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Achieving Lean Workflow By Improved Layout of the Laboratory

ARGENT GLOBAL SERVICES®

Argent Global Services Lean Training Series

Argent Global Services

- Steve Stone, Managing Director
- Argent is a process-engineering and management consulting firm that has established, improved and re-engineered a variety of business operations since 1988.
- With 17-years experience, Argent pioneered many engineering services for the health care diagnostics industry.
- Skill Set & Methodology include:
  - Industrial Engineering
  - Lean Enterprise
  - Six Sigma
  - Management Tools & Software
  - Implementation Support
  - Performance Measurement

Goals & Objectives

What We Will Learn

- Insight on how a laboratory layout can impact efficient workflow

Key Objectives

- Understand how Lean experts view the laboratory and how to see layout opportunities
- Discuss how the layout can affect workflow decisions
- How an efficient layout is a key part of a continuous flow

The Qualifier

- Argent is not an Architectural firm.
- We are an Industrial Engineering company.
- Focus is people and workflow.
- Concerned with efficient flow.
- We have worked in laboratories for 17 + years.
- (When necessary) Argent layout plans are delivered to Facility Engineers and Architects for final development.

Agenda

Achieving Lean Workflow By Improved Layout of the Laboratory

- Intro & Overview
- Layout Tools
- Layout Objectives
- Lean Features
- Layout Examples
- Conclusions

Why Be Concerned?

- Many people will not be concerned with their layout until they are…
  - Purchasing/adding new equipment
  - New testing
  - Moving
  - Running out of room
- There are such great opportunities for efficiency gains, that even sound laboratories should review and update their layouts.

Layout

In a Nutshell…

- A properly designed layout can have the greatest impact on laboratory efficiency and processes.
- Special care should be taken to ensure that the
  - Laboratory layout facilitates the processing of specimens
  - Enhances communication
  - Does not hinder the workflow or add excess travel.

Key Benefits

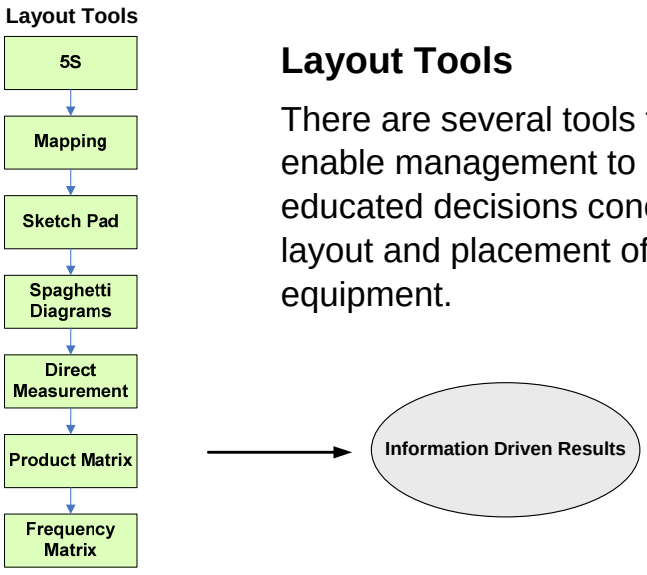
An improved layout can accomplish…

- Reduction in travel
- Reduced turnaround times
- Improved visibility of work and activities
- Improved communication
- Improved utilization of space
- Greater utilization of staff
- Continuous flow of specimens

Another Qualifier

- Layout improvements do not always require a complete redesign.
- Small changes can make a difference

How Do We Start?



Layout Tools

There are several tools that will enable management to make educated decisions concerning layout and placement of equipment.

5S System

5S: Workplace Standardization & Organization

- Used to create organized, clean and functional work areas
- Used to control supplies and materials.
- Create efficient workstations
- Facilitates standardization.
- Reduces unused items.

