

# Systems Modelling and Simulation (Lab session 2)



In this session we will cover:

1. Arena output analyser
2. New Modules in Arena such as Assign, Decide, Separate (used for cloning entities), Record and Entity Animation– [Chapter 6 & 7 of the Course book also Kelton et al book.]



# Build your first model

- **Before you run the model**

- Checking Run setup again

- **Run the model**

- **View the results**

- Siman summary report
- Category overview

# Sample Summary Output

Model2.out - Notepad

File Edit Format View Help

ARENA Simulation Results  
KOMASHIE ALEXANDER - License: 1952000412

summary for Replication 1 of 1

Project: Model 6.1  
Analyst: KOMASHIE ALEXANDER

Run execution date : 8/17/2006  
Model revision date: 8/17/2006

Replication ended at time : 100.0 Hours  
Base Time Units: Hours

1 TALLY VARIABLES

Identifier	Average	Half width	Minimum	Maximum	observations
Machine Process.VATimePerEntity	1.0439	(Insuf)	.53935	1.4664	88
Machine Process.WaitTimePerEntity	2.7263	(Insuf)	.00000	7.0002	88
Machine Process.TotalTimePerEntity	3.7702	(Insuf)	.92386	7.9436	88
Part.VATime	1.0439	(Insuf)	.53935	1.4664	88
Part.NVATime	.00000	(Insuf)	.00000	.00000	88
Part.WaitTime	2.7263	(Insuf)	.00000	7.0002	88
Part.TranTime	.00000	(Insuf)	.00000	.00000	88
Part.OtherTime	.00000	(Insuf)	.00000	.00000	88
Part.TotalTime	3.7702	(Insuf)	.92386	7.9436	88
Machine Process.Queue.WaitingTime	2.7268	(Insuf)	.00000	7.0002	89

2 DISCRETE-CHANGE VARIABLES

Identifier	Average	Half width	Minimum	Maximum	Final value
Part.WIP	3.4676	(Insuf)	.00000	8.0000	6.0000
Machine 1.NumberBusy	.91878	(Insuf)	.00000	1.0000	1.0000
Machine 1.NumberScheduled	1.0000	(Insuf)	1.0000	1.0000	1.0000
Machine 1.Utilization	.91878	(Insuf)	.00000	1.0000	1.0000
Machine Process.Queue.NumberInQueue	2.5488	(Insuf)	.00000	7.0000	5.0000

3 OUTPUTS

Identifier	Value
Machine Process Accum VA Time	91.867
Machine Process Number Out	88.000
Machine Process Number In	94.000
Machine Process Accum Wait Time	239.91
Part.NumberIn	94.000
Part.NumberOut	88.000
Machine 1.NumberSeized	89.000
Machine 1.ScheduledUtilization	.91878
System.NumberOut	88.000



