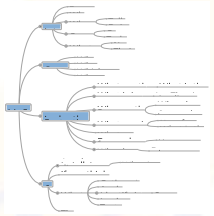
Using Lean/Six Sigma to Improve back office processes in a Maintenance and Construction environment

Charlotta Trimby, Skanska

Pre-Define – One to one interviews

- Finance & Procurement
- Why were the finance team overworked?
- Need to undertake a process improvement project



Pre-Define

- SIPOCs

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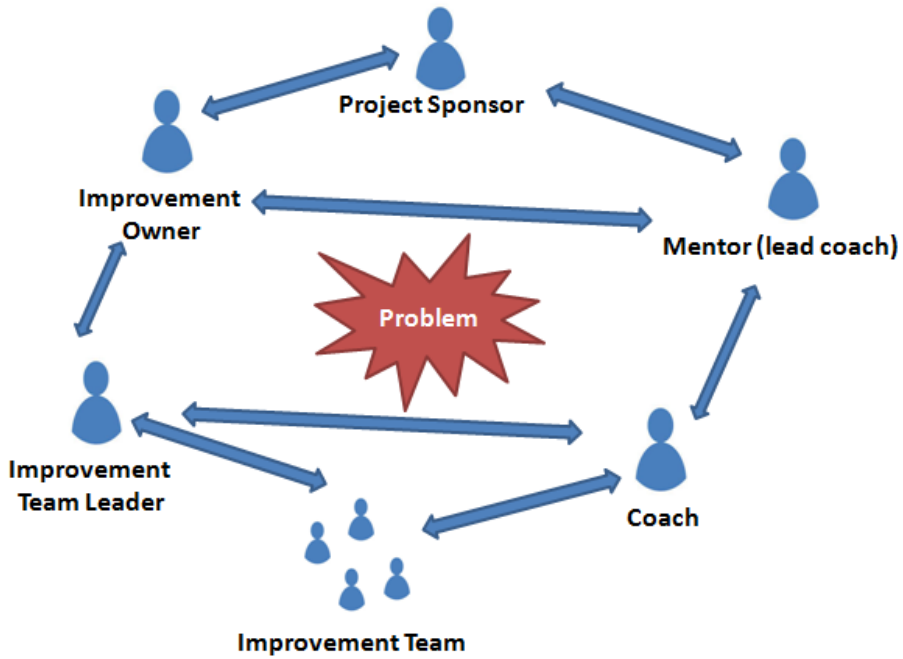
Pre-Define

- Problem Statement

Over 40% of invoices and Goods Received notes in regards to Material and Plant ordering raise one or more query. This requires investigation for each query and often involves more than one team.

Define

- Project Governance



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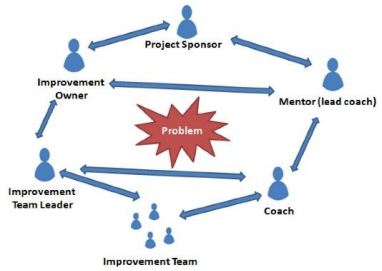
Project Roles – Improvement Projects

For systems thinking projects to succeed it is important to have full buy in from appropriately placed individuals.
This document outlines the roles which contribute to a successful project. Without appropriately informed staff working in each of these roles improvement projects cannot move forward.

Improvement Team



The diagram shows who is typically involved in general improvement work (i.e. daily improvement to systems and processes) or specific improvement projects (i.e. a specific improvement identified that requires a dedicated team to be assigned to it as a one off improvement project) and who tends to interact with whom.

This approach fits with the approach for development of improvement capability throughout the organisation (i.e. a programme of improvement Coaches being developed by or Lead Coaches – each of which helps other key people in the organisation to competently apply the right thinking, tools and techniques).

An explanation of the roles and responsibilities is provided in the following profiles.

Role Definitions

Project Roles		Responsibilities
Project Sponsor	Andrew Denman *Executive Group:* Sarah Smith Kellyann Raven Jo Jarman	✓ Gets Board agreement for go-ahead ✓ 'Kicks Off' Improvement project – engages Improvement Project Owner & Team Leader ✓ Is the Highway Services customer/ benefit owner for the improvement ✓ Responsible to Infrastructure Services SLT for ensuring that the improvement happens ✓ Approves resources ✓ Agrees with Client Manager & Improvement Manager 'the way the improvement will be done' ✓ Agrees changes to scope, approach & resources ✓ Ensures that barriers to progress are promptly resolved. ✓ Logically from above, therefore, needs to be an SLT member
Improvement Owner	Charlotta Trimby (Sri Dandamudi & Dale White)	✓ Appointed by the Sponsor. ✓ Is responsible to the sponsor for ensuring that the improvement happens ✓ Agrees with Sponsor & Improvement Manager 'the way the improvement will be done' ✓ Agrees changes to scope, approach & resources ✓ Keeps Sponsor updated on progress ✓ With Sponsor, ensures that barriers to progress/ plan are promptly resolved ✓ Allocates resources
Improvement Leaders	Sri Dandamudi Dale White	✓ Appointed by Improvement Project Owner ✓ Leads the team of doers ✓ Ensures work is done to agreed plan ✓ Also a doer (usually)
Improvement Team Member	Alina Mickevica Marie Kicks Susan Clark Bethany Nye Gabrielle Cleghorn Paula Kleyn David Crowther Keiron Kimbley-Brown	✓ People who work in the process/ system being improved (and will work with new improved process/ system post project) ✓ Do the improvement work with direction, support, training and education from management and coaches
Coach / Improvement Manager	Charlotta Trimby	✓ Leads in the definition & application of the way the improvement will be done. ✓ Ensures 'the way the improvement will be done' is agreed with Improvement Project Owner & Sponsor ✓ Ensures use of an appropriate method of approach and Improvement Tools ✓ Ensures a realistic plan is created & agreed by team, Improvement Project Owner & Sponsor: Time / Resources / Clarity of roles ✓ Helps in defining the approach to be used for evaluation of costs/ benefits. ✓ Actively 'monitors' adherence to plan & method ✓ Ensures that any exceptions to plan/ method are dealt with promptly. ✓ Ensures that Improvement Project Owner & Sponsor are kept up to date with current status of improvement ✓ Aims to 'transfer' capability into team (including Sponsor & Improvement Project Owner)
Lead Coach	N/A	✓ Mentors the Coach in all aspects of their role ✓ Plays major role in transferring capability into senior people involved (i.e. Sponsor & Improvement Project Owner)

Define

- Material Process detailed SIPOC

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SIPOC - Material

Process start point: Order raised

Process end point: Invoice matched (CPA) and sent for payment

Suppliers	Inputs	Process	Outputs	Customers	IT
❖ Client ❖ Supply Chain ❖ Design	❖ Materials ❖ WO No. on GRNs ❖ Ops ❖ Requisition	Order and dispatch of goods	❖ Contracts ❖ Site changes	❖ Client ❖ Supply Chain	❖ Email ❖ Telephone
❖ Depots ❖ Purchasing team ❖ Supplier customer services	❖ Haulier ❖ Location ❖ Date, time and quantity ❖ Purchase Order number ❖ Change requests	Delivery of goods with GRN	❖ GRN ❖ Listings/ accruals	❖ Managers - Finance, Commercial and Ops ❖ Depots	❖ Email ❖ CPA ❖ Inform
❖ Suppliers ❖ Third parties of suppliers	❖ Other Finance teams ❖ Purchase Ledger team ❖ Payment due date ❖ Sub account numbers ❖ Confirmation of delivery/ authorisation	Invoice raised by supplier	❖ Actual costs	❖ Purchasing team ❖ Client	❖ Customer portals
❖ Supplier ❖ Purchase Ledger team	❖ Dispatch numbers ❖ Customer portals ❖ Invoice address ❖ Purchase Order number ❖ Account numbers ❖ Information checked ❖ Invoice matched	Invoice received and processed	❖ Queries ❖ Amount cost ❖ Batch Headers ❖ Emailing suppliers or phone call	❖ Purchase Ledger ❖ Payments team ❖ Other Finance teams	❖ CPA ❖ Telephone ❖ Email
❖ Purchase Ledger team ❖ Supplier ❖ Other Purchase Ledger teams	❖ Producing Batch Headers from entered info.	Processed and authorised for payment	❖ Producing Journals ❖ VAT Certificates ❖ Remittance Advice ❖ Redirected Invoices for other contracts	❖ Other Purchase Ledger teams in Skanska ❖ Suppliers ❖ Client	❖ iCon ❖ CPA ❖ Vision
❖ Supplier ❖ Purchase Ledger team	❖ Credit Notes ❖ Requests for Remittance Advices ❖ Aged Debtors reports from supplier	Supplier statement reconciled	❖ Chase for missing Invoices ❖ Overdue reminders ❖ Update queries ❖ Match for payment ❖ Reconcile statement	❖ Purchase Ledger team ❖ Suppliers ❖ Client ❖ Other managers	❖ Inform ❖ CPA ❖ Emails

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Define

- Plant Process detailed SIPOC

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SIPOC – Plant (External Plant Only)

Process start point: Order raised

Process end point: Invoice matched (CPA) and sent for payment

Suppliers	Inputs	Process	Outputs	Customers	IT
❖ GAP	❖ Ops/Depot ❖ CPA	Order Raised (Hire Agreement)	❖ Agreement ❖ Procurement Order ❖ Item of Plant ❖ Changes by site	❖ Procurement ❖ Ops/Depot	❖ CPA ❖ Inform ❖ Word ❖ Email
❖ GAP/Depot ❖ Procurement/Purchasing team	❖ Purchase Order Number ❖ Plant Breakdown ❖ Deployment Sheets	Delivery of Plant	❖ On Hire Note ❖ Delivery note	❖ Depot	❖ Email
❖ Purchase Ledger ❖ Supplier	❖ Ops/Depot ❖ Invoice	Invoices Raised by Supplier (Purchase ledger)	❖ Cost Captured ❖ Invoice	❖ Commercial ❖ Finance ❖ Depot	❖ Paperwork only ❖ CPA
❖ Ops Depot ❖ Purchase Ledger ❖ Managers ❖ Finance	❖ Finance ❖ Client Order ❖ Invoice ❖ Delivery Notes	Processed and Authorised invoice paid (Doncaster)	❖ Batch headers ❖ Invoices ❖ Journals	❖ Finance ❖ Doncaster Finance Team	❖ Excel Spreadsheets ❖ CPA ❖ Email
❖ Finance ❖ Purchasing ❖ Supplier ❖ Depot ❖ Management Team	❖ Invoice ❖ Order	Remaining Invoices queired with supplier	❖ Additional cost ❖ Exchange notes for broken plant ❖ Credit notes	❖ Depot ❖ Purchasing ❖ Finance ❖ Purchase Ledger	❖ Email ❖ Inform ❖ CPA
❖ Management ❖ Finance ❖ Purchasing ❖ Depot	❖ Depot Report ❖ Statements	Supplier statement Reconciled	❖ Batch headers ❖ Reconciled statements ❖ Final Queries updated	❖ Depot ❖ Purchasing ❖ Finance ❖ Purchase Ledger	❖ Email ❖ Inform ❖ CPA ❖ Vision ❖ ICon
❖ Purchasing ❖ Depot/Ops	❖ Off-hire request	Off-hire	❖ GAP receive off hire ❖ Off-hire note/reference ❖ Plant Collected ❖ Off-hired on CPA	❖ Depot ❖ Purchasing ❖ Finance ❖ Purchase Ledger	❖ CPA ❖ Email ❖ Inform

Define

- What's in the Frame?

