Systems Modelling and Simulation (Lab session 2)

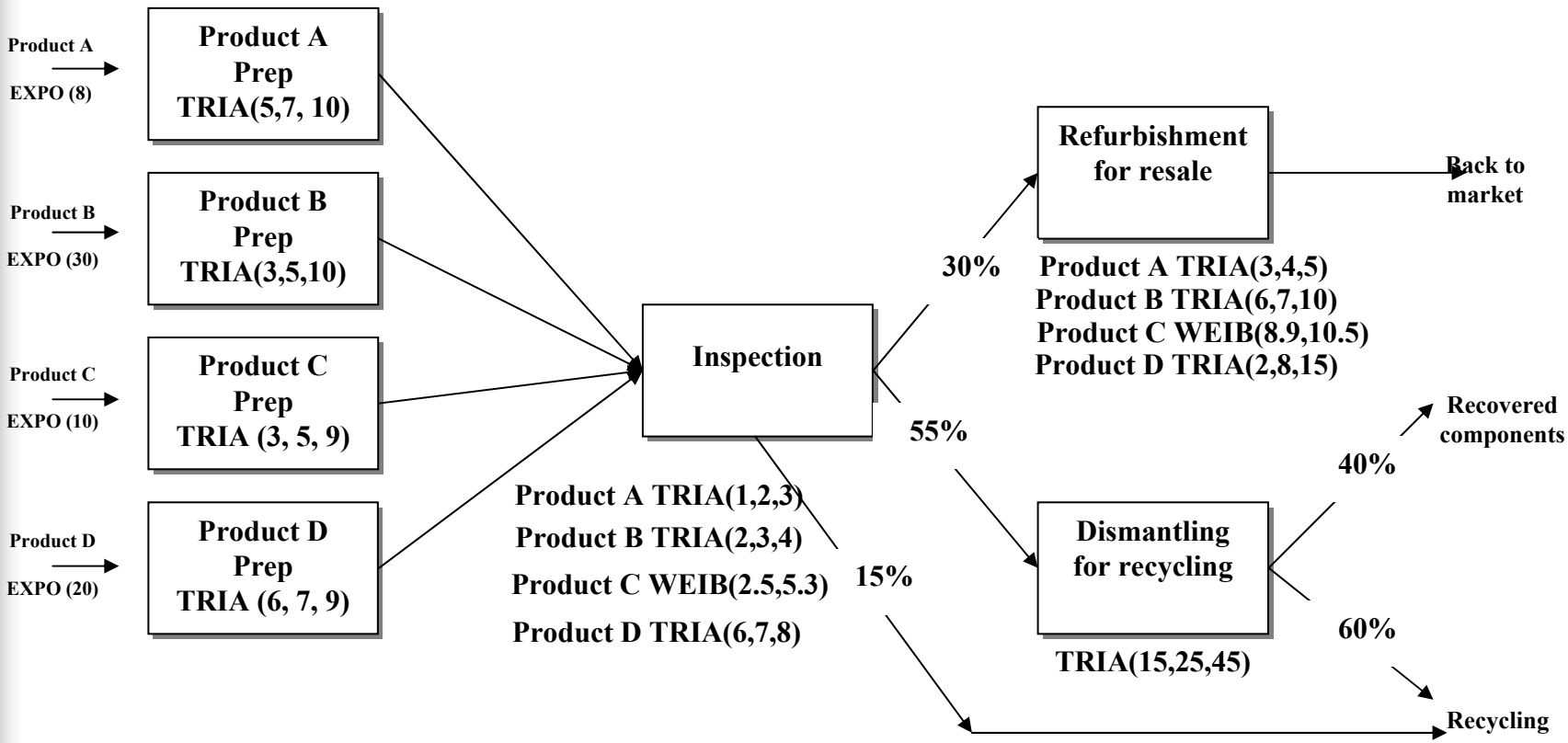
After this session you should be able to

1. Develop a modelling approach for a typical simulation problem.
2. Build and run a complete simulation model.
3. Understand and interpret the results of a simulation run.