1. **SORT**
2. **SET IN ORDER**
3. **SHINE**
4. **STANDARDIZE**
5. **SUSTAIN**

5S System

Outcomes

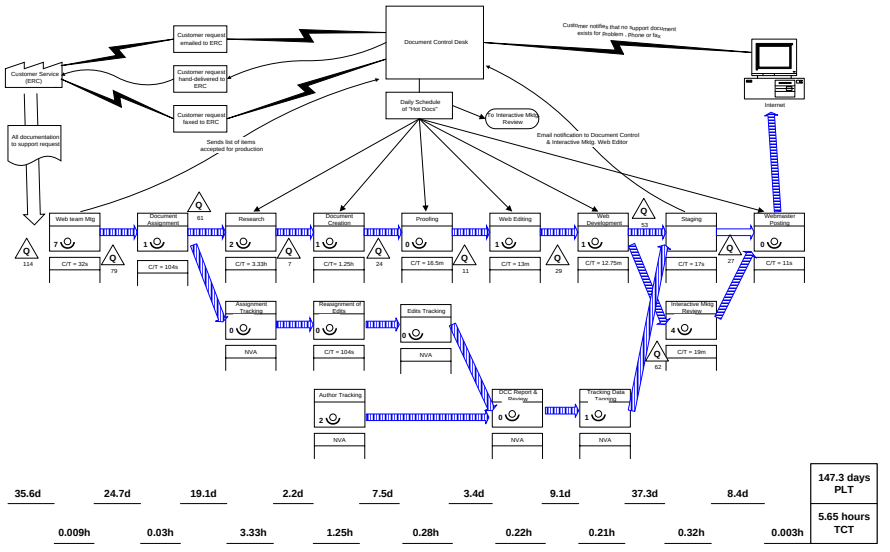
- Best place to start for most projects.
- Clean baseline to work with.
- Starting with an organized and standardized area will lead to better decision making.
- Don't want to move unused items.
- Don't want to plan for unneeded fixtures.

Flowchart / VSM

Need to see the processes…

- Start by mapping the process so that all of the steps required for testing activities are revealed and documented.
- Focus on all common tests and protocols.
- Do not overlook ancillary activities such as retrieving supplies, retrieving reagents, maintenance, cleaning and archiving.
- Use which ever mapping technique you are comfortable with.

Value Stream Map



Sketch Pad

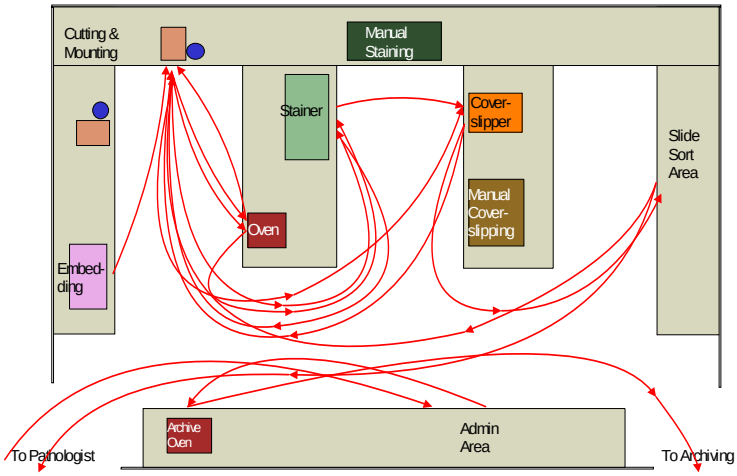
- Need to sketch the current layout.
- AutoCAD or drawing software are not required.
- Just grab a pad, pencil and a tape measure (maybe a ruler).
- Most everything in the lab is square, so it's not that difficult to sketch.
- Hint: use ceiling or floor tiles to measure room dimensions.

Spaghetti Diagrams

- Create spaghetti diagrams to capture the true impact of the current layout and travel.
- Utilize both the process maps and sketches.
- Follow lab personnel and draw a continuous line everywhere they travel to complete a task.
- Or, follow a specimen through the entire testing process.

Spaghetti Diagrams

Routine Histology Staining, Low Volume



Spaghetti Diagrams

Outcomes

- Eye-catching graphic of what is happening in your lab.
- Identify non-value added travel.
- The goal is to reduce the number of lines on the diagram.
- Relocate items that will reduce repetitive travel.

Direct Measurement

- Utilize direct measurement to determine the impact of travel and motion, both of which are typically non-value added.
- Use time studies to capture excessive travel and waiting.
- The number of feet traveled or number of flow chart steps can also be used.
- Use the measurements as a benchmark for potential process improvements and layout changes.

Product Matrix

- A tool used in manufacturing to set up tools and materials for work cells and product lines.
- The object is to identify what key items are shared by each product line.
- In the lab, the product lines are the tests or protocols that are performed.
- List the tests by frequency or volume and then use the matrix to ensure that key items are placed properly to support testing.