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What's in the 'Frame'?
Materials and Plant (costing) process improvement project

In the Picture Within scope of project	In the Frame To be considered but may not be able to change	Outside of the Frame Not within scope of project
Materials Process	ASITE	Internal Plant
Procurement	CPA	Maple Cross Finance Team
Historic Data	iCon	Doncaster Finance Team
Cognitive ability		Billing Client Process
Finance		
Experience/Learning		
Depot		
Commercial Team		
Plant Process		
Line Managers		
Communication with Client & Suppliers		

Define

- Critical to Quality (CTQs)

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Critical to Quality (CTQ)
Materials and Plant process improvement project

Customer	Voice of the Customer	Key Issue	CTQ
Depot	We don't always get paperwork with the delivery.	Missing paperwork (missing Goods Received Note [GRN]).	Paperwork received for every delivery, every time.
Supplier	We don't always know where to send an Invoice.	There are multiple addresses for Skanska.	Clear instructions to where Invoices should be sent to.
Finance	We don't always get the right information on GRNs/ Invoices.	Quality of information on GRN/ Invoice.	Accurate information on all GRNs/ Invoices (right first time).

Define

- Goal/Improvement Statements

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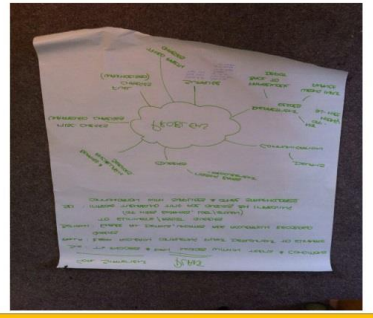
Improvement/Goal Statements – Materials and Plant (costings) improvement Project

Improvement Statements give purpose and structure to an improvement project. It describes the objectives of the project and helps the improvement team retain focus when the way forward is clouded.

Problem Statement Brainstorm -Plant



Problem Statement Brainstorm - Material

Improvement Statements

To Reduce the Volume of GRNs/Invoices that cannot be matched first time

(Additional goals to help the above)

- To Reduce the Time it takes to Process and Invoice/Pay a Supplier
- To Reduce the turn around time of processing Queries

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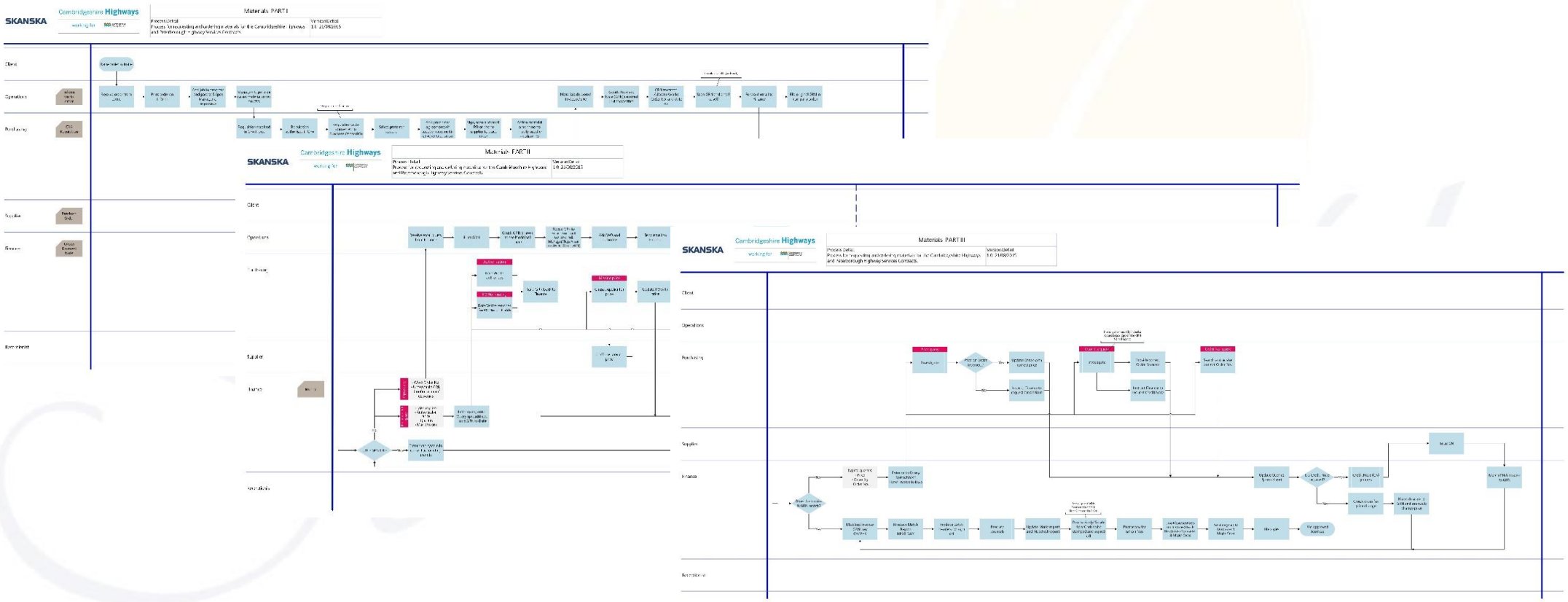
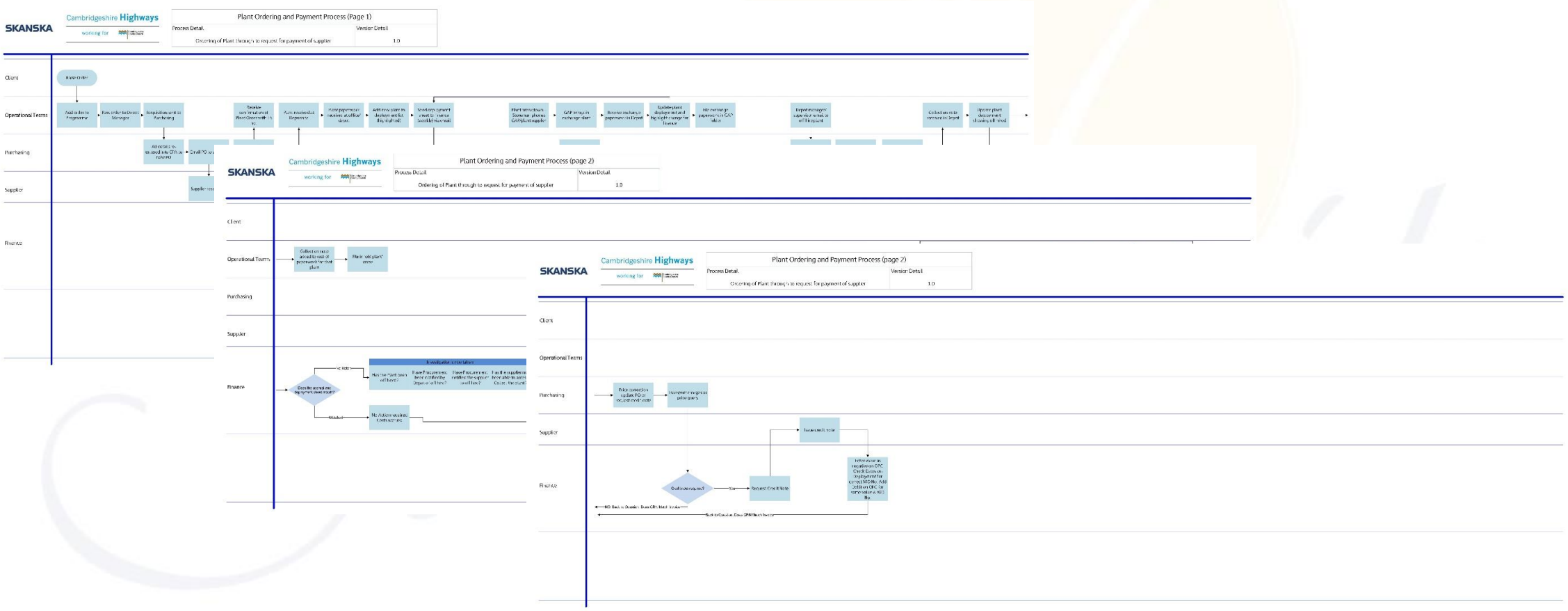
Measure

- Material Process Deployed Flow Map



Measure

- Plant Process Deployed Flow Map



Measure

- What Data?

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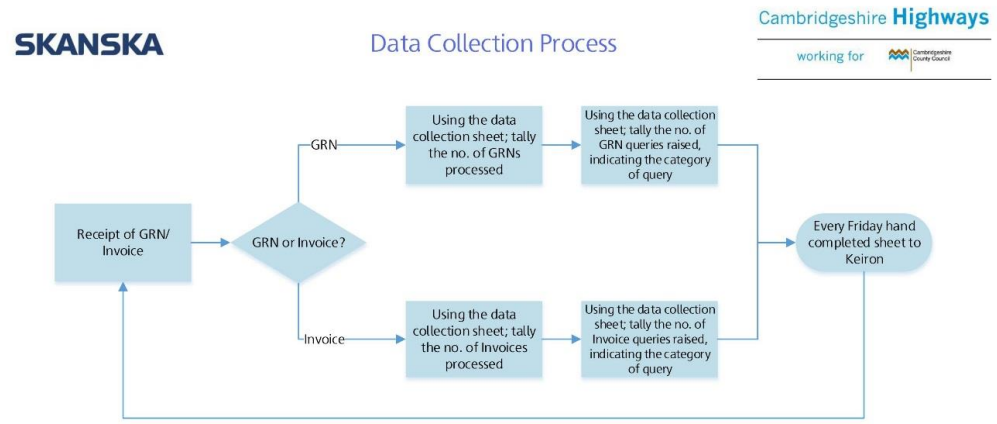
Data collation actions:			CPA data points:
No.	Action:	Owner/s:	Date Purchase Order/ Order raised/ issued ↓ Requested delivery date ↓ Delivery date (GRN) ↓ Date GRN input by Finance team ↓ Invoice date ↓ Date Invoice registered by Finance team ↓ Date Invoice matched ↓ Date Invoice sent for payment
1.	Start recording Plant queries.	SC/ SD/ MK	
2.	Create a simple tally sheet for the depots to start recording the number of queries; for example missing GRNs, received from the Finance team.	KKB (PK)	
3.	Create a simple tally sheet for the Finance team to start recording how many Cambridgeshire & Peterborough Invoices they receive which have been redirected, i.e. initially sent to the wrong Skanska contract.	KKB (SD/ MK)	
4.	Provide CPA export for initial analysis.	SD (KKB)	

Measure
- Data Collection Plan

The challenges of data collection



Operational Definitions for data collection

Processed - When the GRN or Invoice is entered onto CPA, i.e. not when received.

