

Pull / Kanban and Cellular Layout / Flow Patterns

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PULL - What is it?

- A system where no one upstream produces goods or services until the customer downstream asks for it.
- The customer can be internal or external.

What are some of the advantages of Pull?

- 1) little rework
- 2) lower inventory
- 3) greater defect detection
- 4) shorter cycle times
- 5) flow output is more predictable

How can Pull benefit you?

- a) average WIP reduced (Work in Process)
- b) reduced engineering changes
- c) defect detection improved
- d) less pressure for higher quality
- e) shorter lead times
- f) better on-time performance
- g) process variability sources reduced
- h) reduced cycle time variability
- i) reliance on forecasts reduced



Kanban

Kanban: What is it?

A Japanese word for “card” or “sign”
pronounced: (kahn-bahn)

It is a concept that a supplier or the warehouse should only deliver components to the production line only when and if they are needed, so that there is no storage in the production area.

Kanbans typically are cards, they can also be a visual method that triggers the pull system based on actual usage of material.

Kanban cards have written information about the parts:

- 1. Part number**
- 2. Description of the item and**
- 3. Inventory location**

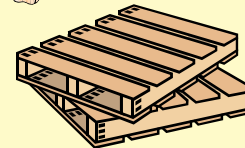
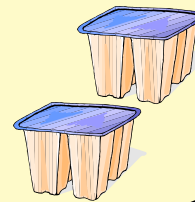
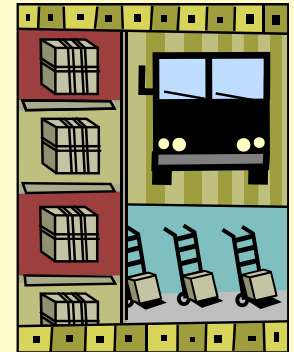
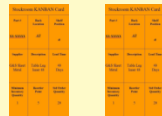
Each card triggers replenishment when the inventory is consumed

A Kanban pull system can also use color-coded cards attached to parts or part containers to regulate the upstream production and delivery flow.



Kanbans are attached to the actual work, an item, or product, at the point of use and come in many forms:

- cards
- bins
- boxes
- containers
- empty spaces
- electronic signals



Creating Kanban:

You will need to determine the most effective kanban for your specific application.

An empty space may be the best solution in a work module that is relatively balanced.

Whatever method you choose,
the kanban needs to signal:

- What part?
- How many parts?
- Where the parts will be delivered?

Using the philosophy of “take one, make one”, as inventory is consumed, the signal (kanban) is sent up stream to call for replenishment activities. A common way to think of kanban is the two-bin system.



The number of kanbans you need is a function of the average demand per unit of time - usually daily total time and container capacity.

The calculation is as follows:

$$\text{Number of Kanbans} = ([\text{Average Demand (Time)}] \times [\text{OC} + \text{PT} + \text{TT}] \times [1 + \text{BT}]) + \text{CC}$$

where:

- ✓ OC = Order Cycle
- ✓ PT = Processing Time
- ✓ TT = Transit Time
- ✓ BT = Buffer Time
- ✓ CC = Container Capacity (not more than 10 percent)
- ✓ Average Demand is a function of Time (daily, weekly, monthly, quarterly, and so on)

Cellular Layout

What is a Cell?

A cell is group of workstations, machines or equipment arranged so that a product can be worked from one workstation to another in a sequence that supports a smooth flow of material, and components through the process with minimal transport or delay.

Cellular Layout

In a manufacturing environment the approach to assembly allows for:

- customization of work
- cross-trained and cross-functional teams

Cellular Layouts in an office environment:

- encourages effective teamwork
- it also allows for participating functions to have access to each others ideas



Remember when we used to have our whole team in one room versus our whole team sitting in their own cubicles trying to solve the same problem?



The Pluses of Cellular Layout are:

- a. Flexibility
- b. Speed
- c. Real-time coordination
- d. Smaller batches
- e. Customization
- f. Higher quality of work

Cellular Layouts address eight forms of waste:

- **Waiting** - parts, documents
- **Overproduction** - making too many widgets - overstock
- **Rework** - "hidden factory" built into the process
- **Motion** - workers having to walk to many steps
- **Transportation** - moving material to storage and back
- **Processing** - having too many non-valued added steps
- **Inventory** - having more parts, material or information
- **Intellect** - your ideas are not supported by your company

Flow Patterns

A. The most common pattern is the U-shaped:



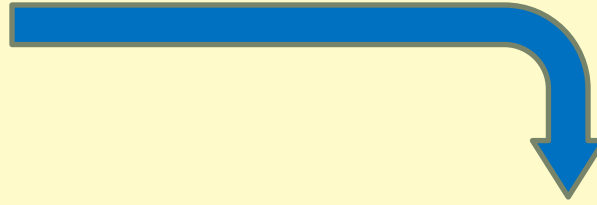
- Allows the work cell to be laid out using a fairly small footprint.
- The workers in the center can assist one another more readily.
- Makes it easier to assign multiple operations to a single operator.
- Allows easier line balancing.

B. Straight:



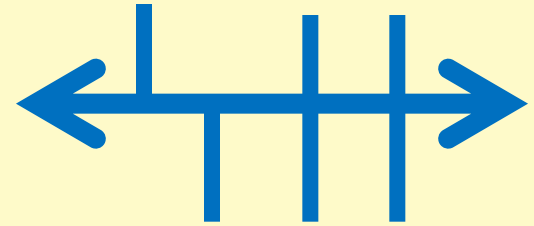
- It is often the best flow pattern for long, narrow buildings
- It has easy access on two sides.
- Helps avoid congestion at point of delivery and takeaway.

C. L-shape:



- This configuration may work best for square-shaped buildings when you have several similar process lines that are nested together.
- It can also easily segregate the flow of materials, products, supplies, and special services that are physically different in and out of the cell.
- Can allow for isolation of dangerous, costly-to-move equipment in the elbow.
- It can also aid in the implementation of cost savings in two directions for expansion.

D. Comb and Spine:



- This arrangement works well for products that must exit the process flow assembly area for operations to various levels of their assembly and then returned for further processing.
- It can also be a two way flow pattern

Which Flow Pattern is best for Your Business?

- You are the one best suited to answer this question, after you have given some thought to the function of your facility's constraints and accommodations

Some of those flow considerations are:

- The location of the utilities,
- Physical site constraints
- Product Families
- Bulkiness of the products on the lines
- Does the process share the same equipment or resources?
- Will you be outsourcing any parts to a supplier?
- Are there any physical constraints such as points of entry or exit i.e. location of shipping and warehouse docks.

Questions?