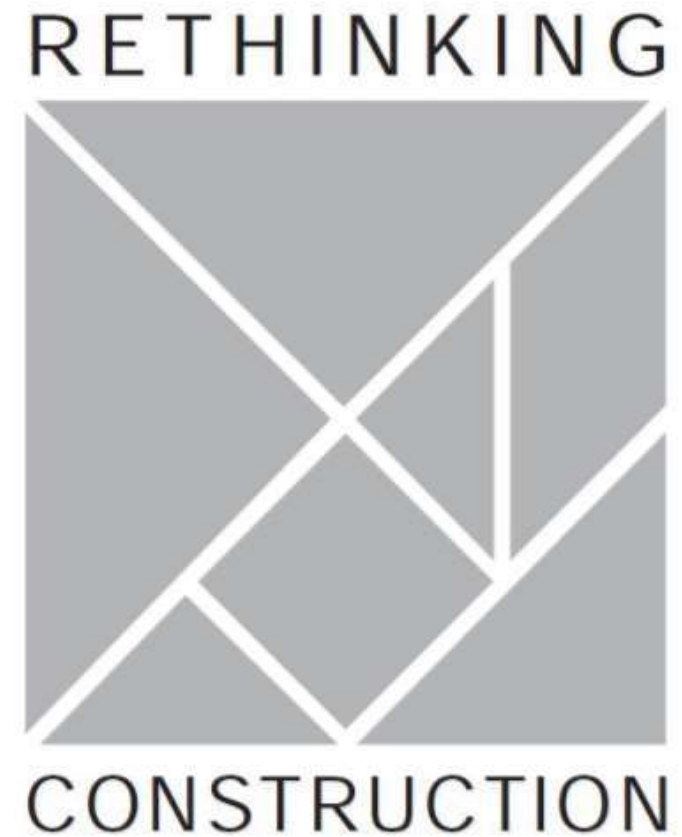


Utilising Lean to improve Defect & Inspection Management

17-Apr-2018

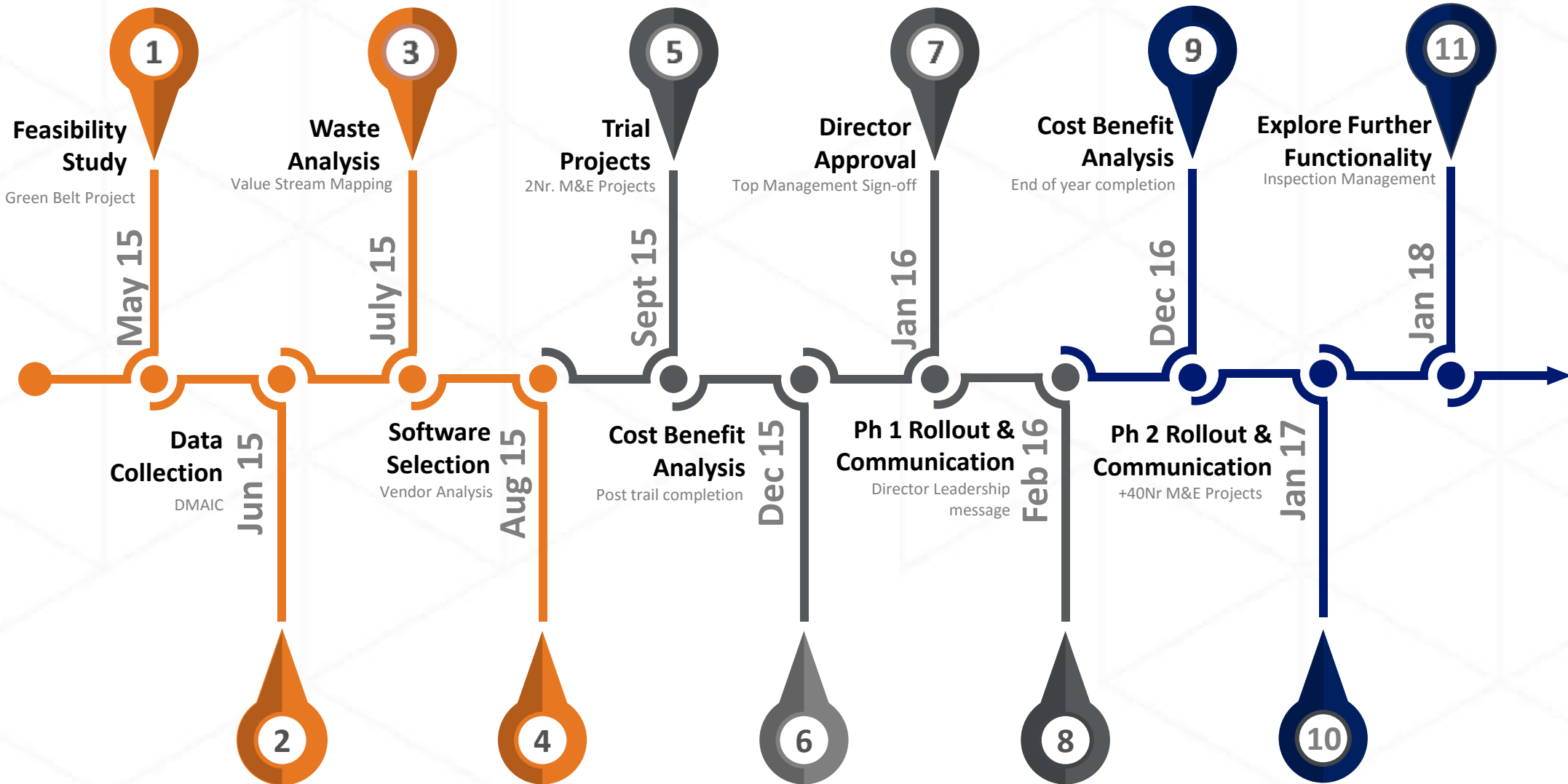


- Step 1:** Systematic elimination of waste.
- Step 2:** Collection & Analysis of data to drive Continuous Improvement.
- Step 3:** Enhance a Preventative Culture – Towards Zero Defects.