Query categories
Price - Where the price information on the GRN or Invoice is either incorrect (too much/ too little) or missing altogether.

Quantity - Where the quantity information on the GRN or Invoice is either incorrect (too much/ too little) or missing altogether.

Authorisation - Where the required authorisation is missing.

Purchase Order Number - Where the PO number on the GRN or Invoice is either incorrect or missing altogether.

Work Order Number - Where the WO number on the GRN or Invoice is either incorrect or missing altogether.

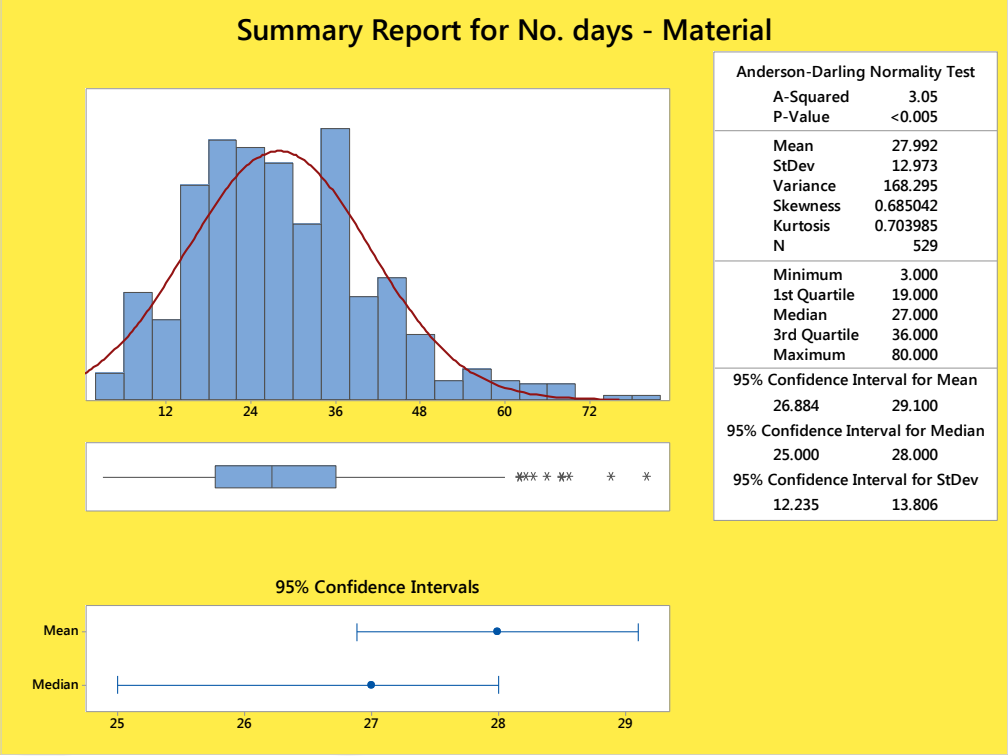
Delivery confirmation - Where the GRN has not been signed.

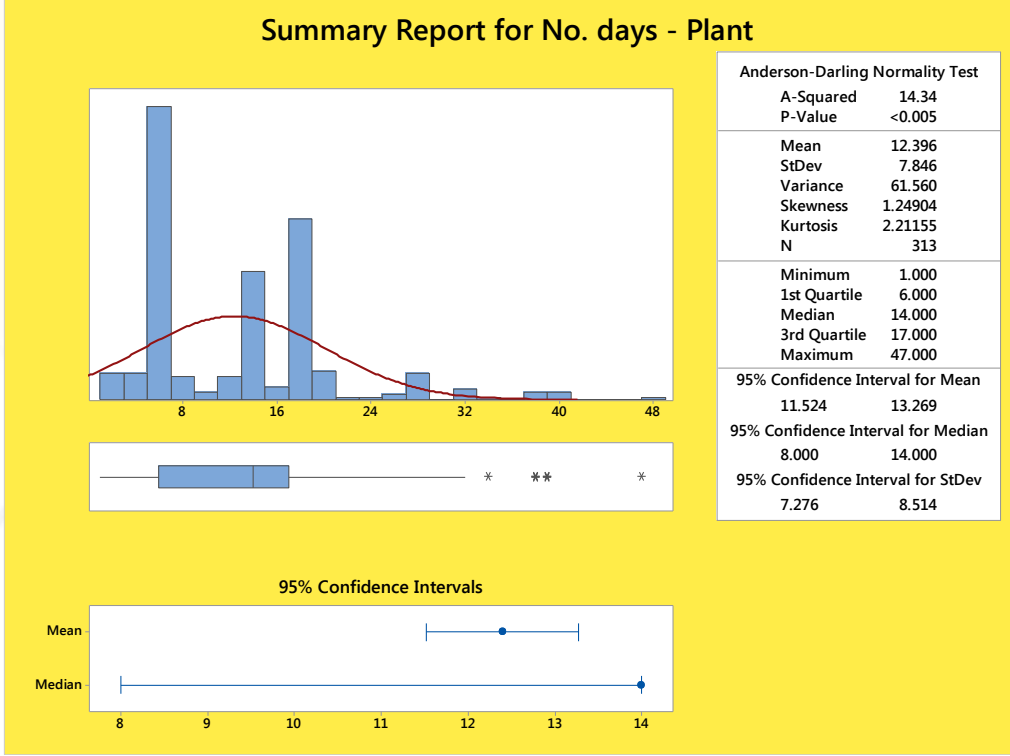
Missing GRN - Where the Finance team have not received a copy of the GRN.

Other - Any other query that falls outside of the above.

Measure

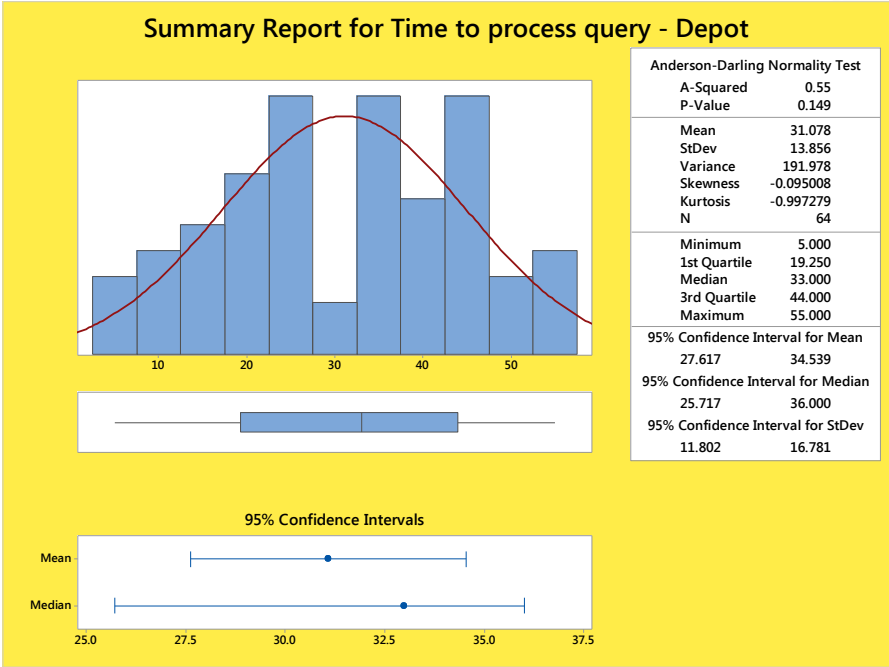
- Baseline Data: Material & Plant Process

