APPLICATION OF LEAN PRINCIPLES & SOFTWARE SOLUTIONS FOR MAINTENANCE RECORDS IN CONTINUING AIRWORTHINESS MANAGEMENT ORGANISATIONS

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Lean Thinking

“a way to
specify value,
line up value-creating actions in the best sequence,
conduct these activities without interruption
whenever someone requests them,
and perform them more and more effectively”

- James P. Womack and Daniel T. Jones
Lean Thinking: Banish waste and create wealth in your corporation
1996

Lean is about systematically identifying the activities that add value and reducing non value adding activities.

- Specify value from customer perspective
  - Internal/external customers - Quality Assurance, Regulatory authorities, Lessors
  - Information products, Airworthiness records, reliability reports, etc;
- Value stream
  - All the steps involved to provide value to the customer.
  - Each step can be sorted into three categories: (1) those that add value; (2) those that add no value but are currently necessary and (3) those that add no value and can be eliminated.
  - The third category must be eliminated to make the stream efficient.
  - Capture, representation, exchange and retrieval of information
- Efficient Flow
  - Reduce interruptions & waste
- Pull
  - Respond to customer demand
- Continuous improvement
Waste

Defects which require rectification and goods & services which don't meet the needs of the customer.

Over-production of items no one wants

Inventories and remaindered goods pile up

Over-processing steps which aren't actually needed

Motion of employees & transport of goods from one place to another without any purpose

Groups of people in a downstream activity standing around waiting because an upstream activity has not delivered on time

Waste
- Activities which needs resources but provides no value

In airworthiness management context
- Transport of physical paper records.
- Transport of emails and files. Extra effort / motion from employees.
- Inventory of projects started but not completed.
- Time spent on switching between tasks and organising work.
- Additional steps taken for system work-arounds
The 5s’s is a tool to help reduce non-value adding activities, improve productivity and quality
1. **Sort** – Remove all unnecessary things and organise to keep only essential items for easy retrieval.
2. **Set in order** – To specify where everything should be stored. Everything in its right place would eliminate the need for its searching.
3. **Shine** – Keep everything clean and neat.
4. **Standardise** – Ensure all procedures are defined and rules are set.
5. **Sustain** – Commitment to follow the defined processes and form a habit of continuous improvement
- Switching from paper to electronic mode of communication is a good method to gain immediate benefits in document management.
  - Airworthiness records can be made available across physical boundaries without significant additional effort. Remote access
  - No physical documents to transport
  - Waste such as waiting and transport are reduced. This results in reduced cycle time.
- A generic system that is not purpose-built may lead to additional resources being spent to overcome process limitations, work arounds and undocumented norms. For a system to be effective, it must be designed with a customer centric approach, taking into account the needs of an airworthiness management organisations.
- Data doesn’t provide value when on paper, it must be utilized
- Employees will have to spend additional effort to retrieve information deep within folders.
- Specify where everything should be stored; a predefined structure for storage of records would reduce the effort needed to search.
  - Instead of a file and folder file management system, a standardised structure of records should be used across all assets of a similar type.

- Search based on records meta data and contents
  - An example of this would be, to retrieve compliance records for a specific airworthiness directive (AD), one might need to browse different sections for each aircraft and locate the task card, but with metadata on records this can be done with just the input of the reference such as an AD number and click to search across all assets.

- Reports & computed results can be given realtime, Such as delays or defects information from Technical Log
- Workflow system supports coordination among cross-functional employees to achieve completion of a complex business process.
  - Standardise the right sequence of activities to be performed
  - Flexibility to update process with visibility to whole organisation

- Reduction of the wastes like motion in the value stream by reducing non-value adding activities such as emailing each task, communicating over phone lines, using post-it notes and spreadsheets to track the status of work etc.

- A tasks dashboard specific to the user will display only the records that his action is required on and only when it is required. This results in fewer wastes as an employee doesn't have to try to determine which of the records require their immediate attention.

- Digital Signature and Audit trail to enable completely paperless work environment
- Standardise process checklists
  - Safety
  - Compliance
- For instance, provide multiple compiled records that are ‘current’ – such as the list of deferred maintenances, service life limited components, compliance with maintenance program, status of airworthiness directives tasks etc.
- These ‘current’ records are to updated regularly and pass through a workflow for certification by appropriately qualified staff.
Handling multiple airworthiness review projects at the same time could involve communication and work processes that are cumbersome; such as email follow-ups, phone calls and miscommunication.

With process workflow:
- airworthiness review staff can see the on-going review projects and their real-time status with ease.
- new review projects can be initiated with a couple of clicks
- a new project is created based on the list of documents requirements for this process defined in this system.
- The process is standardised and repeated motion of specifying the same list repeatedly is avoided.

The requirement for each document from their respective department is added to their queue.
- Information in papers, documents, Intranet, excel files, emails
- Need to invest effort into access information

- Provide status visualisation of the transient state of activities in workflows on a real-time basis.
  - One glance away with dedicated dashboard
  - Effective decision making
  - Identify bottle necks
  - Reallocate resources
- Continuous improvement
- Lean is not a static measure of performance, it is the improvement in performance over a period of time.
- Performance analytics data summarised and visualised for a longer period of time supports continuous improvement activities by providing metrics for all activities involved.
- Different processes on different systems vendors and data formats
- Other stakeholders such as part manufacturers, lessors and regulatory authorities.
- Manual data operations - resources & defects

- To enable electronic data transfer, reduce defects, motion and transport waste, there needs to be a better communication mechanism that enables this collaborative and efficient approach.
- Data exchange model must be such that all the data parameters and the digital signatures are recognised for compliance by all the systems involved.
- While there might be premium standards that exist at this point by different organisations, there needs to be one that is truly open, which follows an open governance or the "Fork and Contribute" ideology of modern open source software projects.
- Opens up aviation data for other software domains - big data and predictive maintenance systems
QUESTIONS ?