Modelling a reverse supply chain problem

- Problem formulation
- Modelling approach
- Building the model
- Running the model
- Viewing the results

Problem formulation (1)



Problem formulation (2)

- There are four types of products; A,B,C and D
- Arrival rates are;
  - A: Exp(8), B: Exp(30), C: Exp(10), D: Exp(20)
- Prep area service times;
  - A: TRIA(5,7,10), B: TRIA(3,5,10), C: TRIA(3,5,9), D: TRIA(6,7,9)
- Inspection area service times:
  - A: TRIA(1,2,3), B: TRIA(2,3,4), C: WEIB(2.5,5.3), D: TRIA(6,7,8)
- Refurbishment area service times
  - A: TRIA(3,4,5), B: TRIA(6,7,10), C: WEIB(8.9,10.5), D: TRIA(2,8,15)
- Dismantling area service times
  - TRIA(15,25,45)

Problem formulation (3)

- After inspection,
  - 15% of products are sent to recycle
  - 55% are sent for dismantling
  - 30% for refurbishment
- 60% of dismantled production go to recycle
- 40% of dismantled products are recovered components for reuse.

Modelling objective

- Collect statistics in each area on:
  - Resource utilization
  - Number in queue
  - Time in queue
  - Cycle time for refurbished products, dismantled components and recycled products
- Run setup
  - Warm-up period = 0
  - Replication length = 4 x 8hr shifts
  - Number of replications = 1
  - Initialize between replications; System-yes, Statistics-yes

Modelling approach (1)

- We can break our system down into the following;
  - Create arrival of products
  - Send products through prep process
  - Send products through inspection process
  - Decide where each product goes after inspection
  - Send part to refurbishment
  - Send other parts to Dismantling
  - Dispose remaining part to Recycling
  - Dispose to market after refurbishment
  - Split products into components after dismantling
  - Dispose recovered components after dismantling
  - Dispose after dismantling to recycling

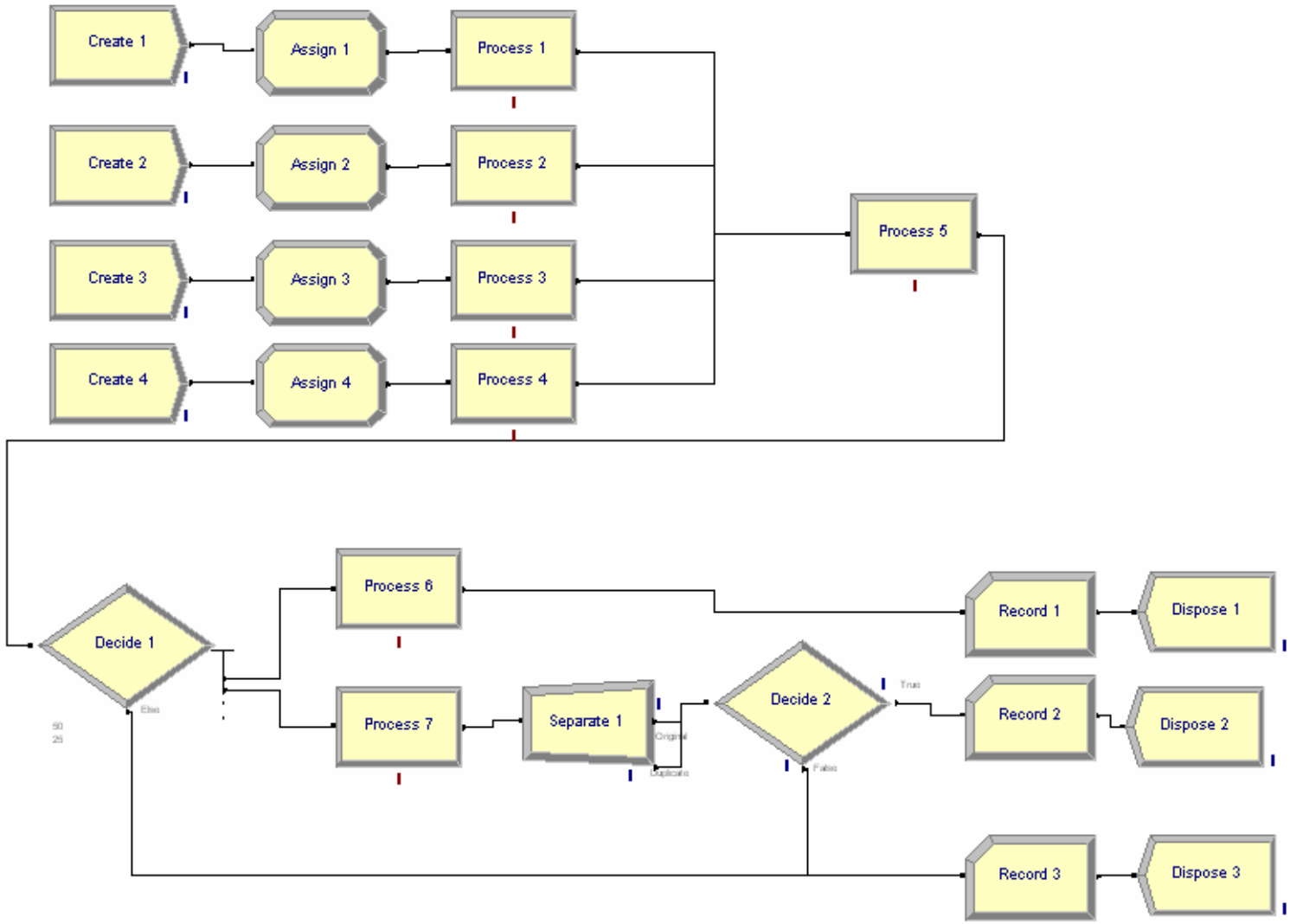
Modelling approach (2)

