Module 08: Resourcing

Maintenance Work Management

Rules of engagement in the VILT environment

1. Mute yourself when you are not speaking.

2. Close your email and any other distractions on your desktop and mute your phone notifications.

3. Let us know if you step away from the session – just type us a note into the chat.

4. Participate and be prepared to be called upon by name to give a response.

5. Speak up, use the chat or raise your hand when you have a question or comment.

6. Use annotations when instructed to do so.

Schedule for this session – Day 3

| Time	Content to be covered
	Welcome
60 minutes	**Module 08: Resourcing**
120 minutes	**Module 09: Long-term Work Plan**
	Lunch
90 minutes	**Module 10: Tactics Optimisation**
90 minutes	**Module 11: KPIs, Reporting and Analysis**

Learning objectives for this module

- Describe the impact and identification of specific resources on the concept of planning work.

- Describe the impact and identification of specific resources on the concept of scheduling work.

- Describe the impact of repairable assets on the scheduling process and the purpose and benefits of serialisation when managed effectively.

- Describe the impact of warranties and additional requirements to maximise the benefits of effective warranty procedures.

Ice-breaker

See who can get the correct answer first! Type your answer into the public chat.
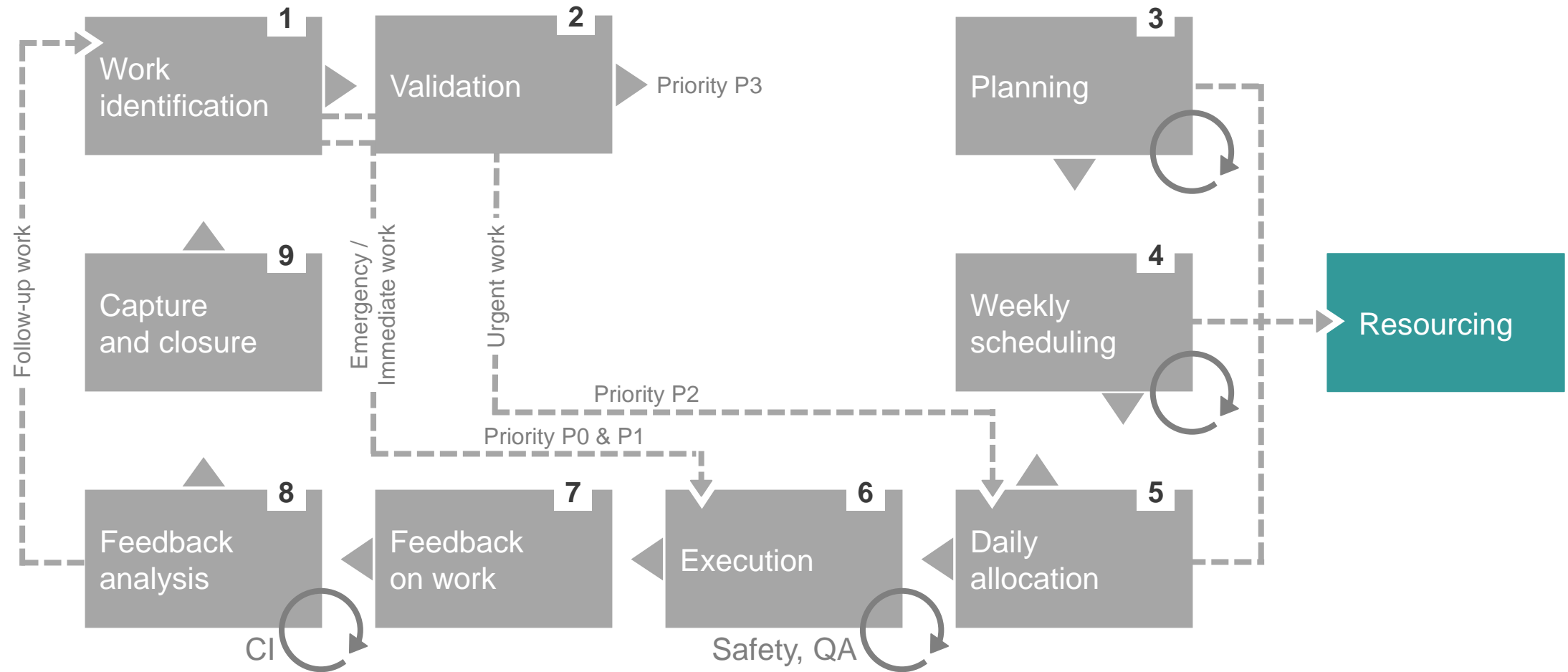
**How many triangles can you see?**
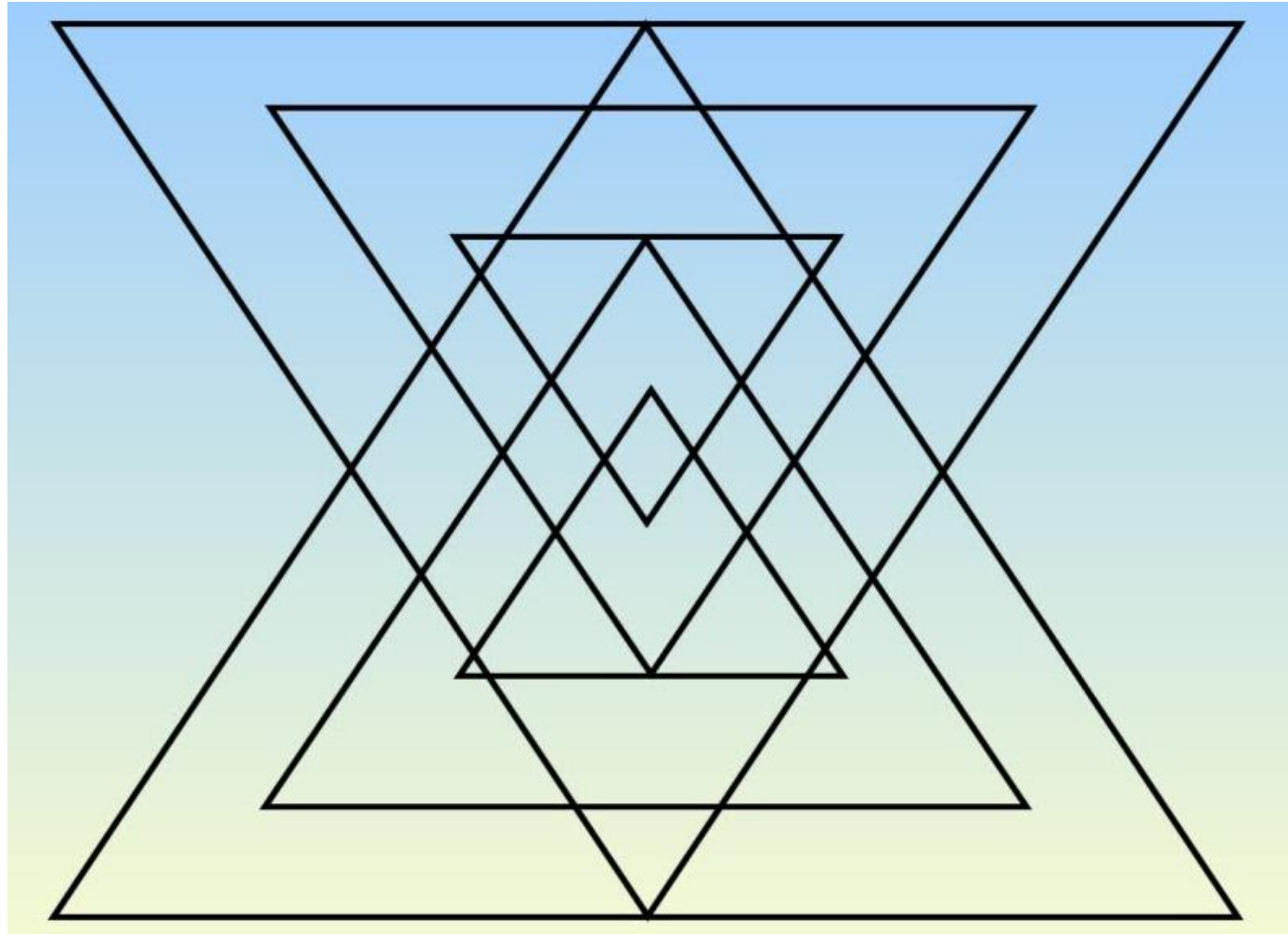
The goal of resource planning

The goal of resource planning is to ensure that the right spare parts are in the right place, at the right time, with minimal expense and effort.

Goal

- Right place
- Right time
- Minimal expense
- Right spare parts

Position in the maintenance work management cycle

Position in the maintenance work management cycle
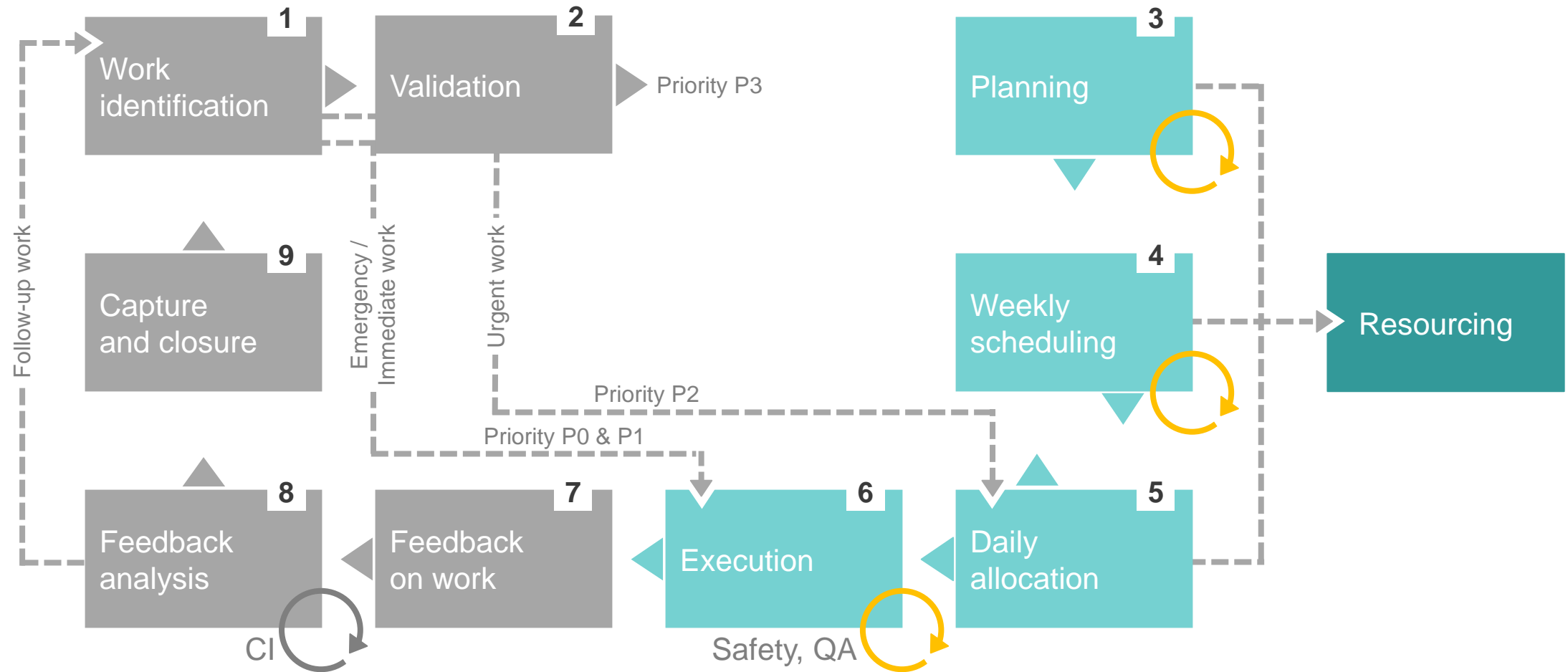
Unpacking resourcing

Think about the frustrations you have had with Supply Chain. List some of them.

