on a button...

[edit data] [plot utilization]

[update]

[close]

Littlefield Technologies -
STATION 1 FORM

Please select a value for the following control variable...
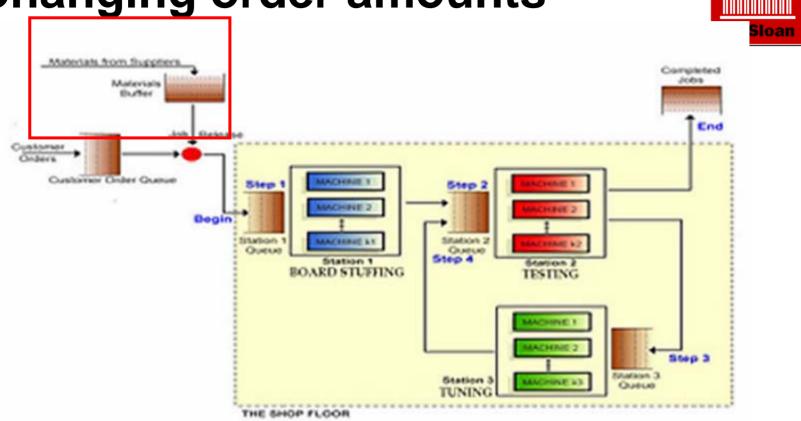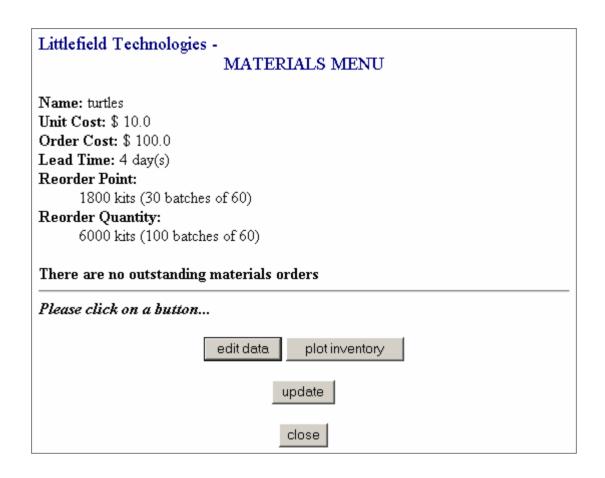
Station Count: 2

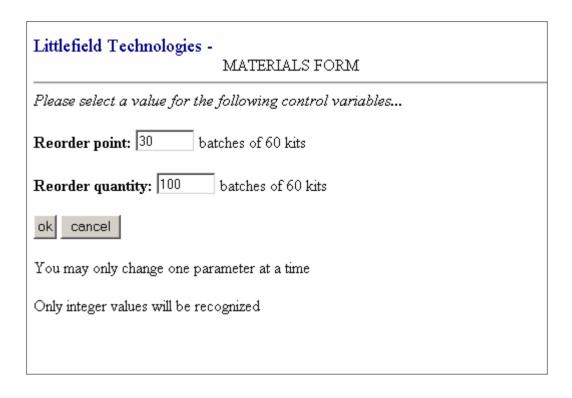[ok] [cancel]

Changing order amounts

- Be careful!
  - Each customer order corresponds to 60 kits
- Click on "Materials from suppliers"
- Choose "edit data"
- Change reorder point or reorder quantity
  - Can only change one at a time
  - Must do two transactions to change both

Changing order amounts

Littlefield Technologies -
MATERIALS MENU

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Unit Cost: $ 10.0
Order Cost: $ 100.0
Lead Time: 4 day(s)
Reorder Point:
  1800 kits (30 batches of 60)
Reorder Quantity:
  6000 kits (100 batches of 60)

There are no outstanding materials orders

Please click on a button...

[edit data] [plot inventory]

[update]

[close]

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Littlefield Technologies -

MATERIALS FORM

Please select a value for the following control variables...

Reorder point: `30` batches of 60 kits

Reorder quantity: `100` batches of 60 kits

`ok` `cancel`

You may only change one parameter at a time

Only integer values will be recognized

Changing lot size and contract

- Make these changes by clicking on the Customer Order Queue

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Some Final Warnings

- You cannot have two replenishment orders outstanding at once

- Cash earns 10% interest rate

- To avoid reorder, set reorder quantity such that cash is not enough (useful for endgame)