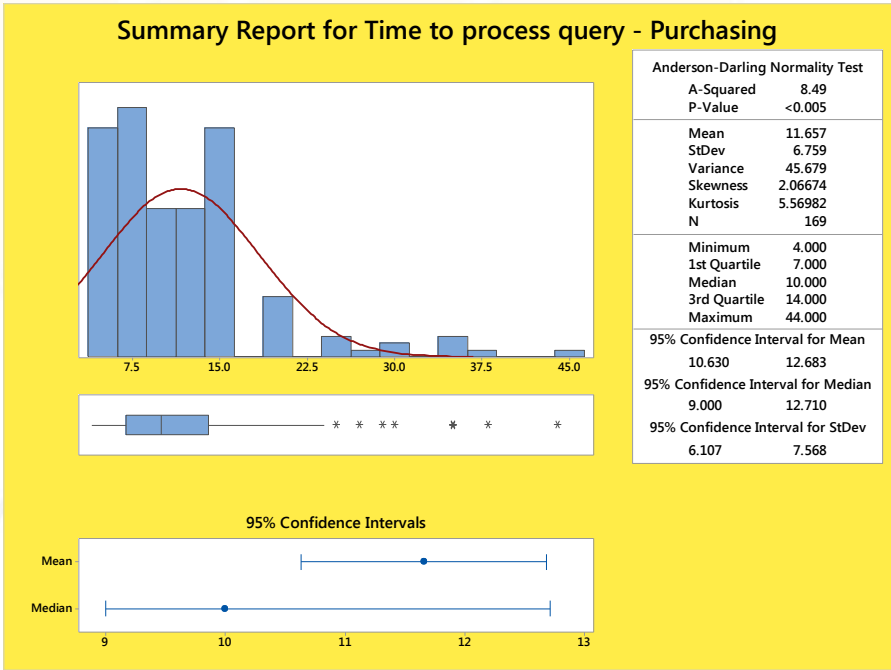




Measure

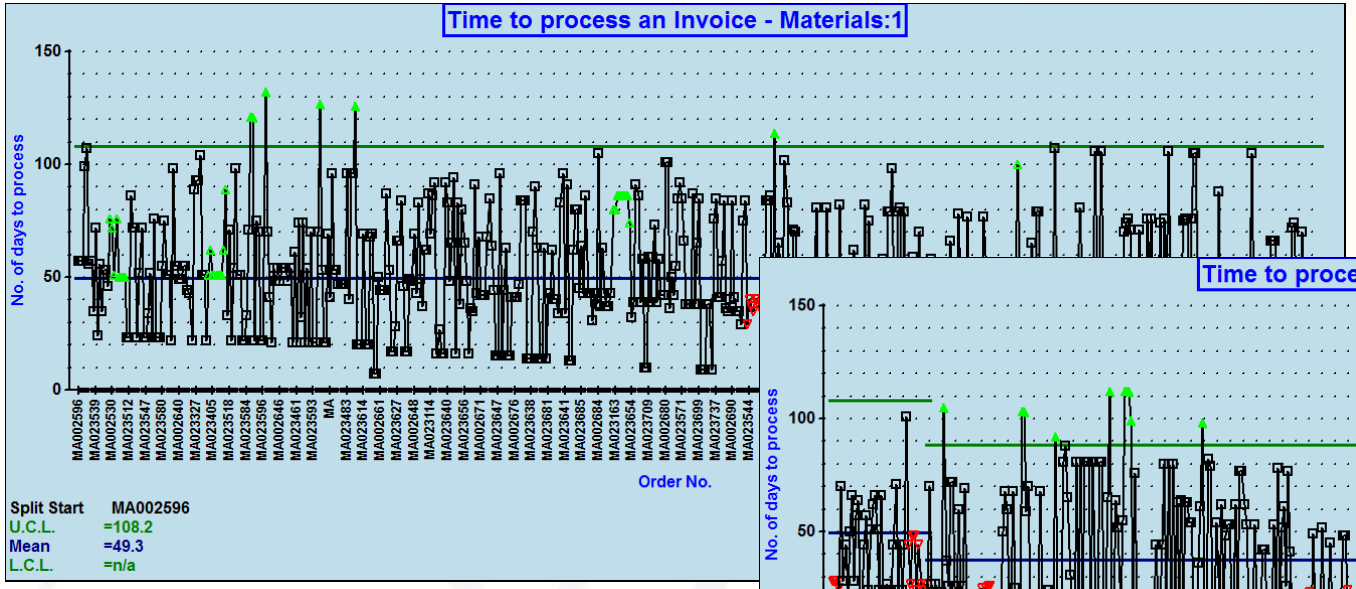
- Time to process a query: Material Process