Type your answer using the public chat feature.

Current constraints with resourcing

In my job the most challenging aspect of resourcing is:

A. internal people
B. contracted services
C. spare parts
D. special tools
E. available time.

Planning and scheduling activities recap

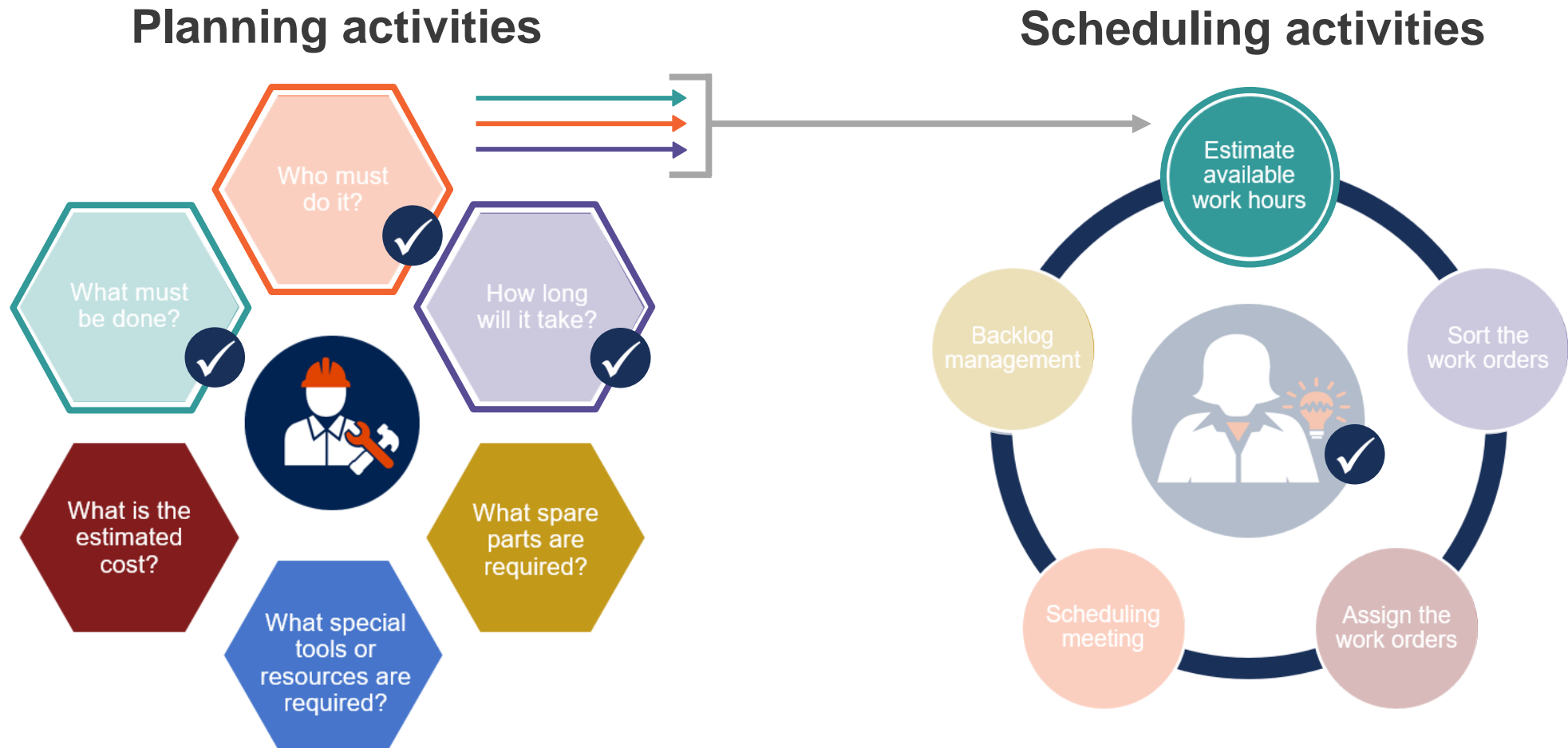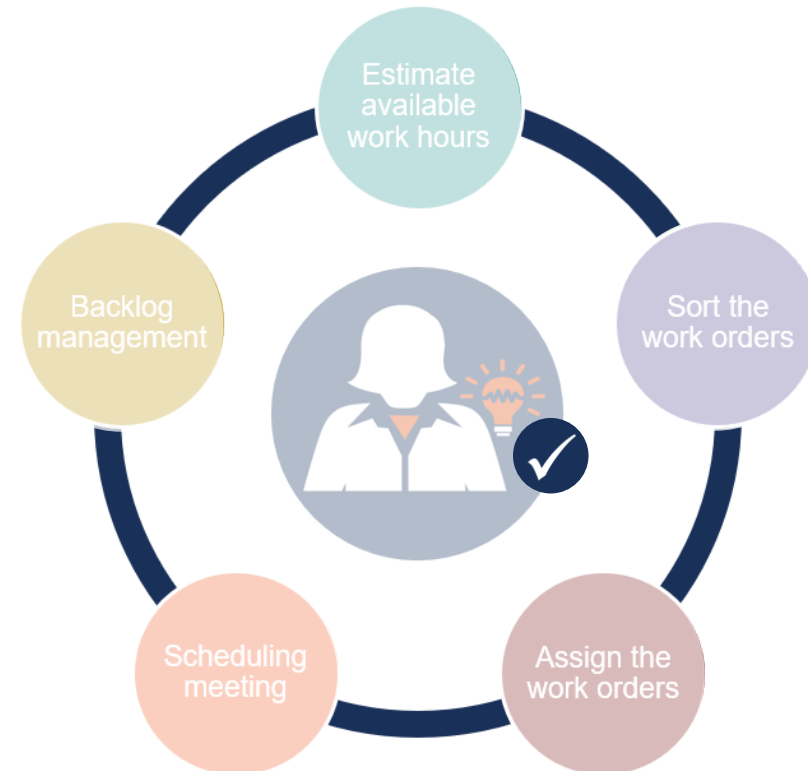# Planning and scheduling activities recap

Planning and scheduling activities recap

Resourcing decisions

# The interaction with resourcing and decision-making

These questions have to be asked by the planner during the scoping phase:

- Are the spare parts available?

- Is any special equipment needed?

- Are specialised skills needed to execute the work?

Once the planner has scoped the work and the above questions have positive confirmation, the scheduler takes over.

Available hours will determine how much of the work can be scheduled in the scheduling period and the latest completion date will inform the decision to bring external service providers on board.

