



Simio Spring 2016 Student Competition - Aerospace Manufacturing Problem

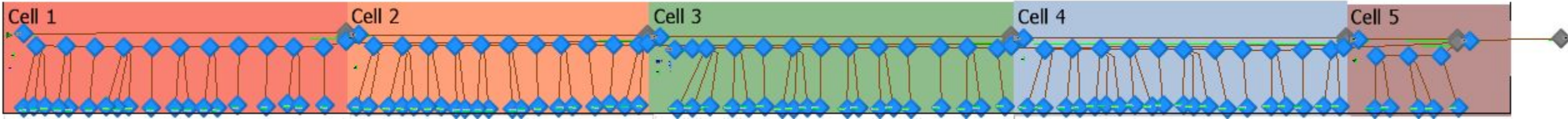
Background

- An aerospace manufacturer needs to evaluate the current state of a final assembly system to accommodate for changes
- The current final assembly process has two types of airplane products.
- A new airplane arrives every 4 days into the system.
 - The airplane travels through five cells and is moved from one cell to the next every 4 days.
 - There are tasks within each cell that need to be completed.
 - Any unfinished work is considered travel work
 - Workers are needed for each cell.

Input Analysis

Cell	PartType 1		PartType 2	
	Worst Case	Best Case	Worst Case	Best Case
1	3.68	2.92	3.11	2.31
2	4.84	3.62	4.85	3.51
3	3.20	2.06	3.32	2.54
4	3.53	2.75	3.19	2.43
5	0.29	0.24	0.29	0.24

Model Overview



- One main source that create plane entities.
- Five Cell areas
- 83 sources that create the work entities in each cell

Workers and Learning Curve Logic

$$T_n = T_1 n^r$$

T_n = time required to complete the n^{th} unit

T_1 = time required to complete the first unit

$r = \log(\text{learning rate})/\log(2)$

Experimental Setup

- General Factorial Design:

Metric	Min	Max
Cell1Workers	5	8
Cell2Workers	4	8
Cell3Workers	5	8
Cell4Workers	4	8
Cell5Workers	3	8

Parameters

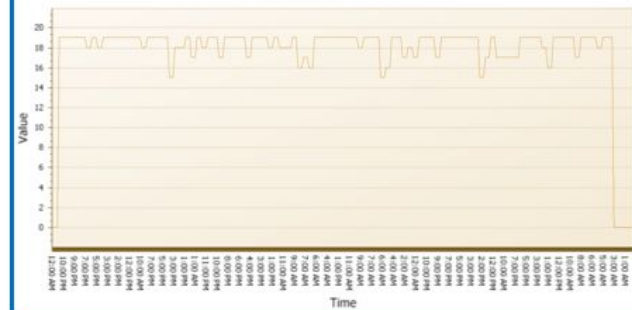
Metric	Min	Max
Cycle Time	3.5	4
ProdQty	75	100
Mix	0.6	0.7
Run Length	7600	8800

Experimental Results

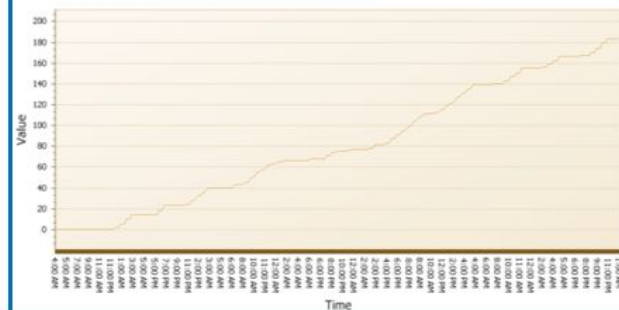
Potential Solutions					
Cell1Workers	Cell2Workers	Cell3Workers	Cell4Workers	Cell5Workers	NumWorkers
6	7	5	4	3	25
5	7	5	5	3	25