## 4 Types of Statistics

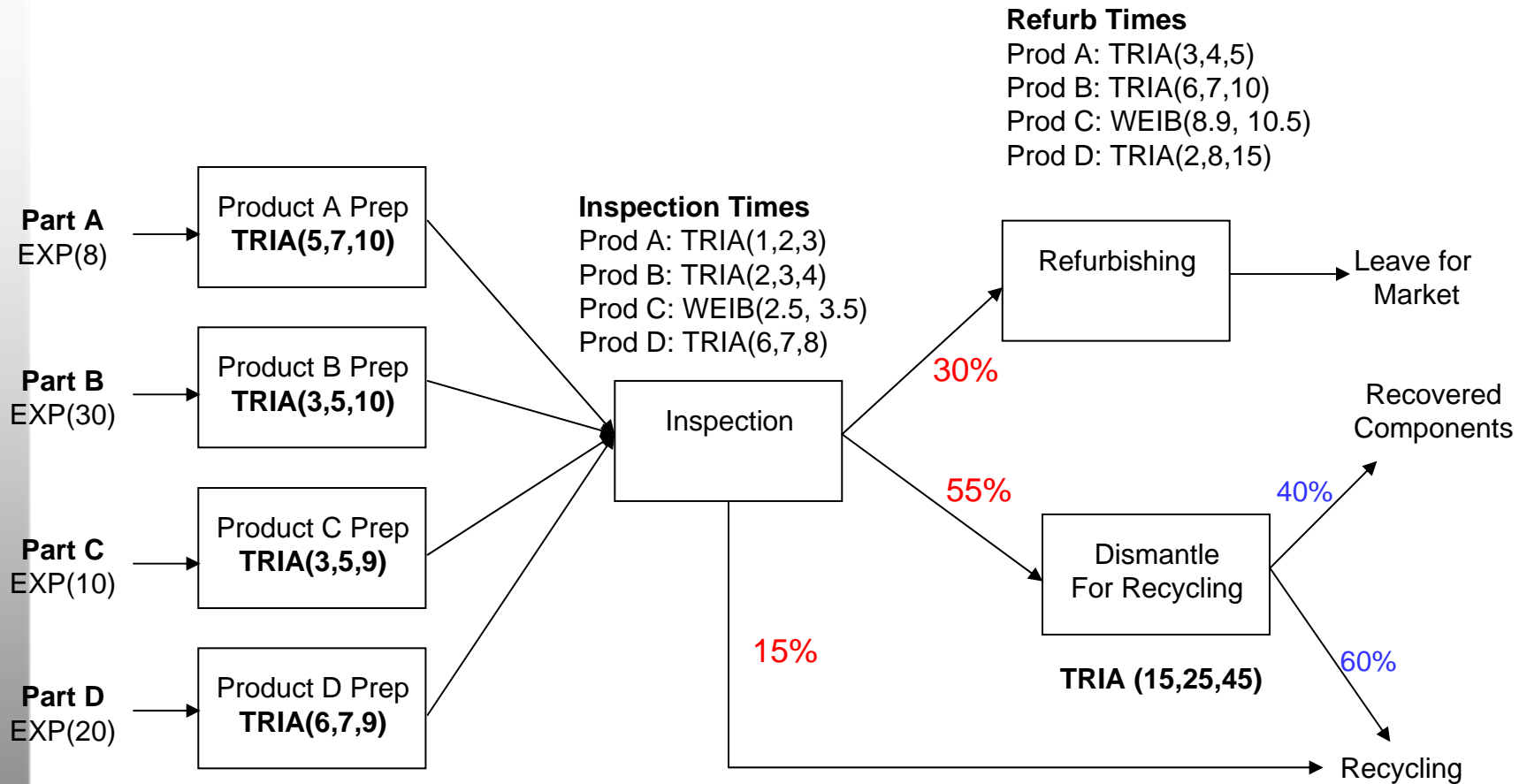
1. **Tally Variables:** display the tallies recorded in your model. Tally statistics include entity and process costs and times
2. **Discrete Change:** Time-weighted statistics "weight" the value of the variable by the amount of time it remained at that value. Included in this category are *Resource Number Busy*, *Number Scheduled* and *Utilisation* as well as *Number in Queue* statistics. These are also referred to as **Time Persistent Statistics**.
3. **Output:** displays statistics for the final value of a given variable the model. Included in this category are costs of resource, total process costs and times and work in process information
4. **Counters:** statistics for any counters identified in your model. The number of entities into and out of the system is included in this category



# Other Data

- **Half width (error margin):** This column shown in the report is the 95% Confidence Interval range around the average. This is included to help you determine the reliability of the results from your replication. This column may either be a value (real number), said to be “*Insufficient*” or “*Correlated*”.
  - **Insufficient:** not enough observation <320
  - **Correlated:** collected data for the variable is not independently distributed (invalid confidence interval). Run the simulation longer and it should correct itself

# The story and the model



**Figure 7.1** Returned products testing and refurbishment process



# Dismantling Station

- At the Dismantling station parts are broken down into their constituent components. The number of components follow a random Triangular (6, 9, 12) Distribution.
- We use the Separate module to break down the entity into its sub-components

# Let's do...