Maintenance work management cycle
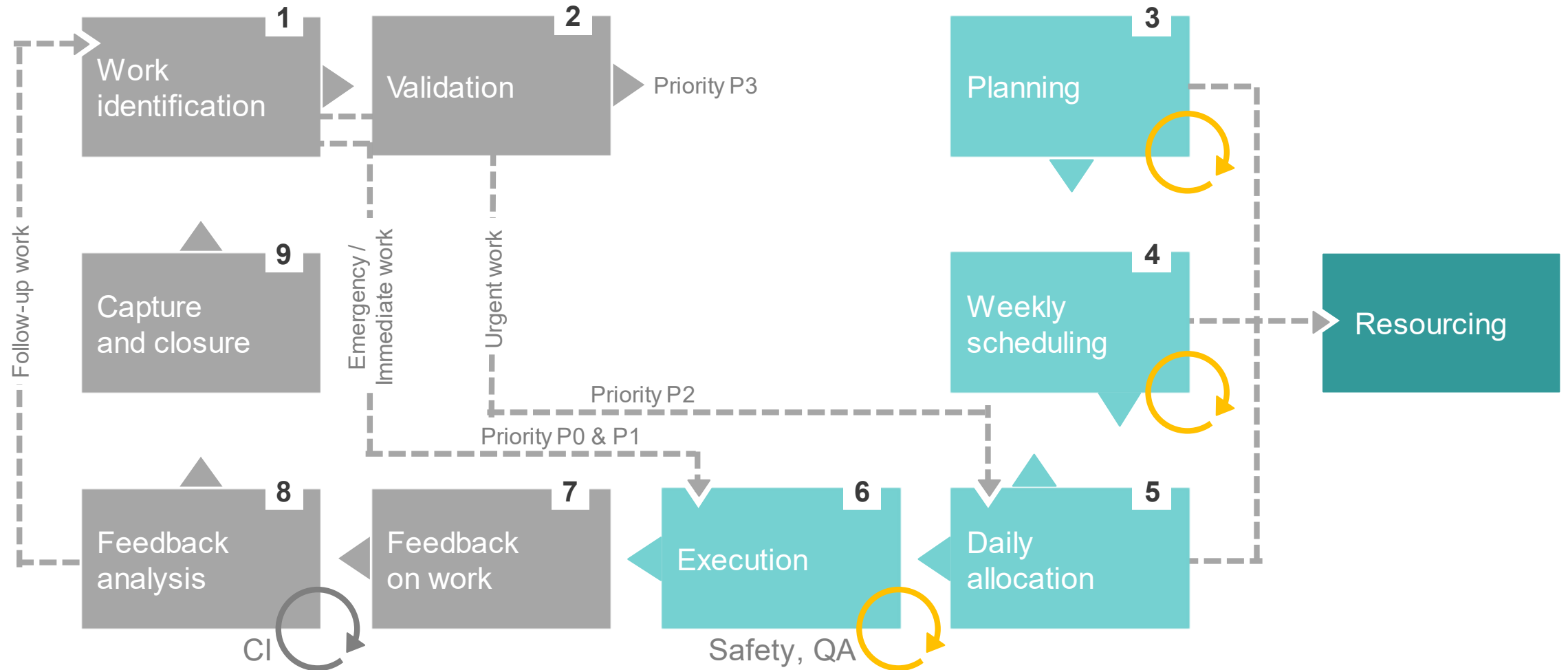
Emergency/immediate work (P0 and P1) with availability confirmed
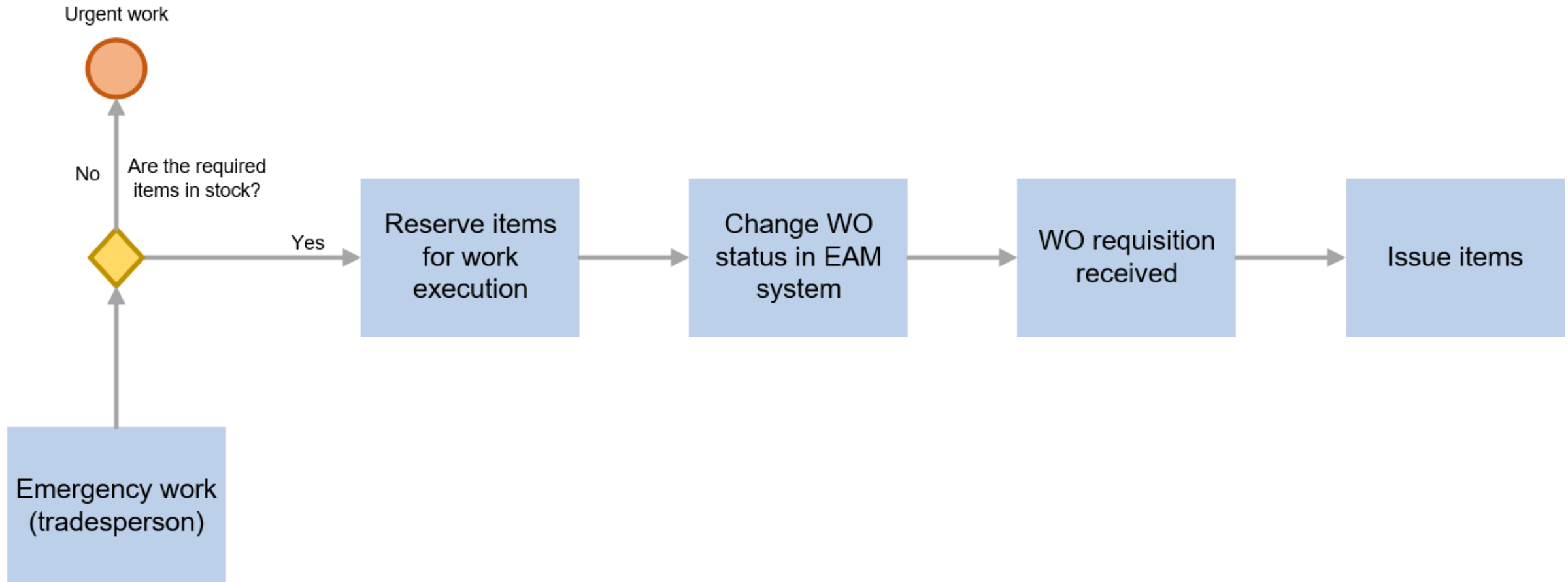
Urgent work (P2) with availability not confirmed (PLT <7 days)
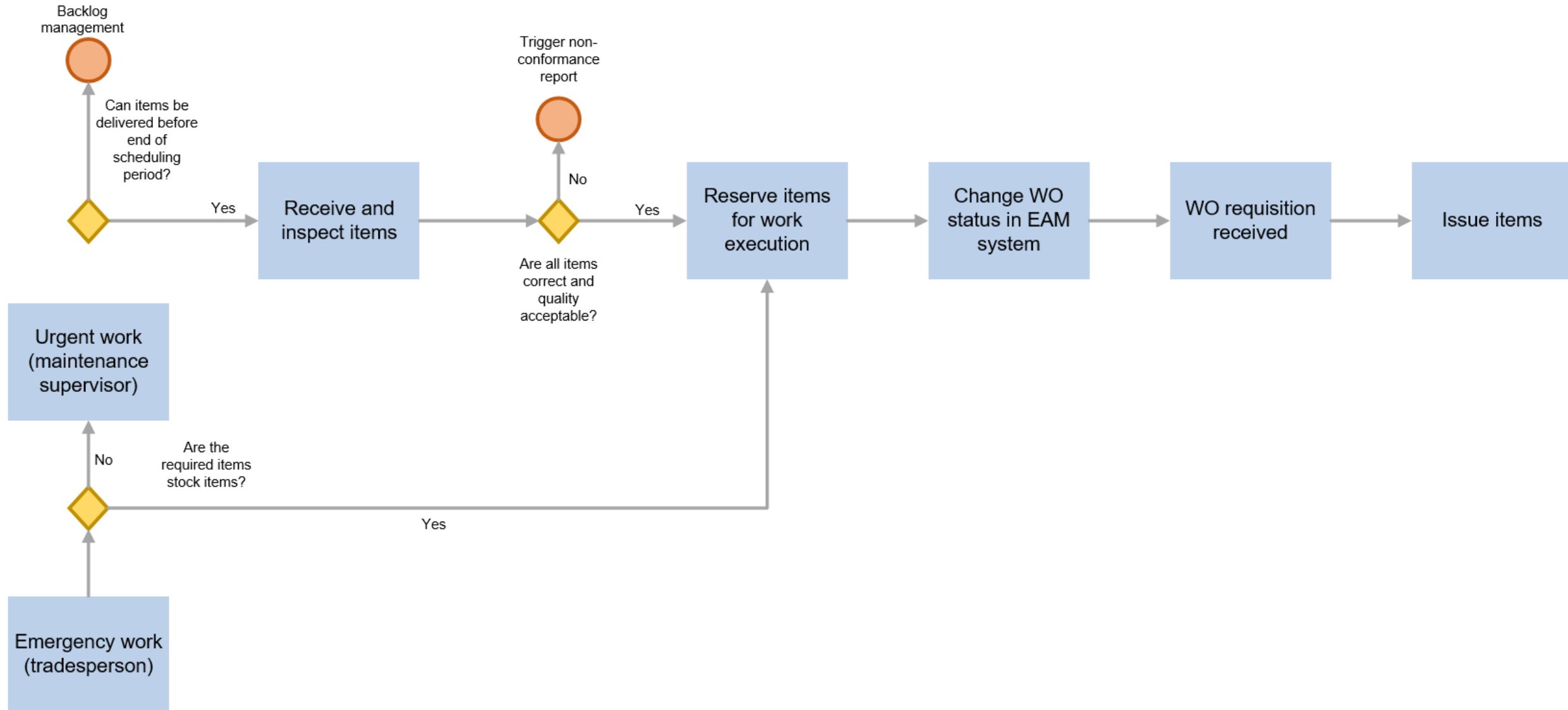
Work adequately scoped (backlog)
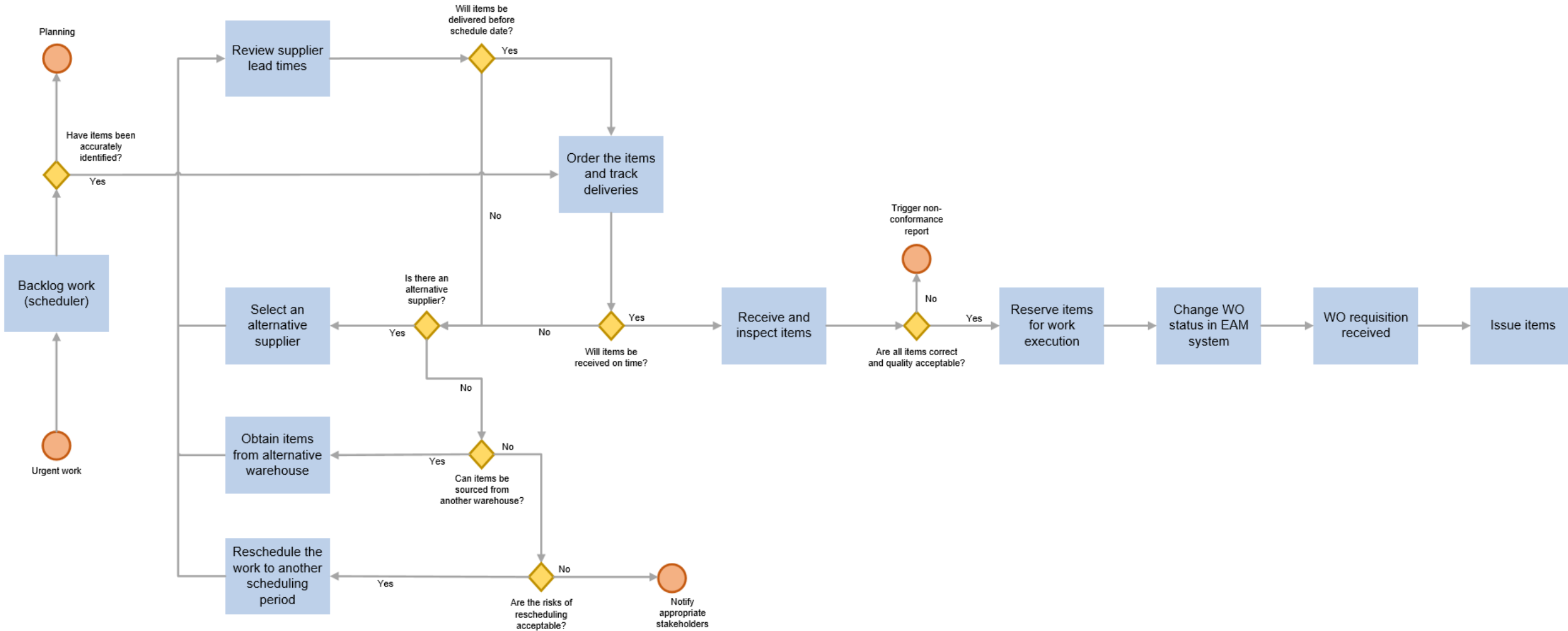
Work not adequately scoped (planning)
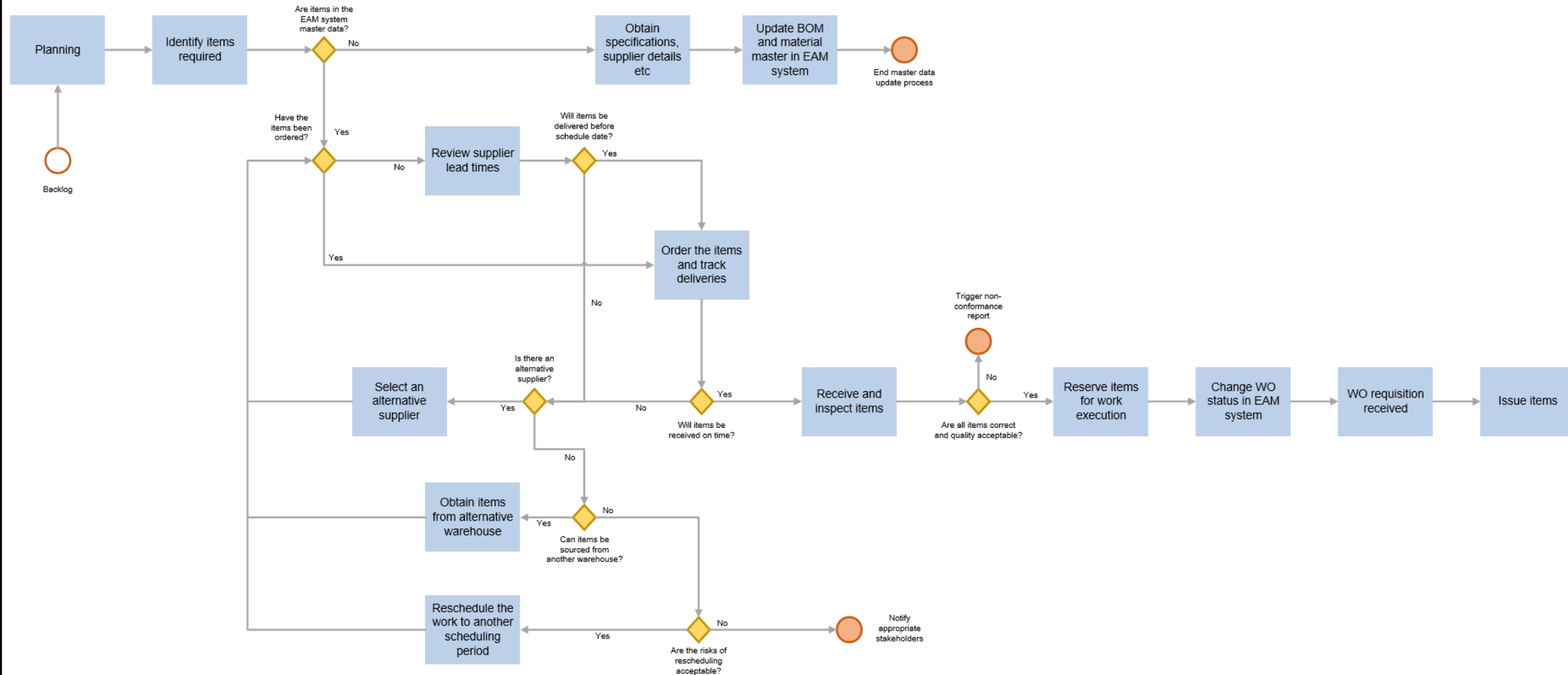
The full picture
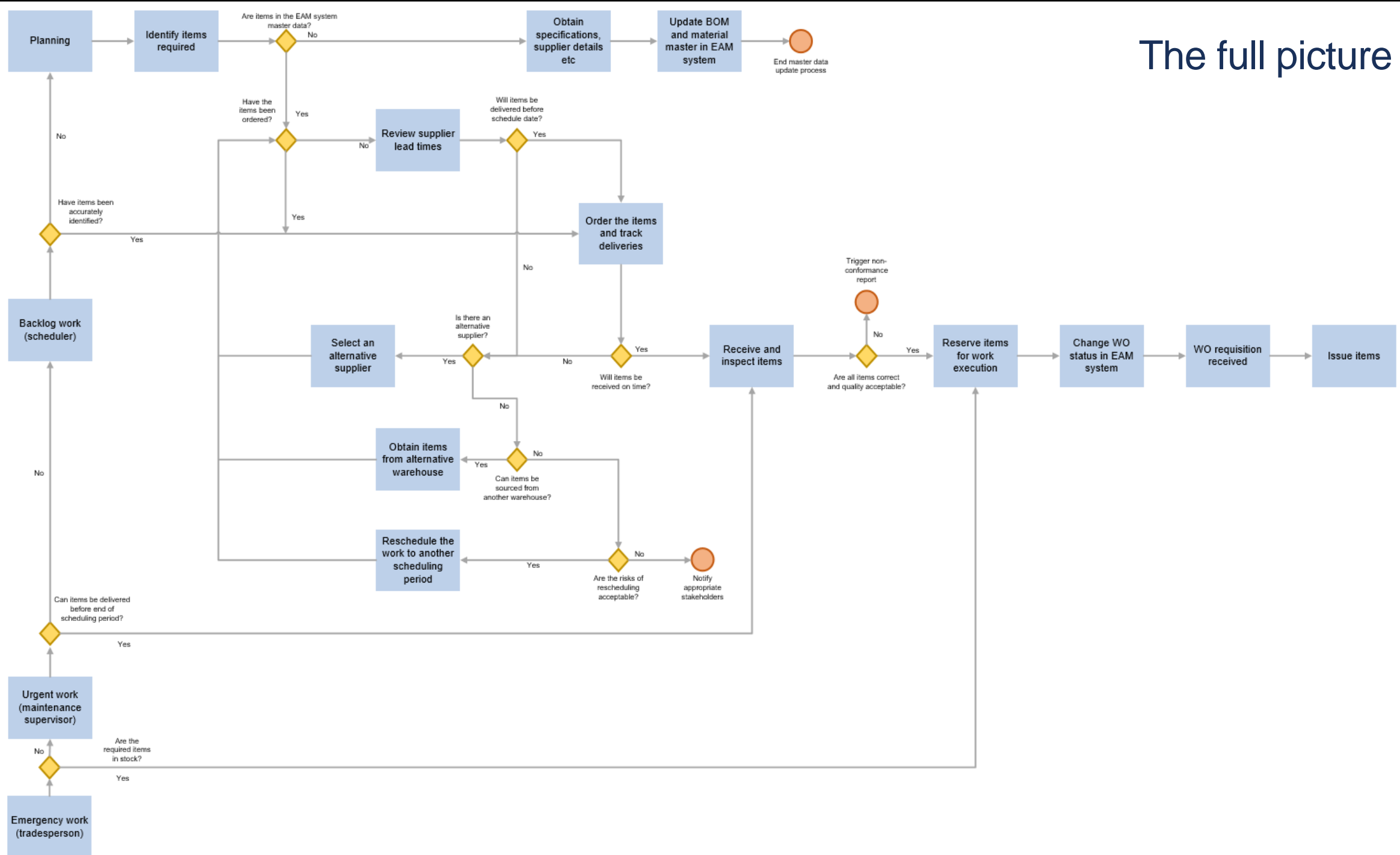
Spare parts