Product Matrix

Sample Product Matrix

Equipment	Tests			
	Test A	Test B	Test C	Test D
Workbench A	X		X	
Workbench B		X		X
LIS Station	X	X	X	X
Centrifuge	X		X	X
Vortex		X		
Pipette Station	X		X	X
Hood	X	X		
Refrigerator 1		X	X	
Refrigerator 2				X
Freezer	X			
Instrument A	X			X
Instrument B		X		
Instrument C			X	

Product Matrix

Outcomes

- Develop a clear picture of what is needed for testing.
- Identifies equipment that is shared and most used.
- Facilitate placement of equipment for higher-volume testing.
- The ultimate goal to reduce travel distance and congestion.

Frequency Matrix

- Similar to the *product matrix,* populate the matrix with the actual number of times each item is visited.
- Utilize the spaghetti diagram to determine the frequency in which each item is used.

Frequency Matrix

Sample Frequency Matrix

Equipment	Tests			
	Test A	Test B	Test C	Test D
Workbench A	3		2	
Workbench B		2		4
LIS Station	1	1	1	1
Centrifuge	1		1	1
Vortex		2		
Pipette Station	1		1	2
Hood	2	1		
Refrigerator 1		2	1	
Refrigerator 2				2
Freezer	1			
Instrument A	1			1
Instrument B		1		
Instrument C			1	

Frequency Matrix

Outcomes

- The higher the number, the greater the opportunity to either streamline the process or provide layout placement to reduce travel.
- High numbers could mean non-value added elements in the process.
- Congestion is also an issue; for example, if there is one LIS station that is always in use, an alternate station may be an option.

Layout Objectives

Layout features that will help achieve the goal of a Lean laboratory.

Layout Objectives

- Laboratory floor plans should always be open and with good visibility.
- Reduce barriers to movement as well as any barriers that could interfere with line-of-site.
- Workbenches and equipment should be movable or on casters.
- The ability to move laboratory components is critical for efficient layout changes or for changes in volumes or testing.

Layout Objectives

- Too many benches and countertops can be inefficient.
- Workbenches can create barriers and generally collect clutter. Keep benches to a minimum and keep them clean and organized.
- Substitute carts for benches whenever possible; they are smaller and more flexible.
- Maintain uni-directional flow and avoid backtracking.
- Avoid bottlenecks, dead-ends and inaccessible areas.

Layout Objectives

- Don't use the entire room for testing if it is not needed.
- Create efficient work cells that use less space. Use excess space for administrative purposes, storage or future testing needs.
- Cabinets and shelving should be open with no doors. Open cabinets are easier to maintain and organize. Moreover, visibility of supplies and tools will lead to efficiencies.

Layout Objectives

- Incorporate POUS (Point of Use Storage) throughout the laboratory.
  - Stock a reasonable amount of consumables at the point of use (no more than a few days).
  - The goal is to reduce travel and delays without creating multiple locations with excessive inventory.
  - Primary inventory locations should still be centralized.
- Use under-counter refrigerators and freezers to store reagents and supplies. This will reduce travel to the larger centralized units. Maintain these points as POUS.

Layout Objectives

- Create work cells to improve workflow, visibility, staffing resources and space requirements.
- Work Cells are fashioned in a way that allows operators to see and move quickly between stations.
- Work Cells reduce travel and motion while providing flexibility to process low to high volumes.

Lean Features

Layout Improvements can facilitate and even rely on Lean features

- Work cells
- Continuous flow
- Batch size reduction
- Balanced Work
- Kanban Signals
- Point of Use Storage (POUS)
- Flexible labor

Lean

The goal of Lean is Waste Reduction in order to achieve Continuous Flow

Lean Tools

Lean Tools for Identifying & Reducing Waste

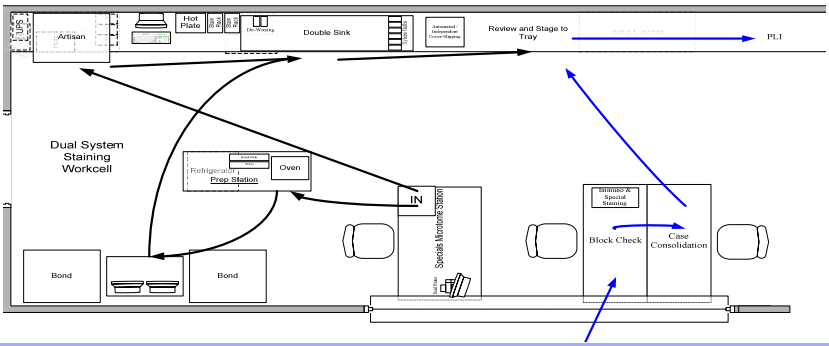
Lean Tools				
	Pull Systems	Work Cells	TPM	Performance Measurement
	Setup Reduction	Quality at the Source	Continuous Flow	Batch Size Reduction
	Standardized Work	Teams	POUS	
	Visual Controls	Value Stream Mapping	5S System	Layout