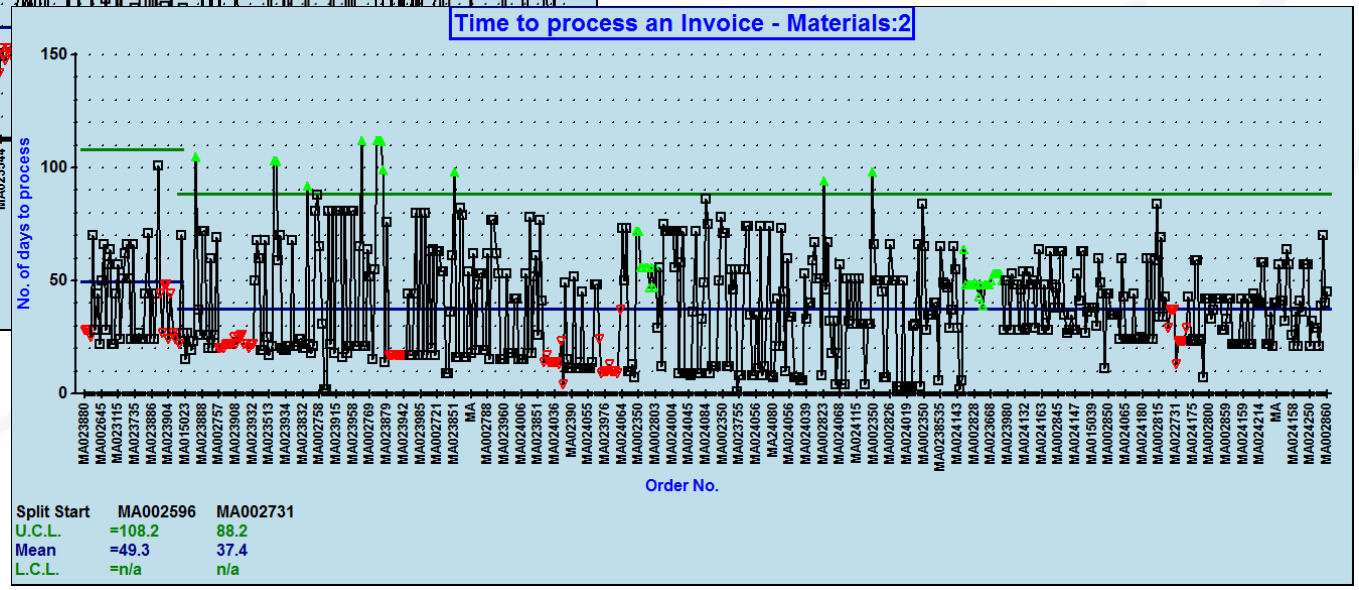


Measure

- Process Control Charts: Materials Process



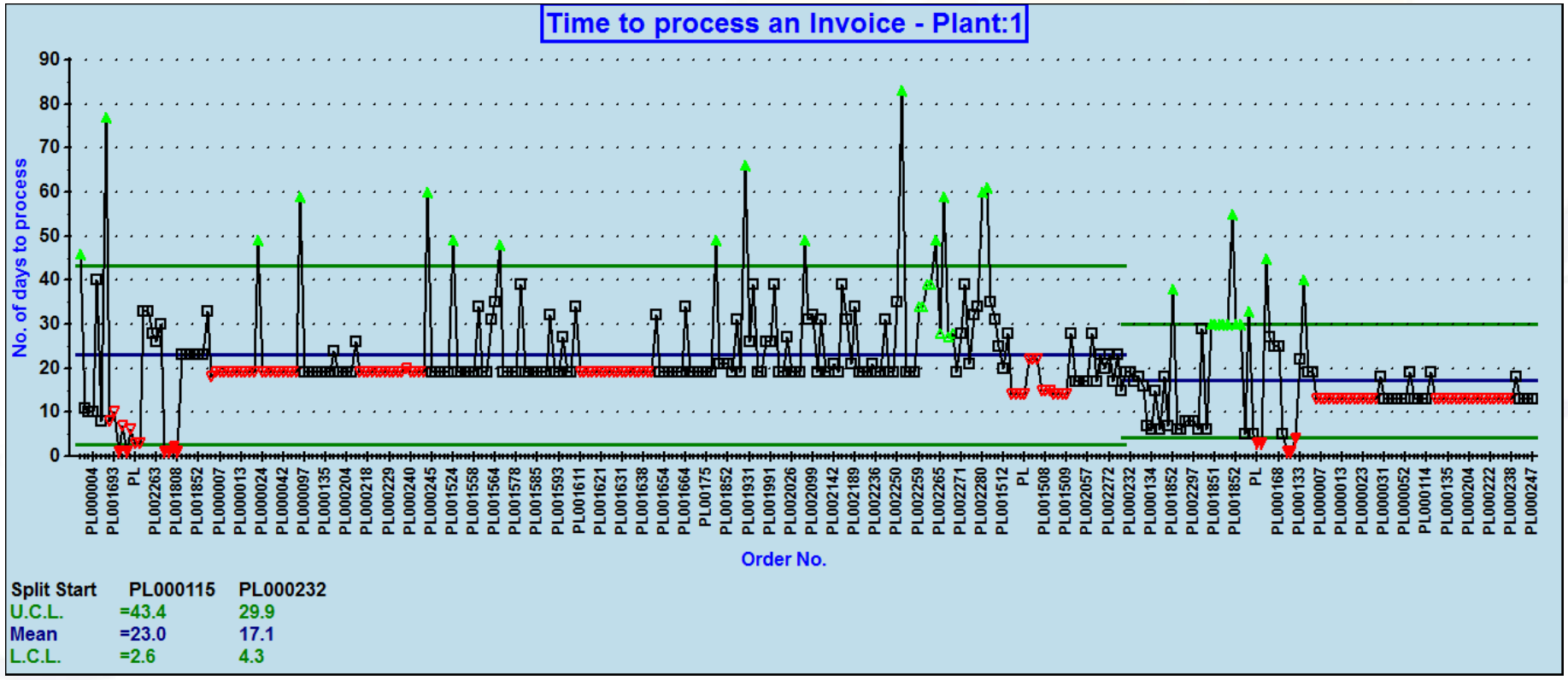
UCL: 108 days



Mean: 49 days

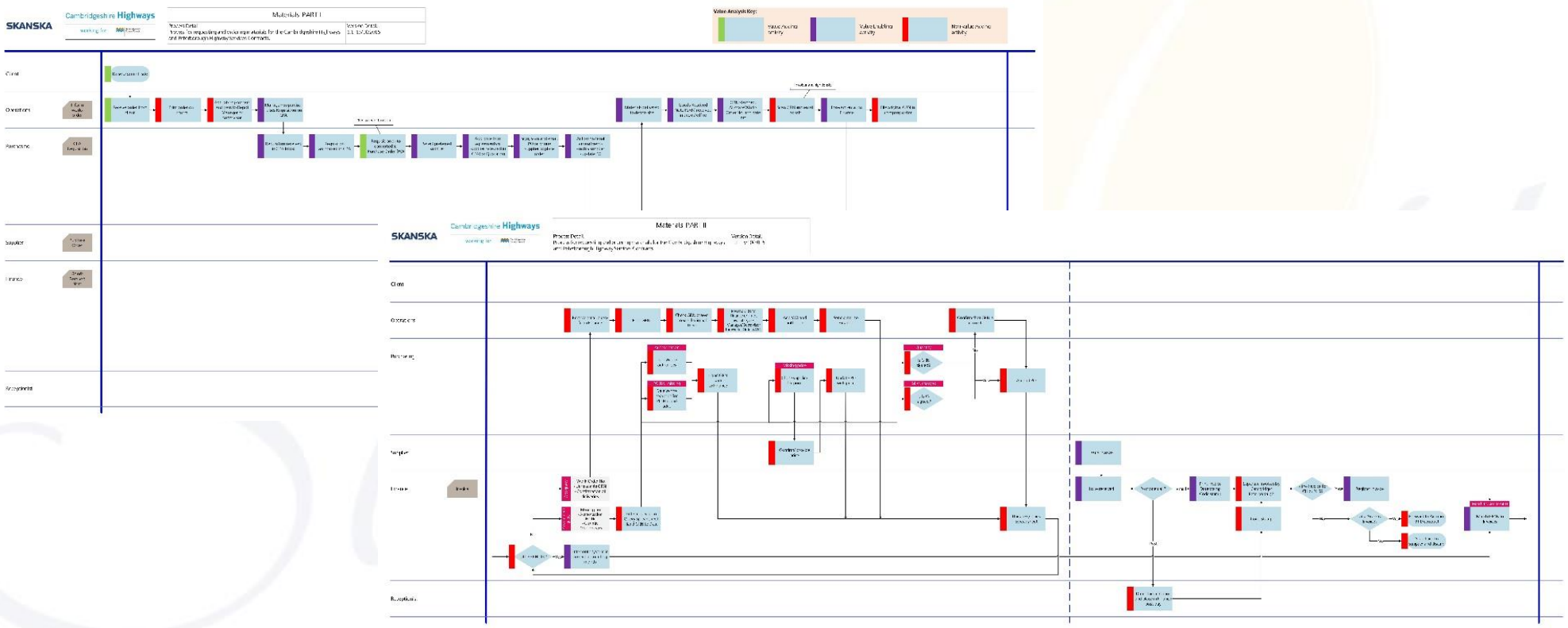
Measure

- Process Control Charts: Plant Process



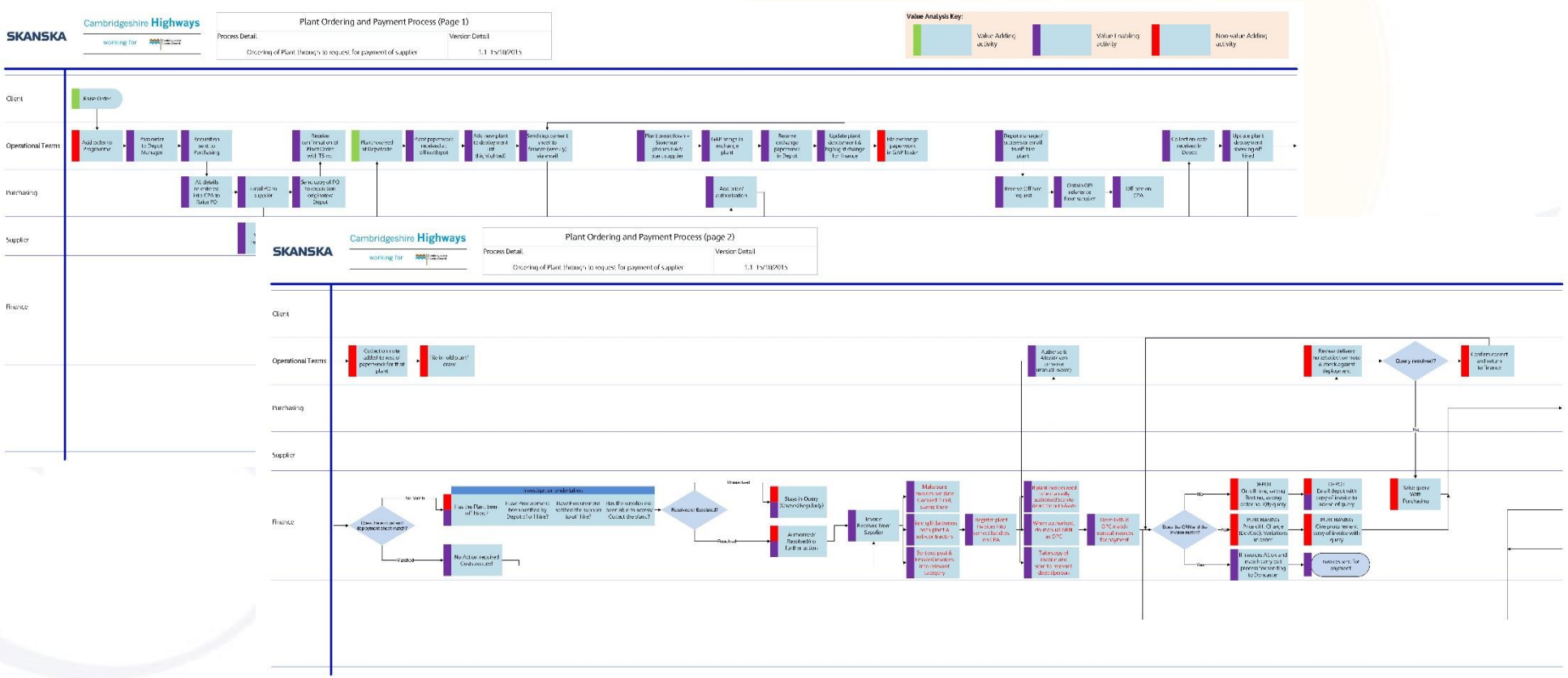
Analysis

- Value Analysis: Material Process



Analysis

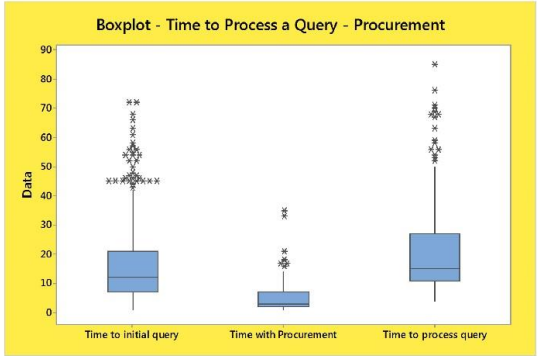
- Value Analysis: Material Process



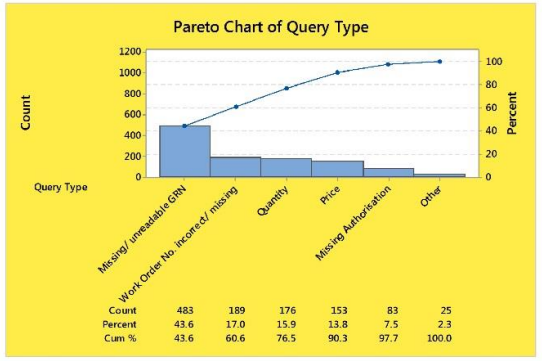
Analysis

- Material Process

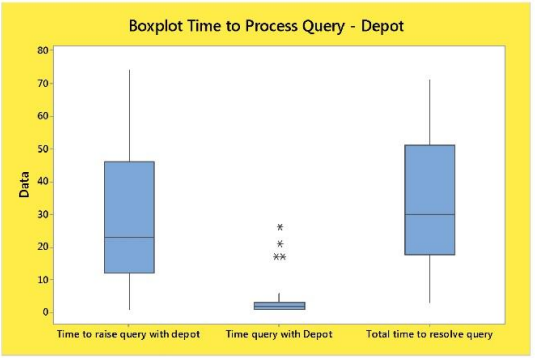
Time to process a procurement related materials query - Boxplot



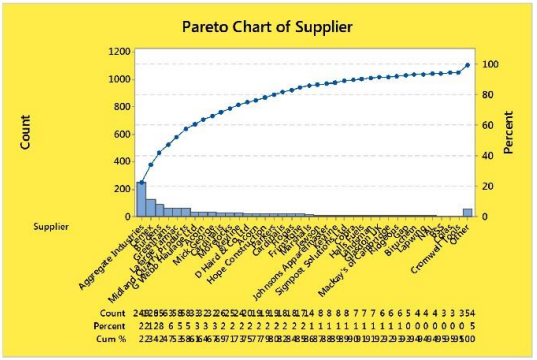
What are the majority of our materials queries?



Time to process a depot related materials query - Boxplot



What suppliers generate the majority of our materials queries?



Analysis
- Plant Process

What are the majority of our plant queries for Cambridge?

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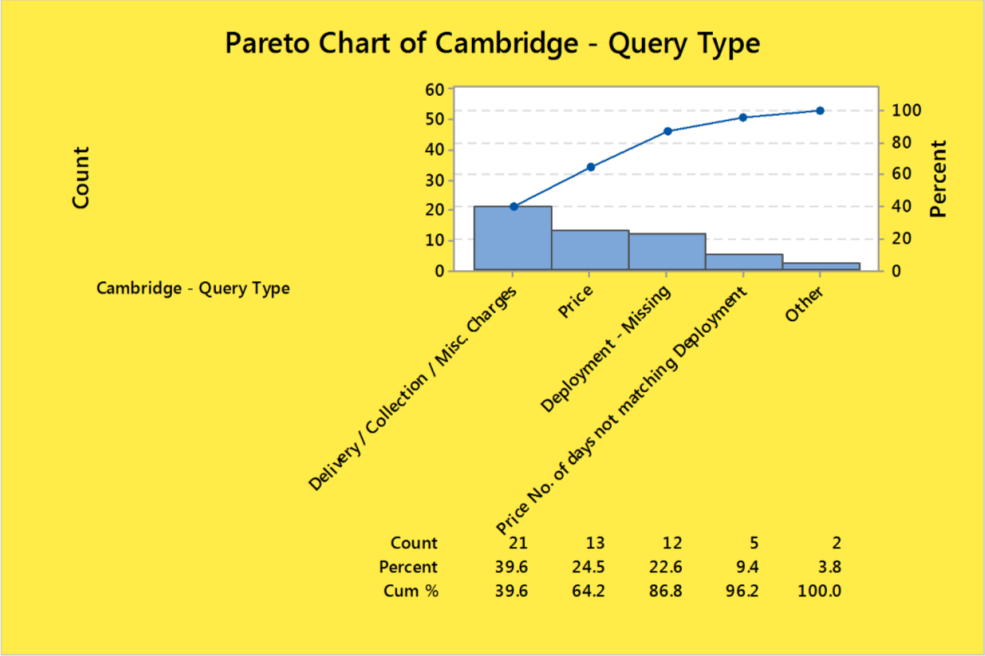