Broad categories of spare parts

Insurance spare parts

- Long lead time, high risk and specific to critical assets

- Only spare parts with the highest criticality and longest lead time are classified as insurance spare parts

- Example – high-voltage cable joints (very rare but when it happens, half the plant goes down)

Strategic spare parts
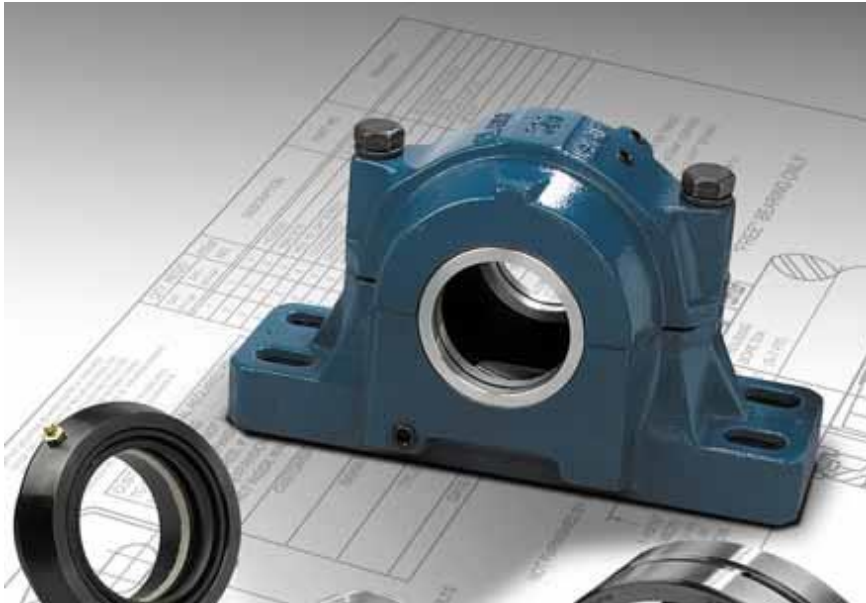
- Long lead time and high risk with predictable usage
- Could be seen as common spare parts used across multiple assets
- PF interval is shorter than lead time, but the "when" is predictable and is critical to the operation at the site
- Example: a bearing on a ventilation fan. As soon as acoustics show that the bearing is nearing the failure date, it needs to be replaced immediately

Rotable spare parts

- Items that can be reconditioned or economically repaired for reuse when they become unserviceable

- Also known as repairables, sub-assemblies or exchangeable items (eg a large gear box, pumps, fans)

- Rotables need serialisation to track the exact locations

Considerations for rotables

Considerations

- Usually expensive and incur high inventory carrying costs.

- Cost due to non-availability is often much higher.

- Repair cycle time influences the number of units being held in stock.

- Due to high unit costs, warranty management is important and hence **serialisation** is necessary.

- Maintenance history and cost data are needed in addition to a life cycle management strategy to answer questions like "when is the repairable 'beyond economic repair'?"

Serialisation

Serialisation is when a spare part can be tracked throughout the process as a result of its serial number.

Serialisation provides the necessary control for effective **warranty** management when parts are fitted and de-fitted multiple times in the warranty period.

Serialisation provides full history retention for better life cycle management.

Serialisation is needed for an effective process.
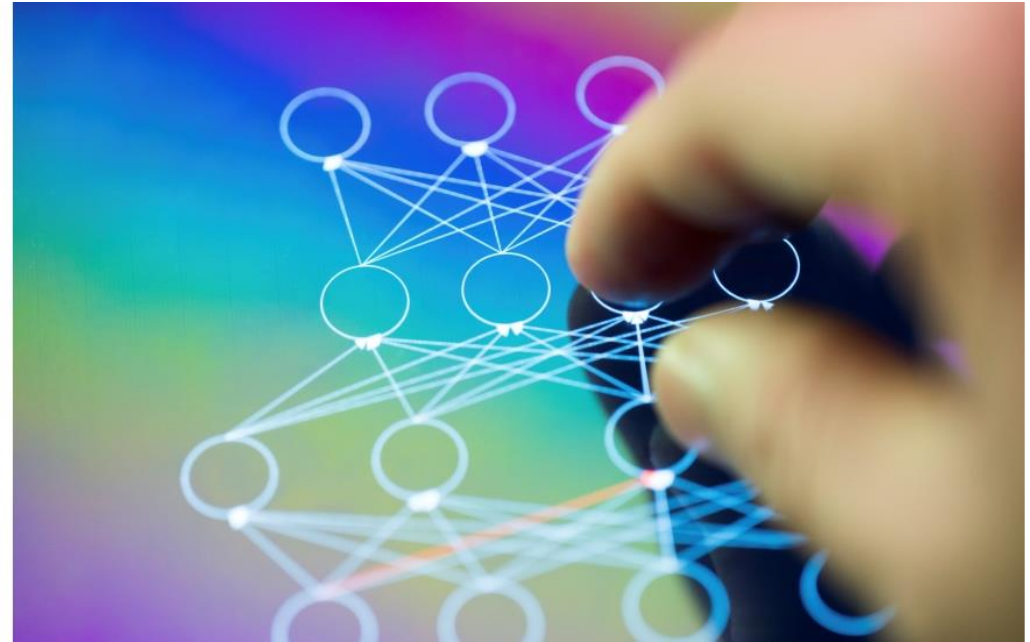
The process owner and quality assurance

Who is the process owner when dealing with rotables?

