

Problem Set 2 - Process Analysis

Problem 1 - Window Boxes

Metal window boxes are manufactured in two process steps: stamping and assembly. Each window box is made up of three parts or pieces: a base part (part A) and two side panels or parts (two part B's). The parts are fabricated by a single stamping machine that requires a setup time of 120 minutes whenever switching between the two part types. Once the machine is set up, the activity (or production) time for each part A is one minute while the activity time for each part B is only 30 seconds. Currently, the stamping machine rotates its production between one batch of 360 units for part A and one batch of 720 units for part B.

Completed parts move from the stamping machine to the assembly only after the entire batch is complete. At assembly, parts are assembled manually to form the finished product. One base (part A) and two sides (two part Bs), as well as a number of small purchased components, are required for each unit of the final product. Each product requires 27 minutes of labor time to assemble. There are currently 12 workers in assembly. There is sufficient demand to sell every box the system can make.

1. What is the capacity of the stamping machine?
2. What batch sizes would you recommend for the process?

Problem 2 - Little's Law

Little's Law states the fundamental relationship between the average flow time, T , the throughput rate, R , and the average inventory I . Namely, it states that

$$I = R \times T$$

(I is measured in units of inventory; R is units of inventory per unit time; and T is in units of time).

Using Little's Law, answer the following questions:

1. An insurance company receives 10,000 claims per year. Average processing time is three weeks. How many claims are being processed at any given point?
2. A major manufacturer sells \$300 million worth of cellular equipment per year. The average amount in accounts receivable is \$45 million. How much time (on average) elapses from the time a customer is billed to the time payment is received?

3. Auto-Moto Financial Services provides financing to qualified buyers of new cars and motorcycles. Having just revamped its application-processing operations, Auto-Moto Financial Services is now evaluating the effect of its changes on service performance. Auto-Moto receives about 1,000 loan applications per month and makes accept/reject decisions based on an extensive review of each application. Assume a 30-day working month.

Until last year, Auto-Moto Financial Services processed each application individually. On average, 20% of all applications received approval. An internal audit showed that, on average, Auto-Moto had about 500 applications in process at various stages of the approval/rejection procedure. How long does an application spend on average with Auto-Moto before receiving an accept/reject decision?

4. After numerous complaints, Auto-Moto hires a consulting company to help streamline the decision making process. The consultants quickly identified a key problem: although most applications could be processed fairly quickly, some - because of insufficient and/or unclear documentation - took a disproportionate amount of time. They suggested the following changes to the process:

- a) Because the percentage of approved applications is fairly low, an Initial Review Team should be set up to preprocess all applications according to strict but fairly mechanical guidelines;
- b) Each application would fall into three categories: A (looks excellent), B (needs more detailed evaluation), and C (reject summarily). A and B applications would be forwarded to different specialist subgroups.
- c) Each subgroup would then evaluate the applications in its domain and make accept/reject decisions.

The new process was implemented in an experimental basis. The company found that, on average, 25% of all applications were As, 25% were Bs, and 50% were Cs. Typically, about 70% of all As and 10% of all Bs were approved on review (all Cs were rejected.) Internal audit checks further revealed that, on average, 200 applications were with the Initial Review Team undergoing preprocessing. Just 25, however, were with the Subgroup A Team undergoing the next stage of processing and about 150 with Subgroup B team.

What is the average flow time of each type of application?

5. Continuing the previous question, what is the average flow time for a randomly selected application? Should Auto-Moto Financial Services adopt the recommendation?

Problem 3 - Class Project

1. Draw a process flow diagram for one of the processes that exists in your partner company.
2. What data do you need to identify the bottleneck?
3. Is a pull system appropriate for this process? What would be a reasonable batch size?
4. Create a spreadsheet model that identifies the bottleneck, the cycle time, and the WIP as a function of the throughput rate of each activity. (make up data if and as needed – for illustrative purposes)

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