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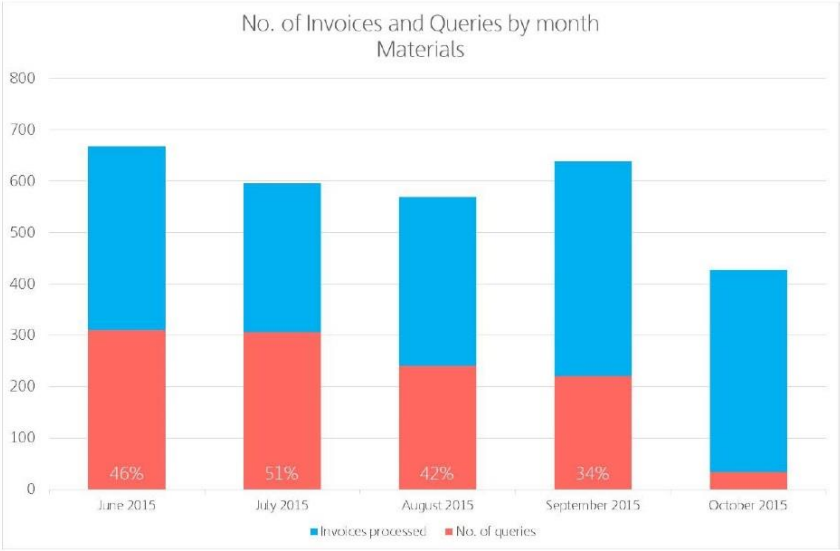
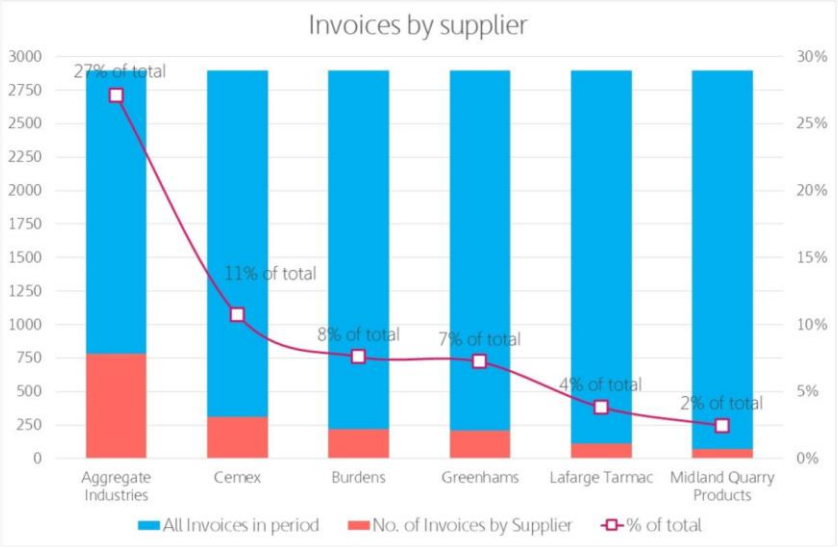
Analysis
- Material Process

How many of our materials invoices generate a query?

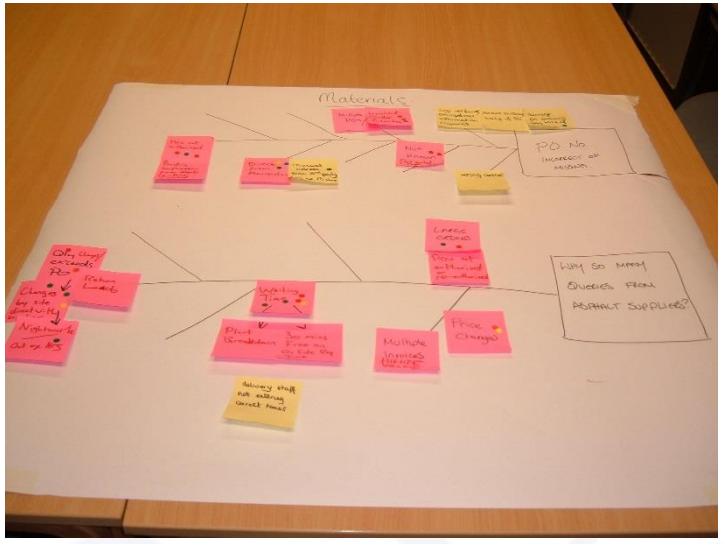


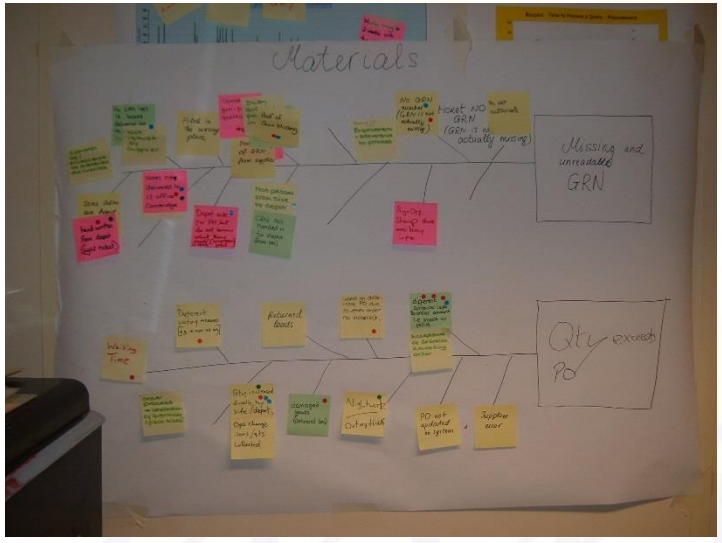
What proportion of all materials invoices do the top 6 suppliers generate?

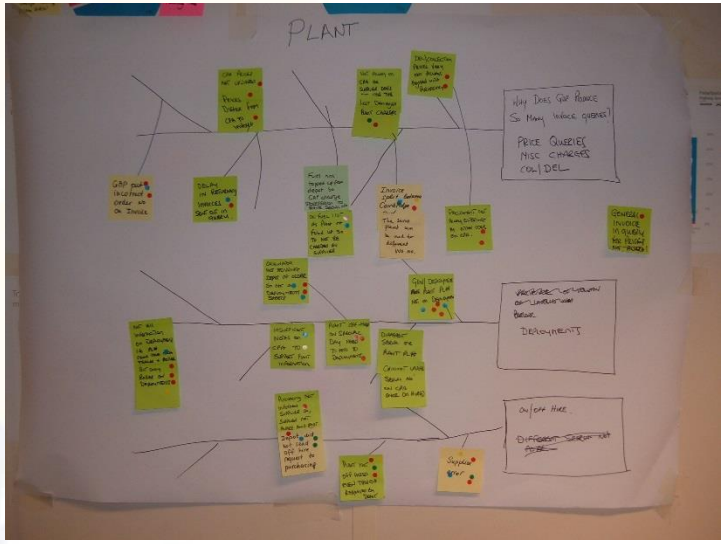


Analysis

- Ishikawa Root Cause Analysis







Using the Pareto Analysis the Ishikawa diagrams were produced.

Analyse

- Verified Root Causes: Material Process

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Root Causes - Material

The Outcome	The Root Cause (of the outcome)	Further Information Required
Missing or Unreadable GRN	Quality of GRN – Poor scan, faint etc.	Split out the data to show if missing GRN or the quality is the larger issue.
	GRN not being sent to Finance – Lost, electronic (sent to wrong email), not handed in, not issued by supplier	Could be worth seeing this process and writing out in more detail.
Quantity Exceeds the Order	Site/depot accepting more than what was ordered and not informing Procurement of the change e.g. pallet sizes.	Could be worth seeing this process and writing out in more detail.
	Depot/site increasing/changing order out of hours and not informing Procurement	Could be worth seeing this process and writing out in more detail.
PO Number Incorrect or Missing from Invoice	Orders Delivered directly from Manufacturer who do not have the PO details.	
	Missing Authorisations on PO	
	Human Error	
Majority of Queries produced by Asphalt suppliers	Site/depot accepting more than what was ordered and not informing Procurement of the change e.g. pallet sizes.	
	Waiting Time Charges (on/off times)	Can we get more data on this?

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Analyse

- Verified Root Causes: Plant Process

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Root Causes - Plant

The Outcome	The Root Cause (of the outcome)	Further Information Required
Price/misc. charges queries on Invoices	Collection/Delivery Charge not on or missing from PO.	
	Prices not up to date or changed on CPA	
	Supplier charges incorrectly (price changes/wrong charge)	
Deployment Queries	PL Number missing off Deployment – originator not advising depot of order	Selection of deployment sheets for the next workshop could be useful.
	Lack of/incorrect information on Deployment sheet	
On/Off Hire queries	No costing on CPA Order – this cannot be on hired	
	Depot off hire but supplier not informed – supplier continues to charge for off hired plant (not fully off hired)	

Note: Updating the notes field on CPA is very important (this can be reviewed as part of the solutions)

Analysis

- Failure Mode Effects Analysis

Failure Mode Effect Analysis

Front end of Material and Plant Processes

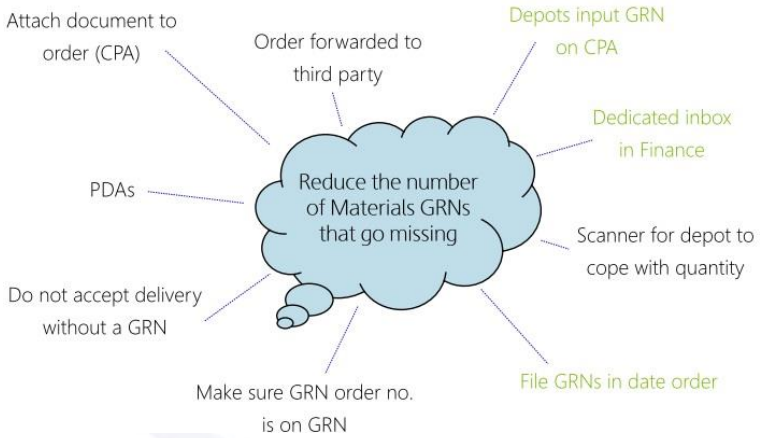
i.e. From order of Material or Plant, through to GRN received by Finance.