What is the quality assurance process to ensure serialisation integrity (after stripping, cleaning and sandblasting)?

Type your answer using the public chat feature.

Serialisation integrity

What is the quality assurance process to ensure serialisation integrity (after stripping, cleaning and sandblasting)?

Type your answer using the public chat feature.

Equipment failure → Work Orders to dismantle and install → Failed equipment held in stores → Refurbishment Order → Interior or exterior repair → Received repaired items back in stock

Repair Order Process

Notification

Repair Order

Install

Dismantle

Rotables Store

New

To be repaired
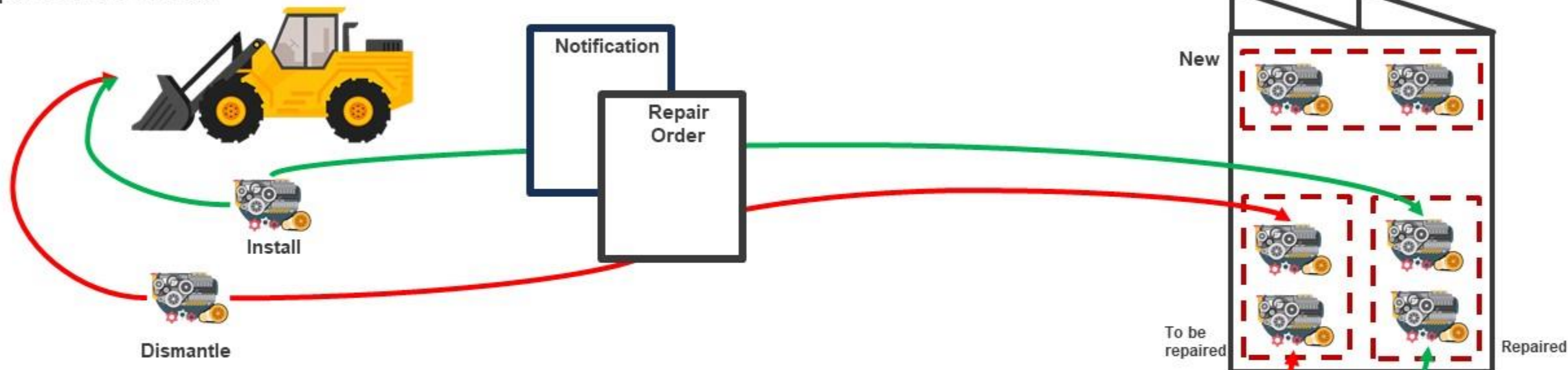
Repaired

Refurbishment Order Process

Goods issue of defective item (C3)

Refurbishment Order
- Material number
- Serial number

Defective item is sent for repair to an external contractor or internal workshop.

Goods receipt of refurbished item (C2)

Rotable: Unique item (Equipment number or serial number).

Refurbishable: Many of the same type of item.

Typical repairable process
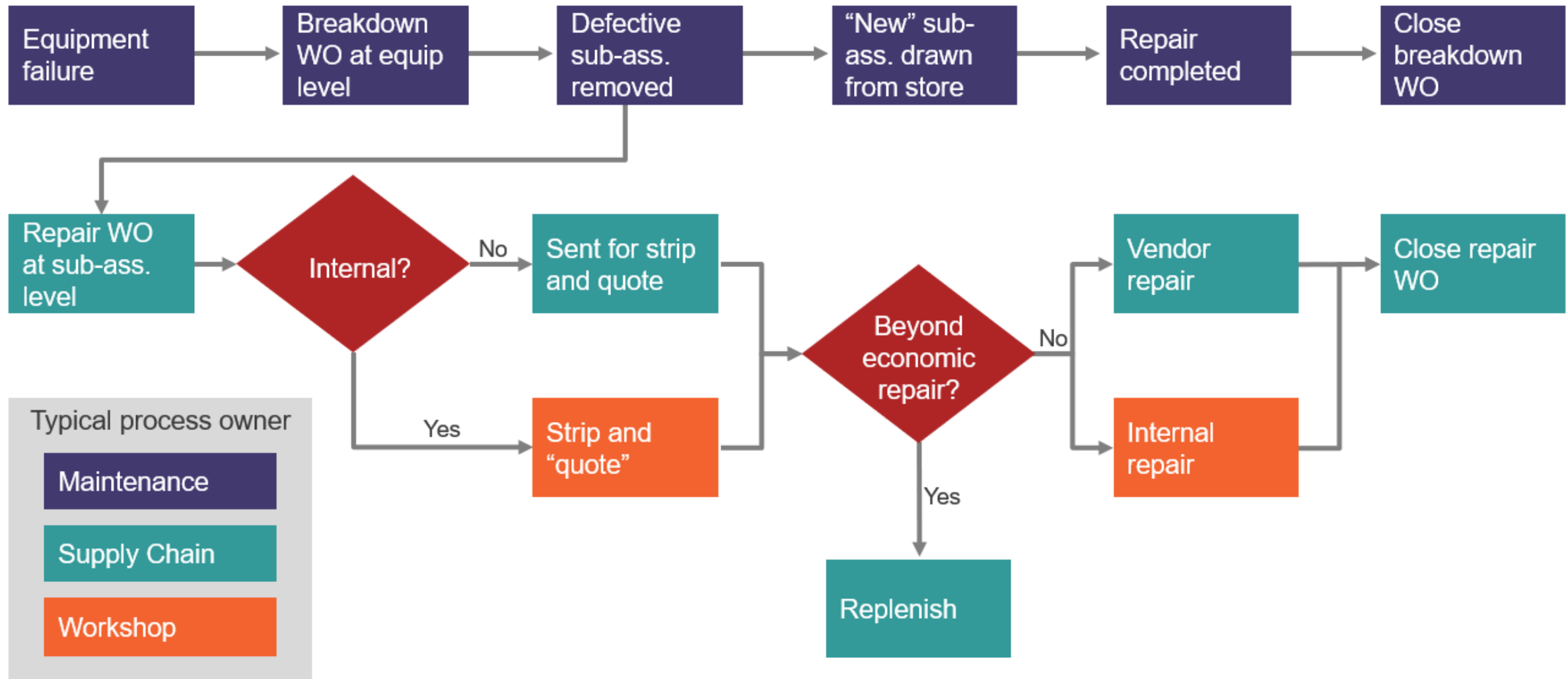
Stock, non-stock and consumables

Stock items   **Non-stock items**   **Consumables**

- Stock items – frequently required, predictable and high usage, essential to many maintenance jobs; examples include small motors / gear boxes, conveyor parts, and PPE items
- Non-stock – random usage, generic-type spare parts, easily sourced locally, break fairly infrequently and impact is not big; examples include electrical switch gear
- Consumables – nuts, bolts, cable straps, cable ties, screws, etc

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Returns to store

Returns of spare parts to the store

Join your breakout room and discuss the returns process.

- List the steps in sequence to describe how the return to store process works to return spare parts and consumables not used during the execution of the job.

- Think of a few consequences if the return to stores process is not followed. What will happen to the spare parts? Where will these spare parts end up? What is the financial impact? What is the long-term impact on work execution and plant performance?

Warranty management

Warranties overview

- A warranty is a statement of assurance by a supplier about the performance of a product or part under normal operating conditions.

- Effective warranty management through robust work management processes can contribute to significant savings.

- Warranty management directly affects the cost of maintenance and therefore needs to be owned by Maintenance, NOT Supply Chain.

- Supply Chain owns the relationship with the supplier and will facilitate the negotiations.

- Maintenance owns the data needed to validate the warranty claim.

Warranty process

Failure event ▶ **1** **2** **3** **4** **Close claim** ‖

1 — Create claim for equipment that failed during warranty.

2 — Validate claim, supply chain provide proof of purchase, planning date of installation, date of failure and maintenance have the failed item available.

3 — Submit claim, supply chain use engineering evidence to submit claim to vendor.

4 — Negotiate claim, supply chain, engineering and vendor negotiate around the claim.

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Considerations of warranties

Handling early-life failures in the workplace should be no different as to how we handle warranty claims when we are personally affected.

Proving that it is not a valid claim is the responsibility of the vendor, however the workplace needs to provide evidence to show that based on probability, no abuse was evident.

The evidence of a warranty claim

How do you preserve the evidence of the warranty claim?

Type your answer using the public chat feature.

Risk mitigation when managing rotables and warranties

Join your breakout room and discuss the following:

- Identify the risks in managing rotables and warranties in the Scheduling and Planning steps of the MWM, then suggest a few options of how these risks can be managed and who should take ownership of that process.

- Each group must prepare to give their feedback to the rest of the class.

Using contractors

Principles for using contractors

These are the four main principles when using contractors:

1. A clear Scope of Work must be defined in the SLA.
2. Use the same procedures for contractors which are in place for employees.
3. Apply all of the HSSE procedures rigorously.
4. The execution supervisor must sign off on the quality of work.

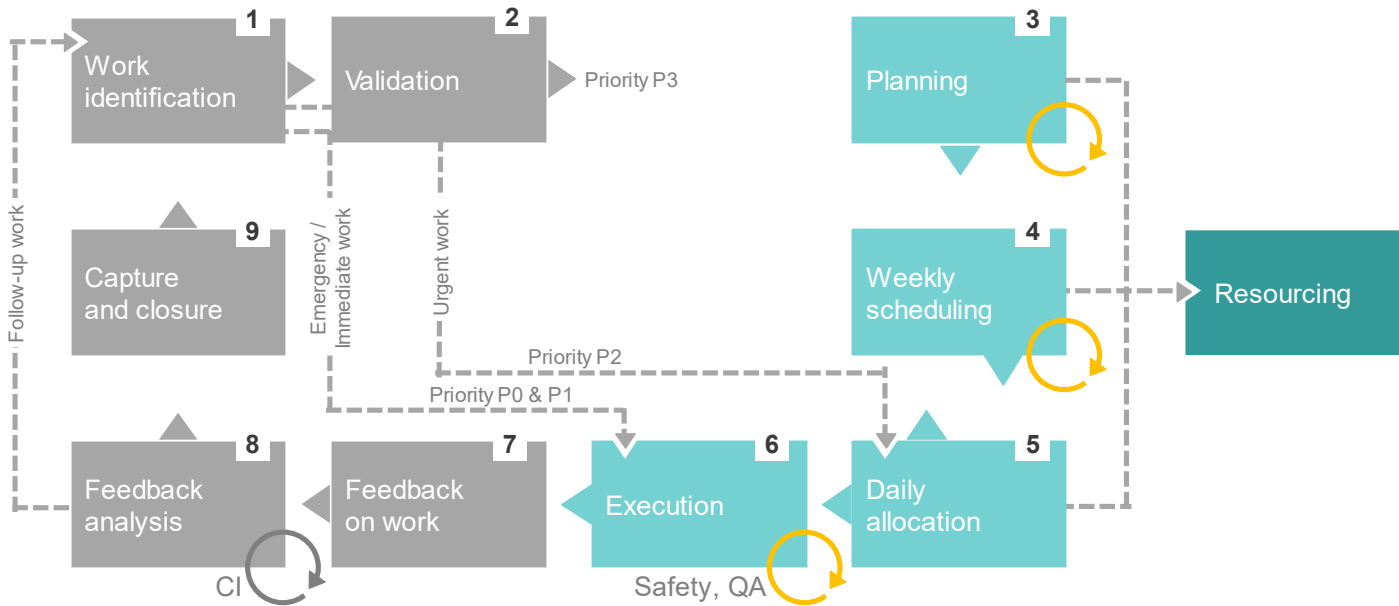# Apply the principles of contractor management

Join your breakout room to discuss which of the principles of contractor management would benefit your organisation if implemented.