Work Cells

- Work Cells are created when workstations that process similar or same type work are brought together and arranged in an open-plan configuration.
- The configuration is fashioned in a way that allows operators to see and move quickly between stations.
- Work Cells reduce travel and motion while providing flexibility to process low to high volumes.

Work Cells

- Histology Work Cell
  - Microtomy
  - Special Staining
  - Quality Inspection and Case Collation



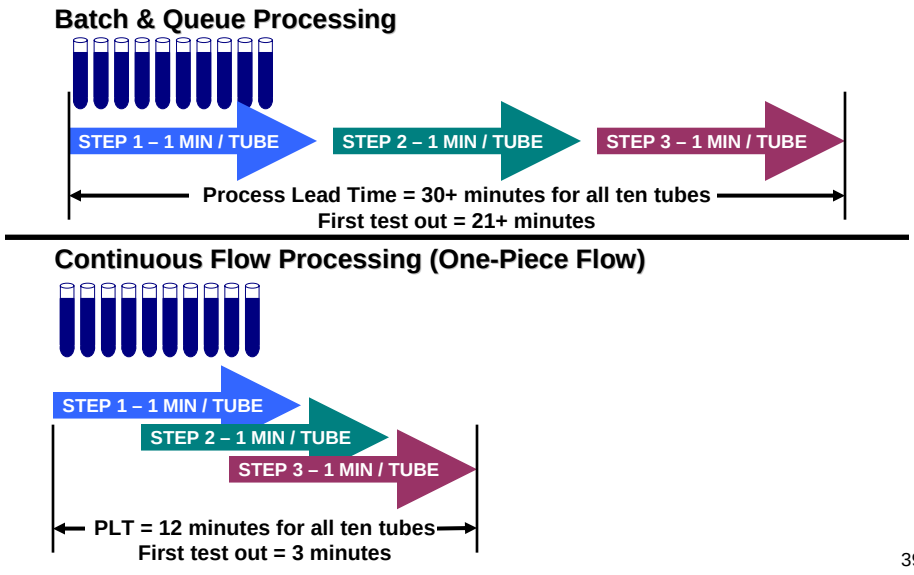
Continuous Flow

- The process of addressing work as soon as possible in single piece or small batches.
- Do not allow work to wait in large batches or queues.
- Why?
  - Reduces large batches and queues
  - Eliminates double handling of specimens, materials, etc
  - Maintains the quality focus on the “current” item
  - Reduces the amount of In-Process work
  - Facilitates FIFO

Batch Size Reduction

- Single Piece Flow is a goal of Lean
  - The real key is..
- **Optimal Batch Size**
  - Sets attainable and realistic batch sizes for the environment. Based upon:
    - Arrival patterns
    - Instrument cycle times
    - Instrument capacity
    - Rack and container sizes
    - Staffing & Schedules

Batch Size Reduction



Balanced Work

- To manage batches and queues, process stations (steps) will need to be balanced
- Balanced work requires the process steps to be in pace and harmony
- How is this accomplished?
  - Shift the work elements
  - Utilize multiple work stations
  - Use your direct measurement to understand time requirements (aka Takt Time)

KanBan Signals

- KanBan Signals are utilized to control batch and queue sizes.
- A KanBan can be anything
  - A full rack
  - A full tub
  - Taped-off area on the bench
  - A card system

Point of Use Storage

POUS

Storing supplies in an organized fashion at the work location.

Right-levels and visual identification is important.