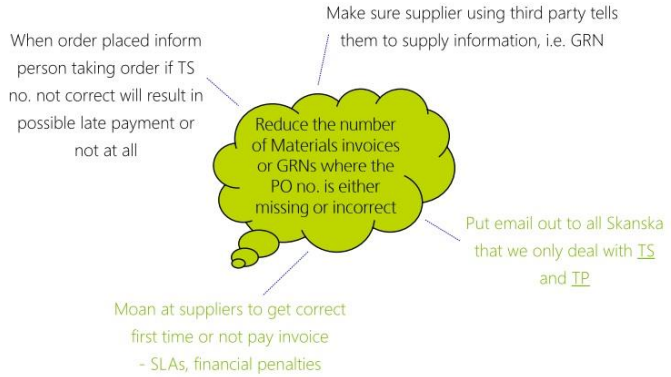
(Please note that the solutions were not agreed at the FMEA workshop and may not be the solutions that were implemented)

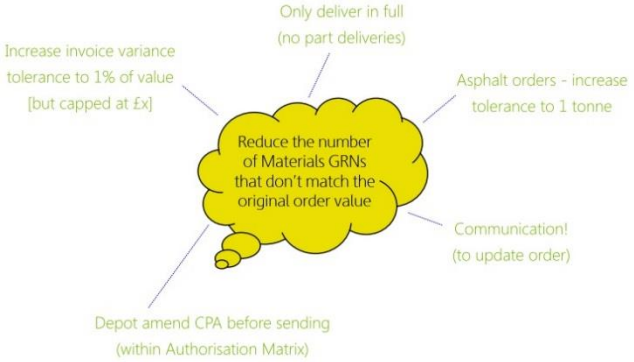
	Process Step	Potential Failure Mode: What can cause the step to fail?	Potential Effects of Failure	Severity	Potential Causes of Failure	Occurrence	Current Process Controls	Detection	RPN	Action/Solution (this is also the potential action taken – RPN based on this)	Severity	Occurrence	Detection	RPN
1	Depot Manager Raises Requisition on CPA	Forget to raise order Wrong Supplier requested Wrong Delivery date Wrong Quantity/Item ordered	Request not met and customer requirements not met	5	Training Communication IT	1	Accuracy in the Depot	2	10	Supplier list and what they supply Material Quantity sizes e.g. how many on pallet/pack	5	1	1	5
2	Requisition Authorised in CPA	Delays in authorisation in CPA	Delay of start of work/scheme	4	Annual Leave Sickness No communication	2	Holiday/absence cover Accuracy/remembering	1	8	Additional member of staff (procurement) Holiday Cover	4	1	1	4
3	Select Preferred Supplier	Wrong supplier not noticed in Procurement	Delay to payments	2	Training	3	Procurement refer to sourcing framework (to check suppliers)	2	18	Updating/Expanding Framework	2	2	2	8
4	Add price from agreement (if not on CPA)	Wrong price selected Items collected directly from supplier on ops order – not told procurement New prices not agreed (delay in price changes from supplier)	GRNs not matching the order and creating a query re-work loop Huge time delay	5	Lack of training Wring price lists Lack of communication from supply chain.	4	Checking and Knowledge Updating system regularly	2	40	When item is ordered on CPA, system remembers cost. On ad hoc items.	5	2	1	10

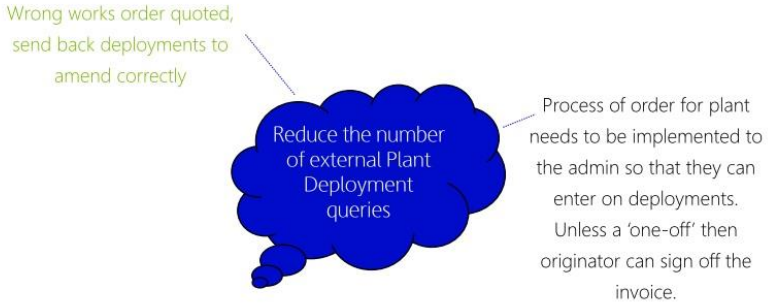
Improve

- Solution Brainstorming









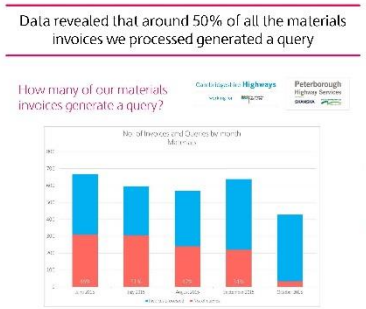
Improve

- Selecting the right solutions

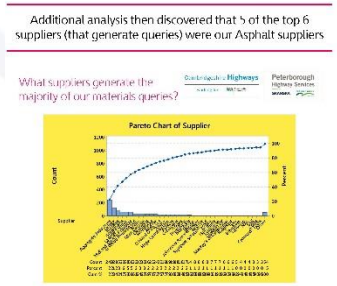
Plant	Material
1. Dedicated plant and procurement inboxes 2. Deployment sheet updated and common template used at all depots 3. Fuel charges to be reviewed 4. Re-communicated of on/off hire definitions	1. Dedicated finance inboxes 2. Re-communicate who should receive what invoices 3. Re-Communication to supply chain 4. Asphalt tonnage tolerance to be increased based on data 5. Out of hours process to be defined and communicated 6. Finance to have dual screens for less printing 7. 50p invoice tolerance review

Improve

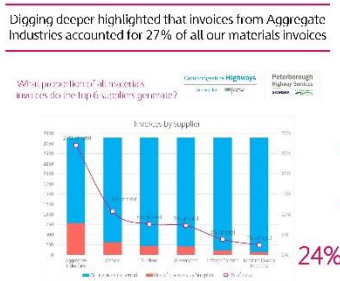
- Asphalt tonnage



insight

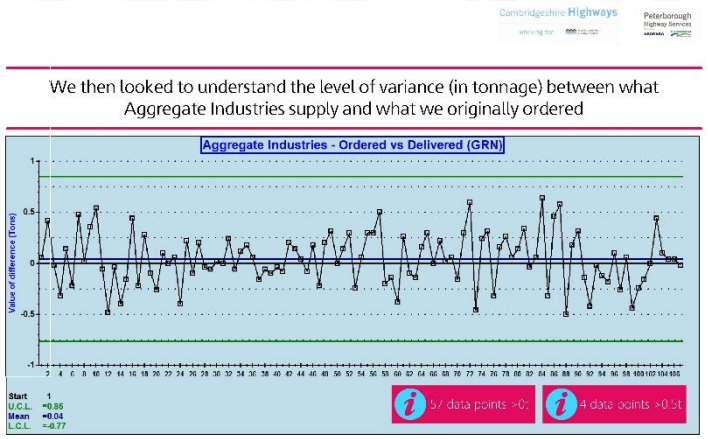


insight



24% of all Aggregate Industries queries are quantity related

insight



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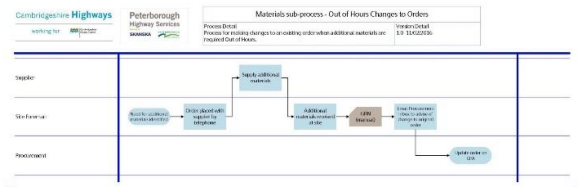
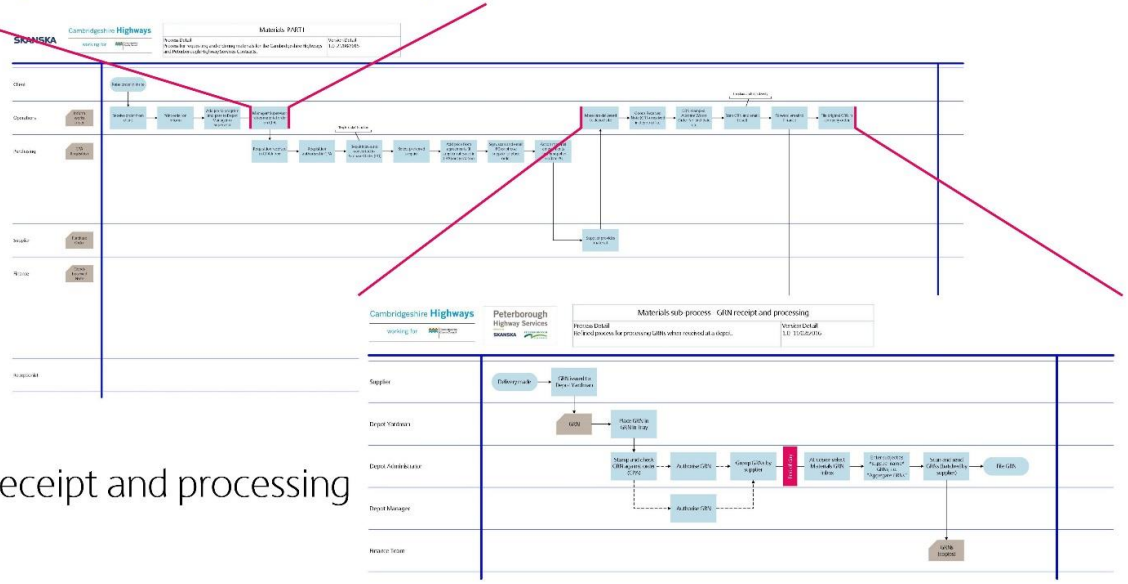
Improve

- Refined Sub-processes

Refined/ new sub-processes



Changes to existing orders out of hours

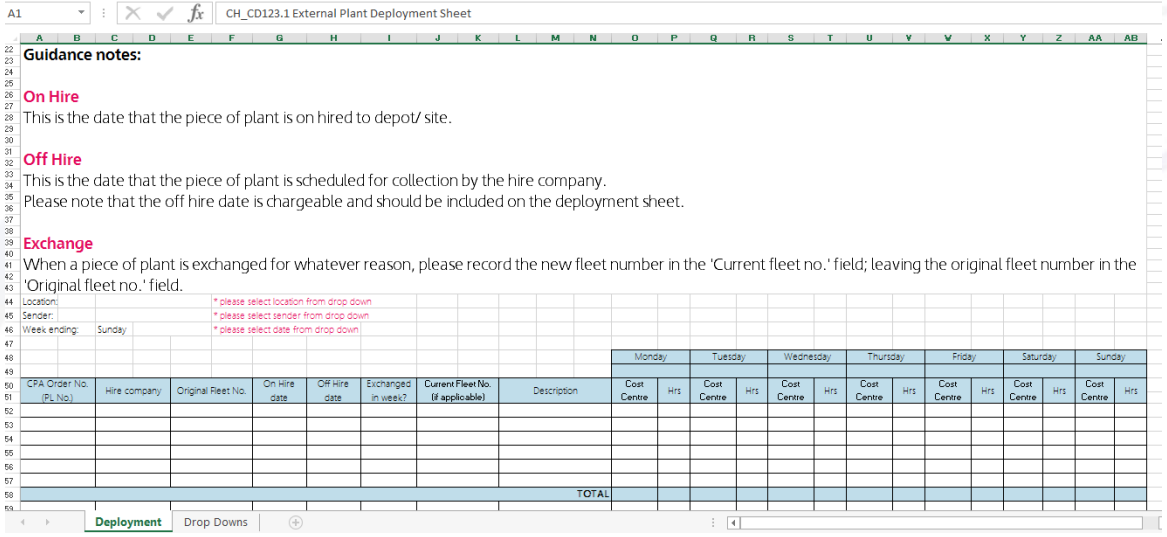


GRN receipt and processing

Improve

- Refined Sub-processes

- A consistent template used across the contract
- Trialled prior to implementation



A1 | CH_CD123.1 External Plant Deployment Sheet

Guidance notes:

On Hire
This is the date that the piece of plant is on hired to depot/ site.