Identify which of the previously listed frustrations would be eliminated by it.

Share your feedback with the rest of the class.

The influence of resourcing on KPIs

Tactical work pre-planned	% tasks with no duration
Efficient planning	No of standard tasks
Accurate planning	Approved work "awaiting spare parts"
Backlog management	No. of weeks' pre-planned work in backlog
Effective planning	Wrench time

4

Scheduling accuracy	Schedule compliance
Labour efficiency	Labour utilisation
Effective scheduling	Wrench time
Effective scheduling	Cancelled work

Reflect on the learning objectives of this module

Are you able to:

- describe the impact and identification of specific resources on the concept of planning work

- describe the impact and identification of specific resources on the concept of scheduling work

- describe the impact of repairable assets on the scheduling process and the purpose and benefits of serialisation when managed effectively

- describe the impact of warranties and additional requirements to maximise the benefits of effective warranty procedures?

A. Yes

B. No

C. Partially

Module 09: Long-term Work Plan

Maintenance Work Management

asset management | engineered

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Ice-breaker

What is the best piece of advice that you have ever been given (personally or work-related)?

Type your answer using the public chat feature.

Learning objectives for this module

At the end of this module you will be able to:

- define a long-term work plan
- explain the benefits of a long-term work plan
- identify the best time for reviewing the long-term work plan
- use practical examples of optimised non-value-adding high-frequency tasks
- use practical examples to optimise the long-term work plan and carry out resource levelling.

Making it all work together

Maintenance resource planning and task programming classification
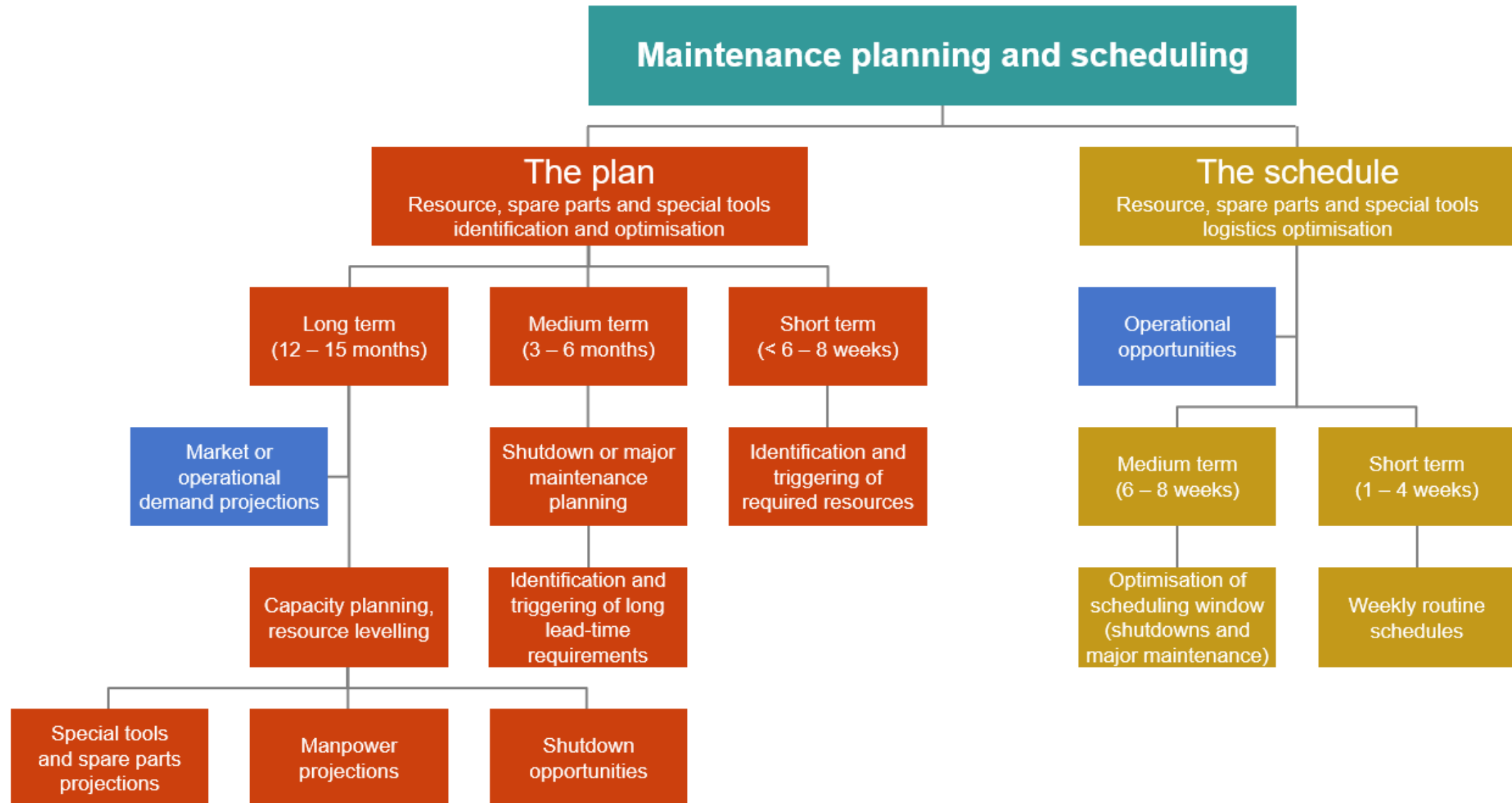
Analyse the input requirements for the long-term work plan

Join your breakout rooms and discuss each of the following:

- What are the benefits of having a long term work plan?

- Do you have periods (months / weeks) where there are too few resources and periods where there are too many?

- What information do you require as input into your long term work plan?

- How do you determine the quantity of resources required by the long term work plan?

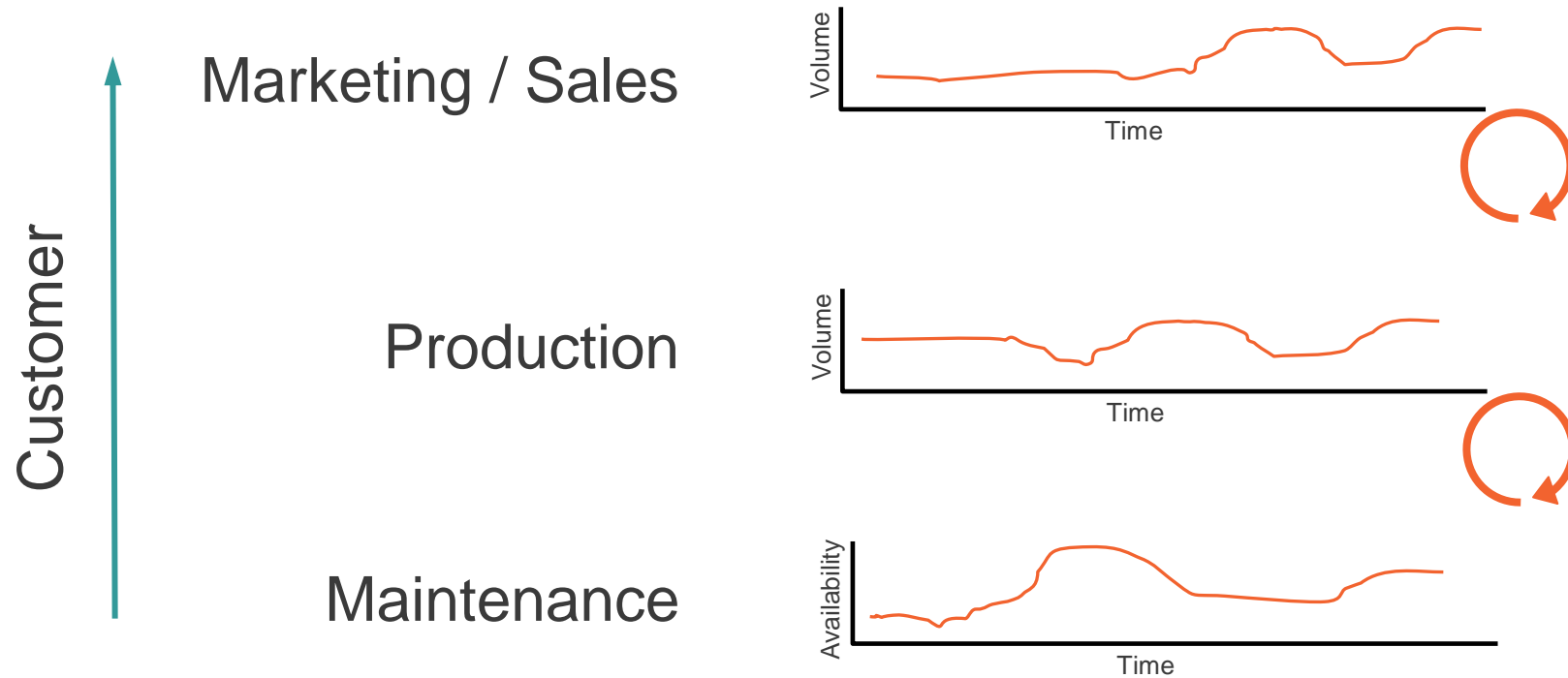- What information can the planner provide for the development of the maintenance budget?