- We will need the following modules
  - *Create (4)*
  - *Assign (4)*
  - *Process (7)*
  - *Decide (2)*
  - *Record (3)*
  - *Separate (1)*
  - *Dispose (3)*

Modelling approach (3)

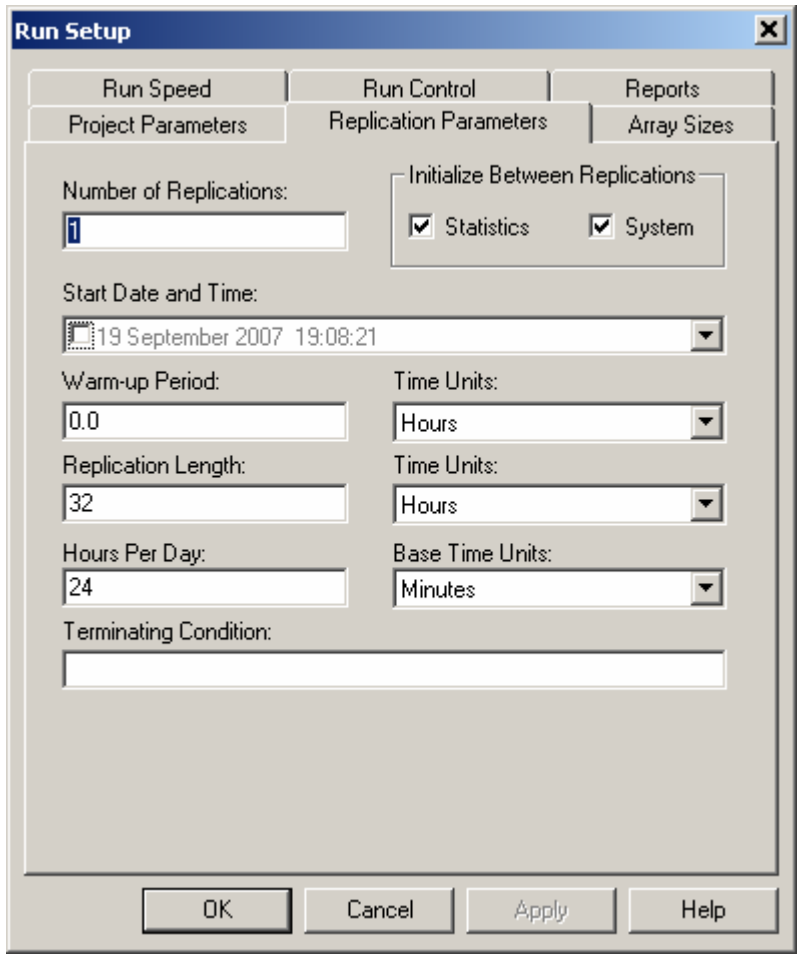
- Entities in the model
  - Product A
  - Product B
  - Product C
  - Product D
- Resources in the model
  - Prep A
  - Prep B
  - Prep C
  - Prep D
  - Inspector
  - RefTechnician
  - DisTechnician

Our basic model



Building it yourself

- **Before you running the model**
  - Go to “Run” menu and select “setup”
  - Set replication parameters as shown



Viewing the results

- Select “yes” to view report at the end of the simulation run.