Off Hire
This is the date that the piece of plant is scheduled for collection by the hire company.
Please note that the off hire date is chargeable and should be included on the deployment sheet.

Exchange
When a piece of plant is exchanged for whatever reason, please record the new fleet number in the 'Current fleet no.' field; leaving the original fleet number in the 'Original fleet no.' field.

Location: * please select location from drop down
Sender: * please select sender from drop down
Week ending: Sunday * please select date from drop down

								Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday	
CPA Order No. (PL No.)	Hire company	Original Fleet No.	On Hire date	Off Hire date	Exchanged in week?	Current Fleet No. (if applicable)	Description	Cost Centre	Hrs	Cost Centre	Hrs	Cost Centre	Hrs	Cost Centre	Hrs	Cost Centre	Hrs	Cost Centre	Hrs	Cost Centre	Hrs
							TOTAL														

Deployment | Drop Downs

Improve

- Implementation Plan

Name	Date/Location				Declined all dates	Comments/Notes	Attendance on the day
	21/06/2016 Girton	21/06/2016 Huntingdon	22/06/2016 Witchford	23/06/2016 Wittlesford			
Michael Martin					√	Annual Leave	
Peter Nicholas			√			Tentative	x
Steve Lander	√						√
Gareth Stephenson			√				√
Mick Flanders			√				√
Duane Smith		√					√
Chris Musgrave	√						√
Chris Comber				√			√
Rick Skinner					√	Annual Leave	
Barry Welch					√	Covering annual leave	
Dan Crawshaw		√					√
Jim Morris			√				√
Teddy Panayotov	√						√
Paula Kleyn			√				√
Jim Ladds			√				√
Lois Burgess			√				√
Dave Crowther				√			x
Janusz Stansk				√			√
Paul Jessop					√	Annual Leave	x
Sue Harris				√			√

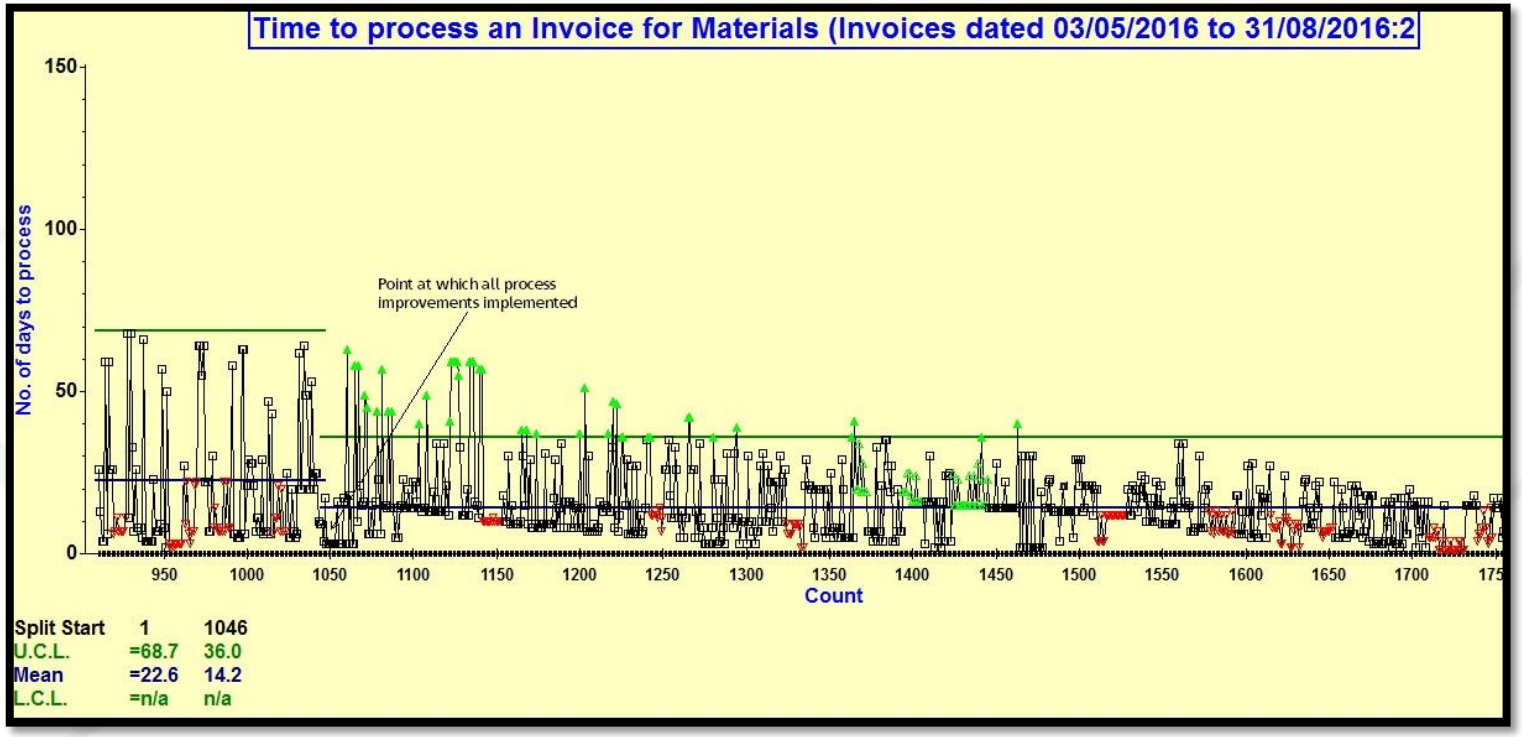
Plant and Material process improvement project – Briefing sessions

Plan for the session:

1. Brief outline of project and method used. Being clear to explain why it all relates to everyone i.e. it's all part of the system.
2. Run through the issues as part of the above and end with the improvements there were agreed upon.
3. Defined processes:
   - out of hours and changes to orders
   - GRN receipt and sending to finance (we will need to set up all the printers)
   -
4. Dedicated inboxes - what they are and what should be sent to them. (I will update the poster to relate to what has been set up).
5. Tonnage tolerance - this may mainly relate to finance but provides a good example of how we have used data. I can also then explain the other two side data study projects (SOs and fuel tolerances).
6. Deployment sheets - we can also then explain that it is not only the administrators that need to know but also those that will cover this task if the admin staff are away.
7. The above to take in effect from.....the next Monday??
8. Any questions/feedback.

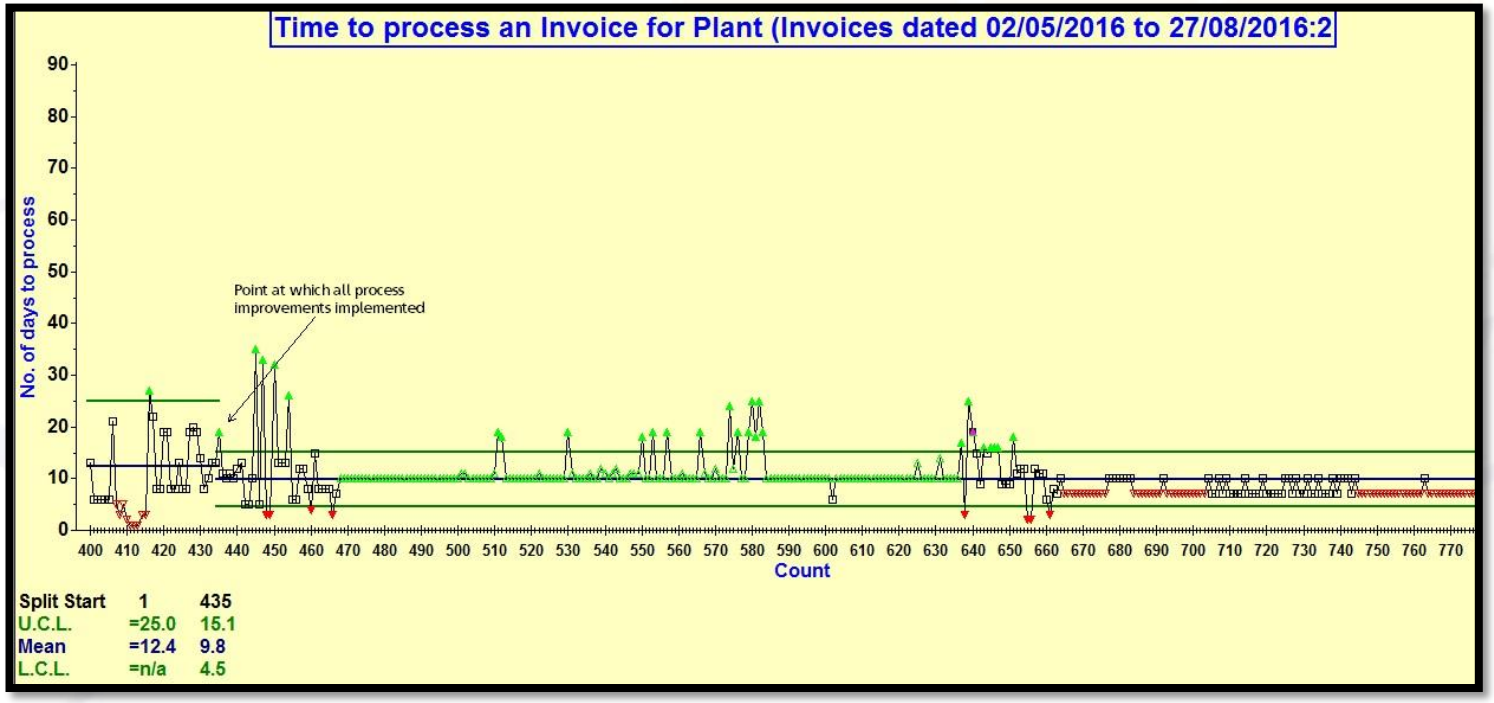
Control

- Data Showing the Improvement: Material



Control

- Data Showing the Improvement: Material



Benefits Realised

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Lessons Learnt

- What have we learnt?
- Could we have done anything differently?
- The benefits of having a committed team

Questions