The long-term work plan

Maintenance demand
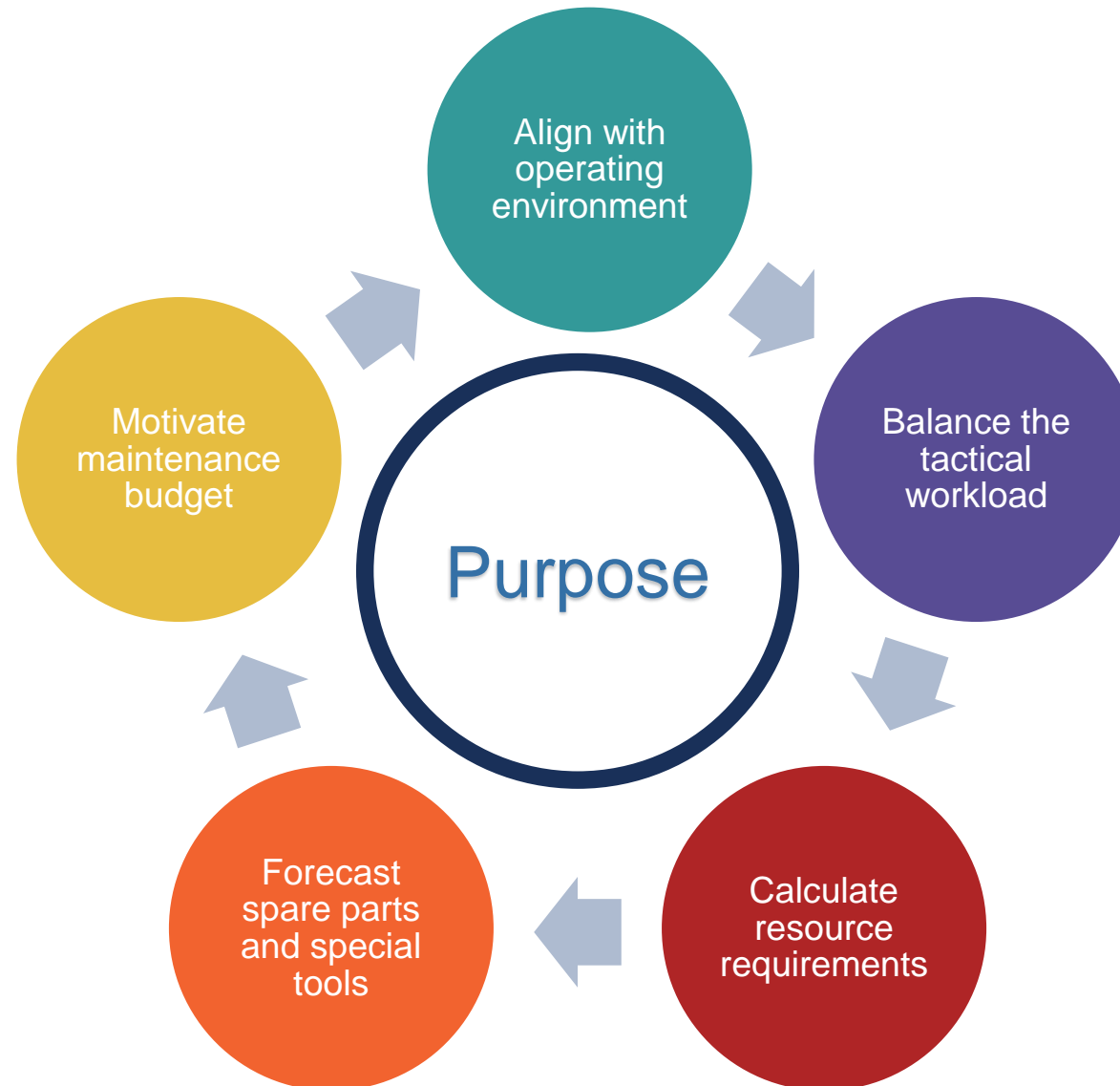
Align with operating environment

Customer

Marketing / Sales

Production

Maintenance

The more variables there are, the better the scheduling must be

Sales forecast, production and maintenance

- 12-month view for initial production budget.

- Planned Offcrop season included in the forecast.

- Rolling three to six month view for ongoing production and maintenance alignment.

- Marketing or sales forecast is normally the main driver in the production schedule, but alignment with Maintenance is essential to ensure it is practical and achievable.

Perform a workload assessment

Annual assessment to be done per section and trade

Actual workload

- Tactical workload (from EAM system long term work plan)
- Non-tactical workload (historical averages from EAM system)

Available resources

- Available average hours per week

  (calculations)

Indicators of workload issues

- Backlog out of control
- Ratio of tactical to non-tactical effort
- Tactical tasks not performed
- Large percentage overtime

Indicators of task effectiveness

- schedule attainment per task
- Break-downs associated with assets or components linked to the task
- Follow-up or replacement work arising from the task
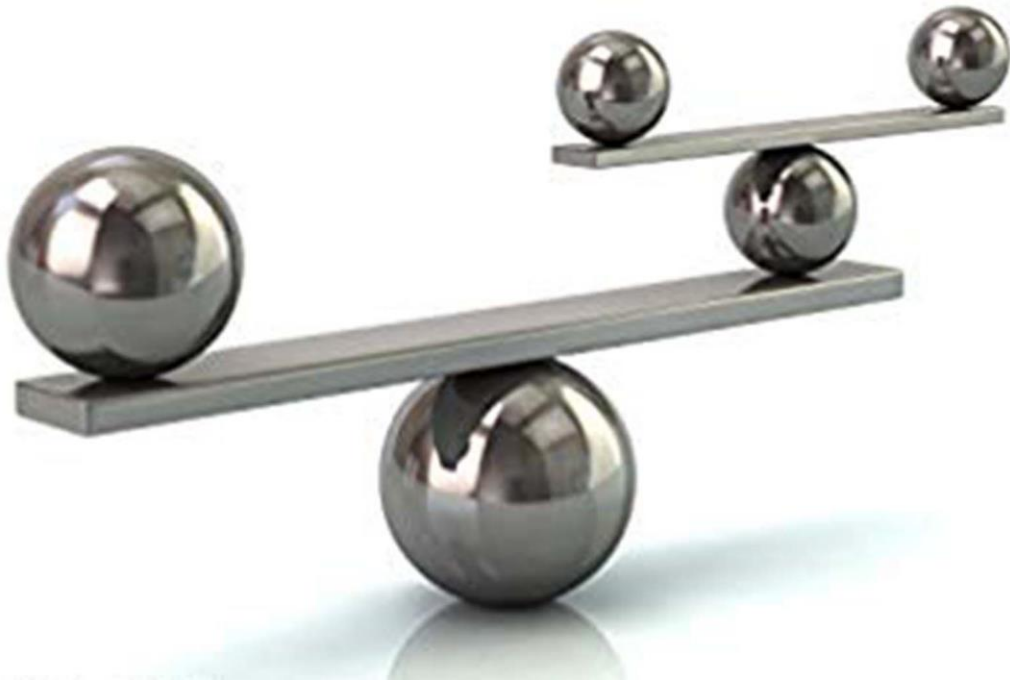
Loading maintenance plans

Best practice when loading maintenance plans:

Maintain one unit of measure for frequencies as far as possible (weekly is typically used)

Keep task frequencies in denominations of 52 (weeks in a year) as far as possible to prevent year-end clashes (156, 104, 52, 26, 13, 4, 2, 1). This is preferred to (1, 2, 4, 8, 16, 32) and (3, 6, 12, 24, 52)

When "loading" the EAM system with the tasks, schedule from the tasks with the highest frequencies and the highest work hours

• Start with the 1-weekly's by default as there are no other options.

Loading maintenance plans

When loading maintenance plans (continued):

- Stagger tasks with the same frequencies one week out of phase
- Always try to schedule as late as possible (deferment)
- Schedule planned downtime together where possible to coincide with production opportunity windows
- This may require occasional additional resources to support off-crop type peak work load.

Work that can be controlled

Which work type do you have the most control over?
A. Breakdowns (immediate)
B. Urgent work
C. Tactical
D. Deferrable work

Demand and capability

How do we bring the demand and capability together without getting overwhelmed?

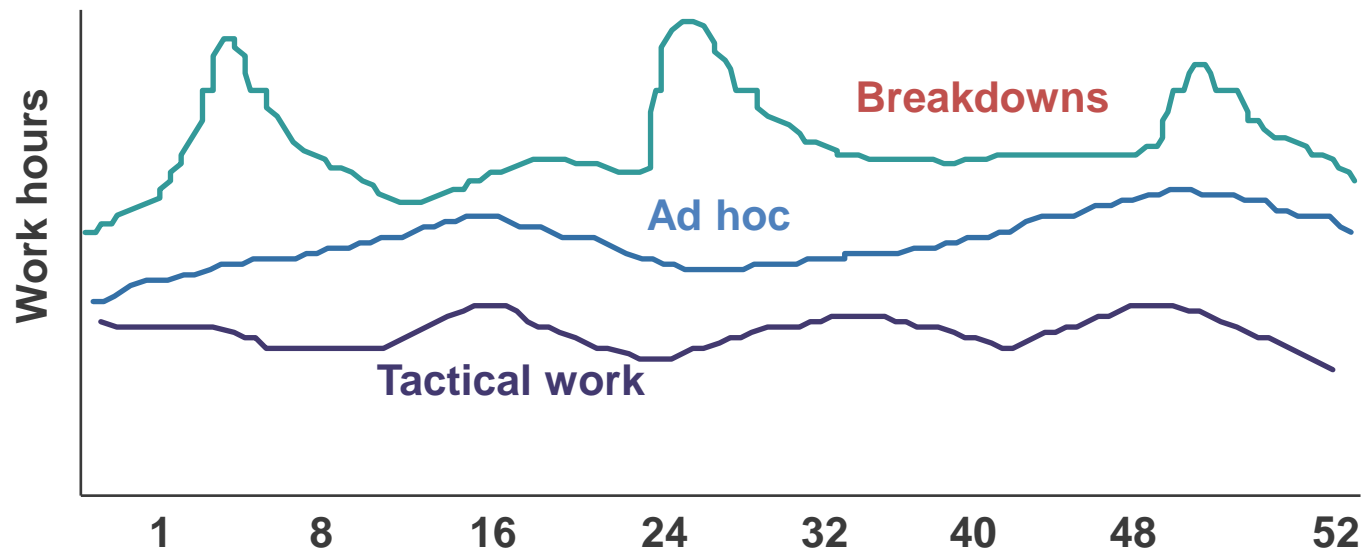Type your answer into the public chat.

Tactical, deferrable, immediate and urgent work

- 12- to 15-month view per trade.

- Focus on balancing the tactical workload very well (as there is limited control over breakdowns and ad-hoc work).

Calculating the effective time for your environment

- How many working days are there in each year?

- How many public holidays do they get off each year?

- On average how many sick leave days do artisans take on average?

- How much unpaid leave do people take on average?

- How much study leave do artisans need for training?

- What time do artisans start each day?

- What time do they knock-off?

- How many breaks do they take? For how long?