Graphical Analysis

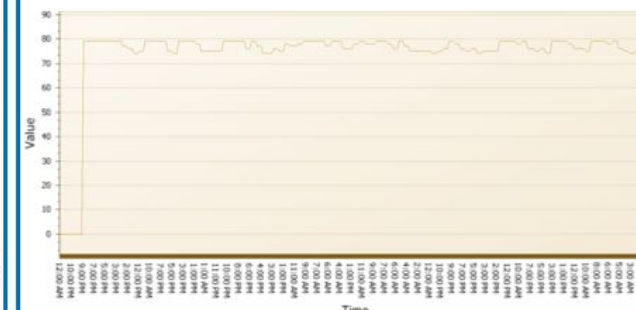
Cell 1 Total Work Elements



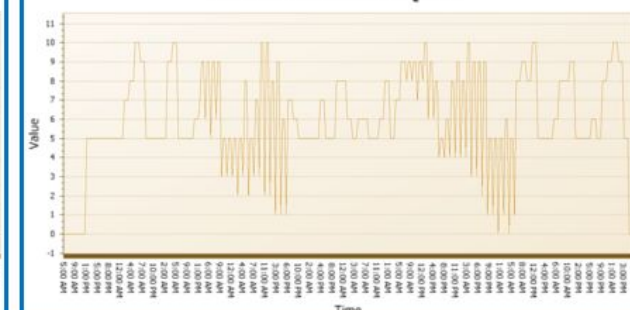
Cell 4 Traveled Work Elements



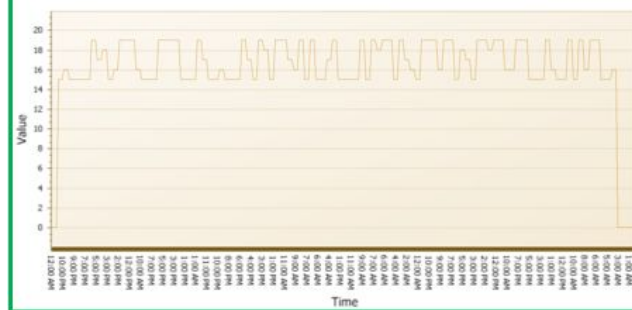
Cell 4 Total Work Elements



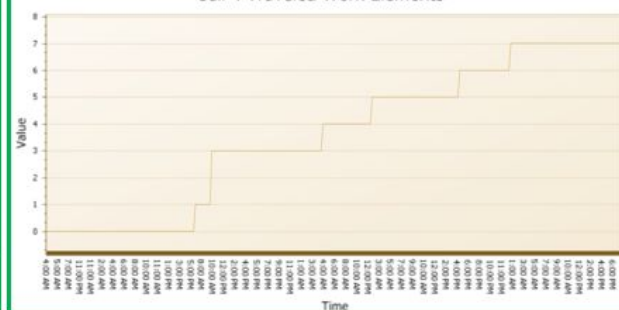
Cell 5 Work Elements in Queue



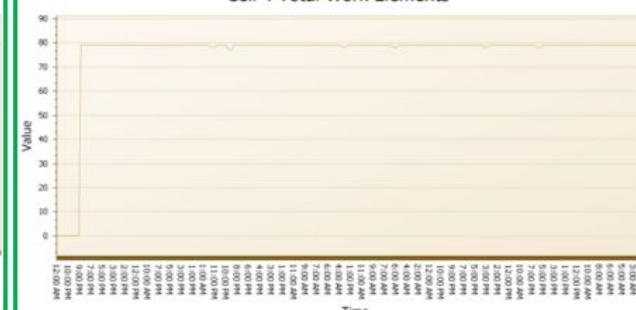
Cell 1 Total Work Elements



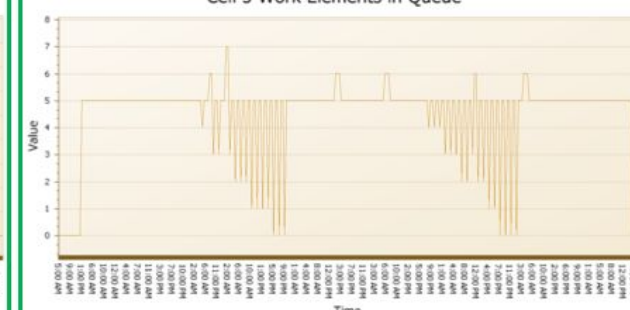
Cell 4 Traveled Work Elements



Cell 4 Total Work Elements



Cell 5 Work Elements in Queue



Graphical Results & Final Recommendation

Final Solution					
Cell1Workers	Cell2Workers	Cell3Workers	Cell4Workers	Cell5Workers	NumWorkers
5	7	5	5	3	25

Assumptions and Limitations

- Workers could not travel backwards
- If multiple workers are seized to a task, learning curve effects are averaged together to impact the overall processing time of that task
- Storage for the wings was not an issue
- Cells were not drawn to scale
- Only analyzed uptime

Video

<https://www.youtube.com/watch?v=x72GaxjGSyg>