Flexible Labor

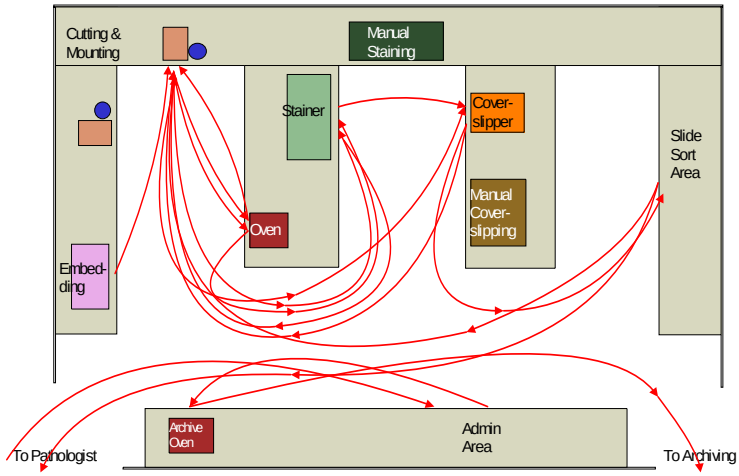
- Take advantage of an efficient layout to flex staff.
- Select staff can float and move to different areas throughout the day to respond to higher work demand.
- Use multi-skilled employees to create flexible schedules and shifts that match up with demand.

Layout Examples

A few layout examples to support our lessons.

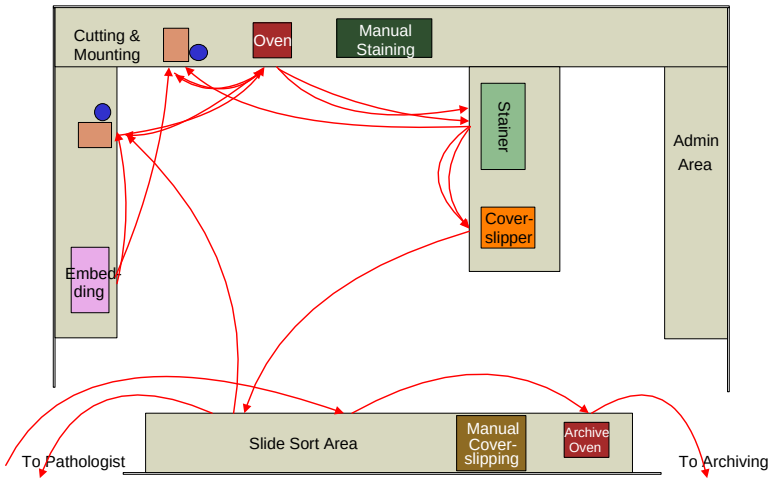
Workflow Example

Routine Histology Staining, Low Volume



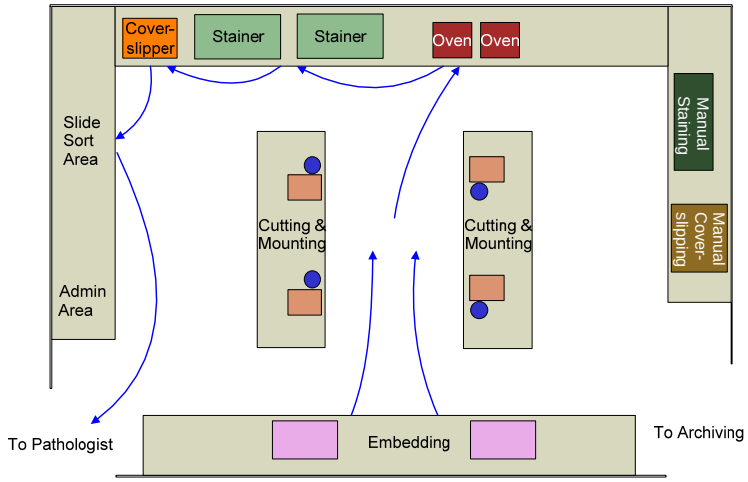
Improved Workflow

Routine Histology Staining, Low Volume



Improved Workflow

Routine Histology Staining, Medium Volume



Example Benefits

Routine Histology

- Work is easier for HistoTechs
- Less travel
- Better visibility of equipment and workstations
- Promotes continuous flow

What does all of this mean?

Combine the…

Information from ⟶

- Layout Tools
- Layout Objectives
- Lean Features

With your own experience and common sense

- To create a model for an efficient layout that meets your needs

What Can You Do?

Project Examples

- Relocate supplies
- Reduce work benches or fixed counters
- Relocate a component, instrument or work cell
- Create a work cell
- Redesign a room (no construction)
- Create an open laboratory (construction required)
  - Work closely with your facility staff or a third-party

Final Advice

- The greatest attribute of Lean is the idea that you should try new ideas very quickly.

Just Go Do It!

Closing

- Q&A
- Thank you

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