- How much time do they need for admin or meetings in the day?
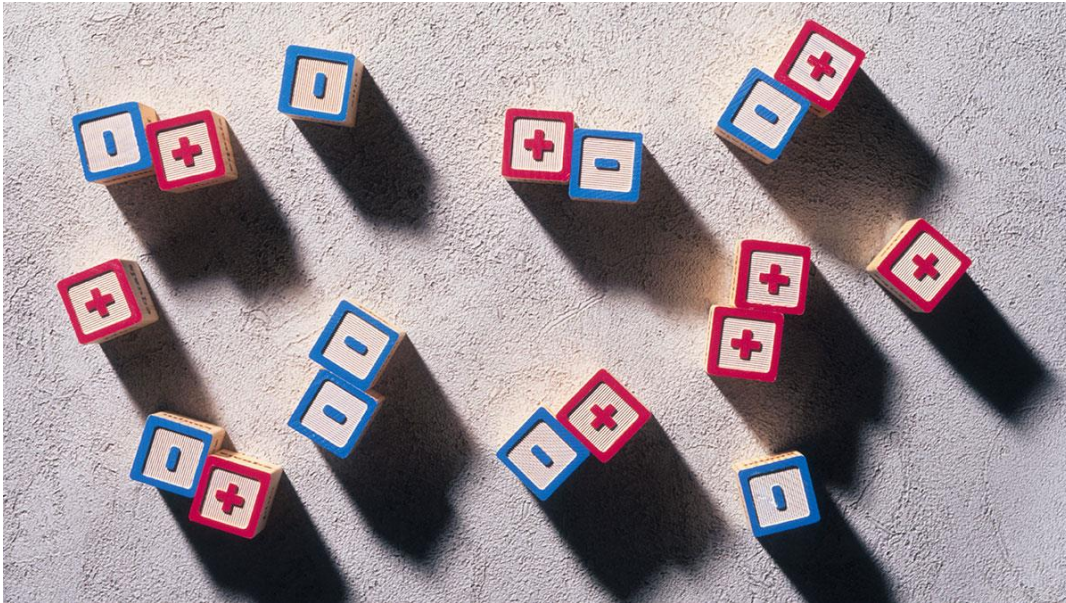
Calculate the effective wrench time

Working days available

Days in year	5x52	= 260
Public holidays	-13	
Leave	-20	
Sick leave	-10	
Unpaid leave	-5	
Study leave (training)	-8	= 204 days

Productive time per day

Working hours	8.5	
Lunch and tea time	-1	
Wind-up time	-30 min	
Unwinding time	-30 min	
Meetings	-1	= 5.5 hours per day

Internal capacity assessment

- 12- to 15-month view for doing workload assessment.
- Only accurate way to motivate for staff complement requirements.
- Valuable opportunity to group and outsource some maintenance work to reduce internal loading.
- Need to use the long term work plan to motivate the tactical component of the annual maintenance budget.

Demand analysis for spare parts and special tools

- Rolling three- to six-month view. Can be longer based on typical lead times.
- Bill of Material (BOM) must be configured for the programmed maintenance activities (P3).
- Supply Chain needs to review spare parts requirements based on the BOMs.
- By considering the task due date and spare parts lead time, potential problems that need addressing will be triggered.
- Special tools need to be linked to the tasks so that their requirement can be projected into the future.

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Maintenance budget motivation

- 15-month view, considering months before and after the 12-month budget period to detect possible late or early maintenance requirements.

- Engineers in general struggle to motivate or defend their budgets.

- Very difficult to defend if only based on historical figures and "gut-feel".

Timing to develop the budget

How do you determine when it will be best to develop the maintenance budget?

Type your answer into the public chat.

When to develop the long-term work plan

- Parameters used to determine when to develop the long-term work plan:
  - Date on which the plan is to start
  - Length of the plan (determined by business cycles, etc)
- The plan needs to be developed and agreed ± a ¼ of the length of the plan before the start of the plan.
- Example: if the plan is 12 months long, a quarter of 12 = 3 months. Therefore the long-term work plan needs to be in place 3 months before the start of the plan.
- Must be seamless (long- to short-term).

When to develop the long-term work plan

We apply this same rule all the way through to the creation of the weekly maintenance schedule.

Let us consider a 5-day maintenance week starting on a Monday morning and ending on the Friday afternoon. A quarter of 5 = 1.75, so 1.75 days before the period starts = Thursday morning.

It is considered best practice to have the weekly Maintenance meeting on a Thursday morning to agree upon the next week's schedule. This gives the planners and supervisors enough time to still react on the new schedule and maybe make some final arrangements, before the actual period starts.

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Calculating the effective number of human resource hours available

Using basic assumptions regarding labour utilisation and wrench time, calculate the effective number of hours available per day / week / year.
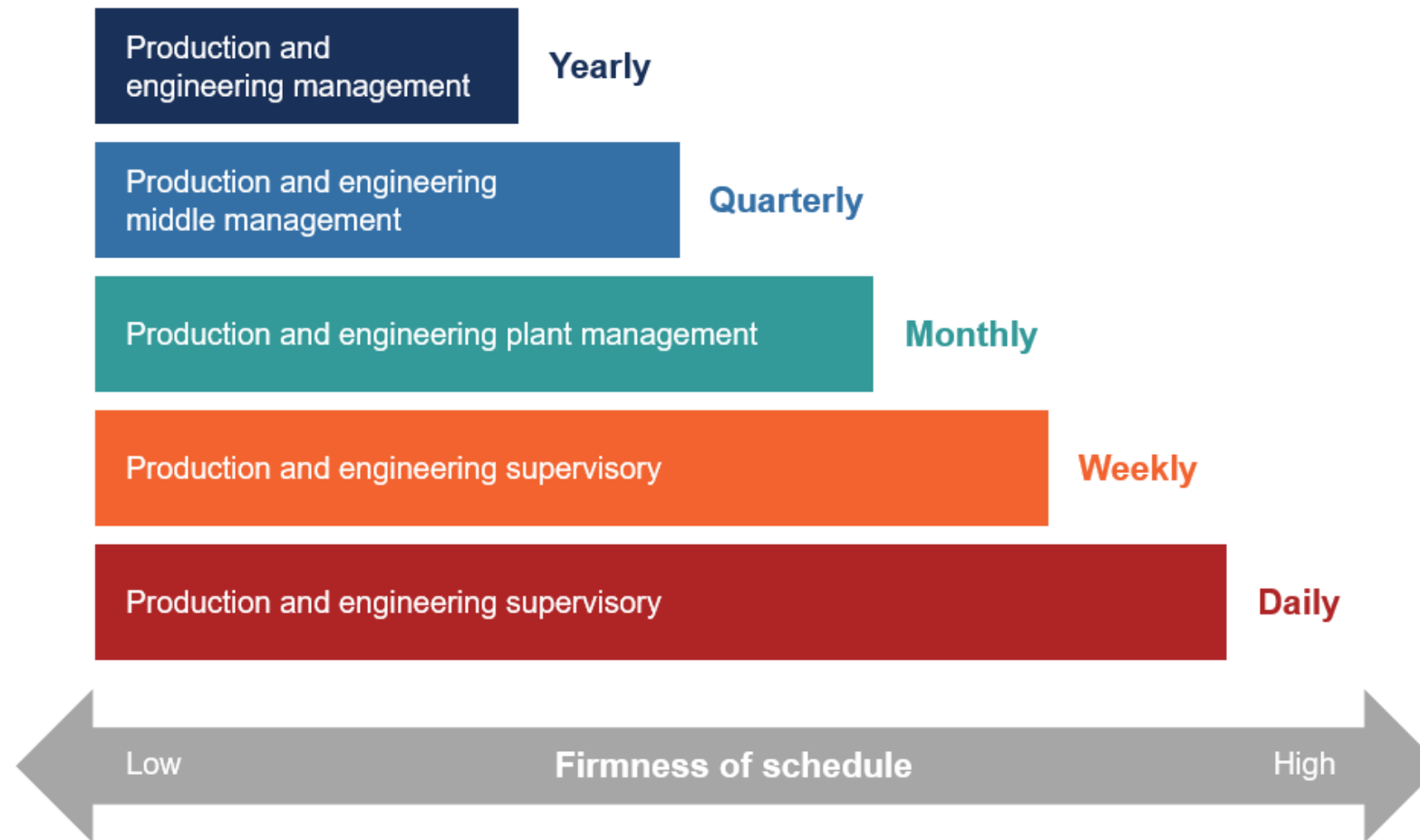
How does the expression "peaks and valleys"
relate to scheduling?

Best practices for long-term work plans

Ensure the long term plan is visible to supervisors

- They need to have visibility of forthcoming tactical tasks.
- An EAM system tends to hide future tactical requirements.

Generate a complete long term work plan as this is a very good evaluation of how comprehensively the work tasks are defined

- The long term work plan serves as a reality check on the quality of the asset care plans.

Good long term scheduling is essential to ensure effective short term scheduling

- You need to firm up the schedule as you move closer to the one week maintenance schedule.

We are now going to look at how we can use the existing information which has been fed into the maintenance plan and use a step-by-step approach to optimise the plan.

To do this, you need to have downloaded the spreadsheet from the LMS. You need to have the spreadsheet open on your screen and split screens (or use a second screen) so that you can follow the explanation and apply the method to our own spreadsheet.

Homework
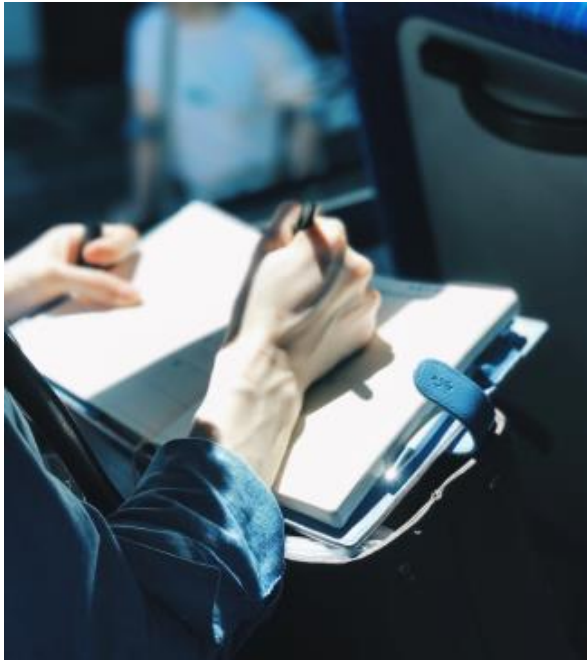
After seeing the demo activity and the final data, you are required to calculate the required resources to perform the mechanical maintenance for the Hot End section.

Take into account the Tactical (see handout) and Non-tactical work load.

From the maintenance history of the previous year we know that the Non-tactical work load was 70h per week.

Keep the previous activity in mind, where we established that the productive time of an employee is equal to 5.5 hours per day.

Reflect on the learning objectives of this module

Are you able to:

- define a long-term work plan

- explain the benefits of a long-term work plan

- identify the best time for reviewing the long-term work plan

- use practical examples of optimised non-value-adding high-frequency tasks

- use practical examples to optimise the long-term work plan and carry out resource levelling?

A. Yes

B. No

C. Partially

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