CONSTRUCTION TASK FORCE

Timeline of the Green Belt Project



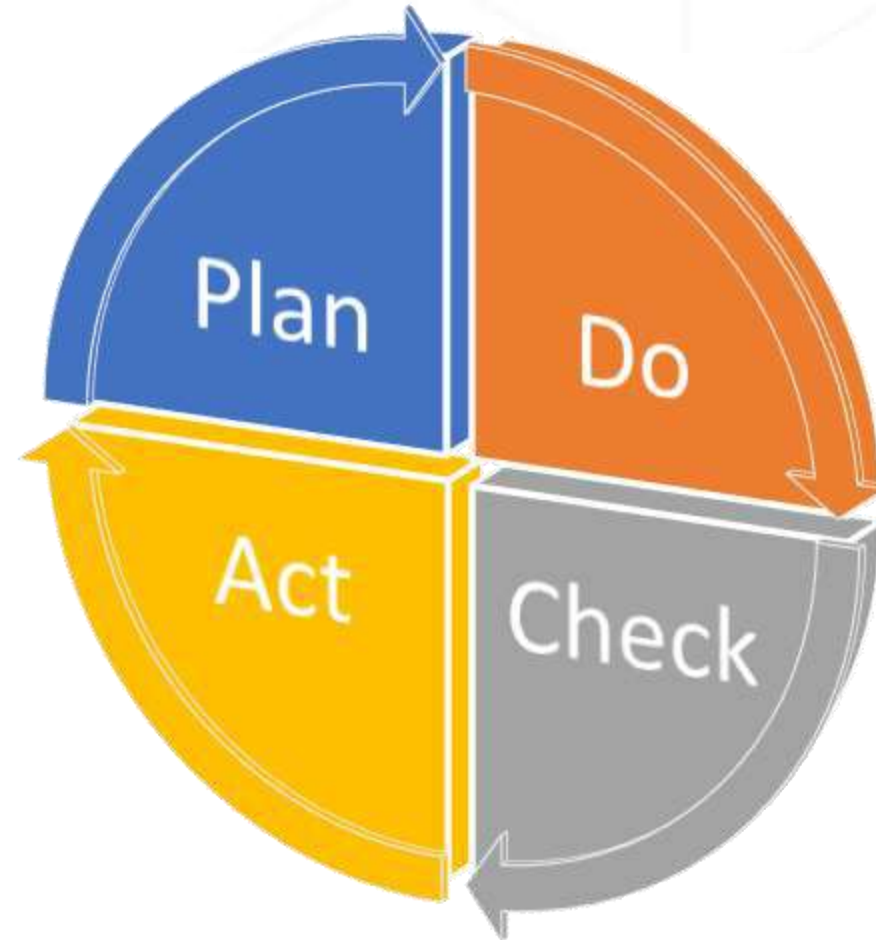
+100
Internal Software Users

+1249
Kirby Inspections Recorded & Streamlined

+191
No. of Weeks Labour Saved

Lean Improvement process steps

- 1 Define the problem
- 2 Develop a solution
- 3 Prove that it works
- 4 Implementation Plan
- 5 Additional improvements
- 6 Conclusion



Plan Phase – Define the problem



1 – Define the problem

What is the Problem?

To rectify defects (Snags) costs between 2.5% - 15.0% of a Projects' overall value.

*Ref: Peter ED Love and Heng Li – Construction & Economics Journal (2000)
“Quantifying the causes and costs of rework in construction.”*



1 – Define the problem

M&E Installations

M&E Defects account for 0.7% of the direct costs of the Original Tender Price.

Ref: Martin Searson – Group Quality Manager – Masters Thesis (2011)



1 – Define the problem

Goal statement:

Improve, Streamline and Automate the Snagging (Defect Management) process to reduce the overall costs to the Project.



1 – Define the problem

Project Charter developed

- Start & End dates
- Sponsor
- Team Leader & Members
- Milestones & Metrics

Project Charter			
Project Title: Improve & Automate Snagging Process		Start Date: 12 May 2015	
Project Type: Waste Reduction / Elimination – Lean Project		End Date: 11 Feb 2016	
Estimated Financial Savings and/or Customer Benefit:			
Proof of concept, more satisfied customer, 2% savings made on the pilot project. 2% savings to be made from implementing improved and automated snagging process on 5 projects in 2016. 2% savings to be made from implementing improved and automated snagging process Companywide in 2017.			
Team:		Milestones:	
Team Leader: Giedre Visockaite Mentor: Éamonn Ó Bearra		Define: June 19 th 2015,	
Sponsor: Jimmy Kirby		Measure: July 24 th 2015,	
Team Members: Quality – Eamonn Quirke, Martin Searson; Site Project Manager – Brendan Coffey; IT – Adrian Harte.		Analyse: Aug 28 th 2015,	
Extended Team Members: Site Supervisors, QS's, QC's.		Improve: Sept 25 th 2015,	
		Control: Oct 2015.	
Project Scope		Metrics Impacted	
Is	Is Not	Primary	Secondary
Snag Processing time (from capture to resolution), Snag Resolution Window, Snag Volume, Snag Categorisation.	Fixing the actual Snag (Labour & Materials, Variations, Design Changes.	Snag Processing Time	Snag Resolution Window, Snag Volume, Snag Categorisation.





Do Phase – Develop a solution



2 – Develop a solution

Utilising Lean Tools

- Process Mapping
- Value Stream Mapping
- Waste Walks
- Baseline Measurements



2 – Develop a solution

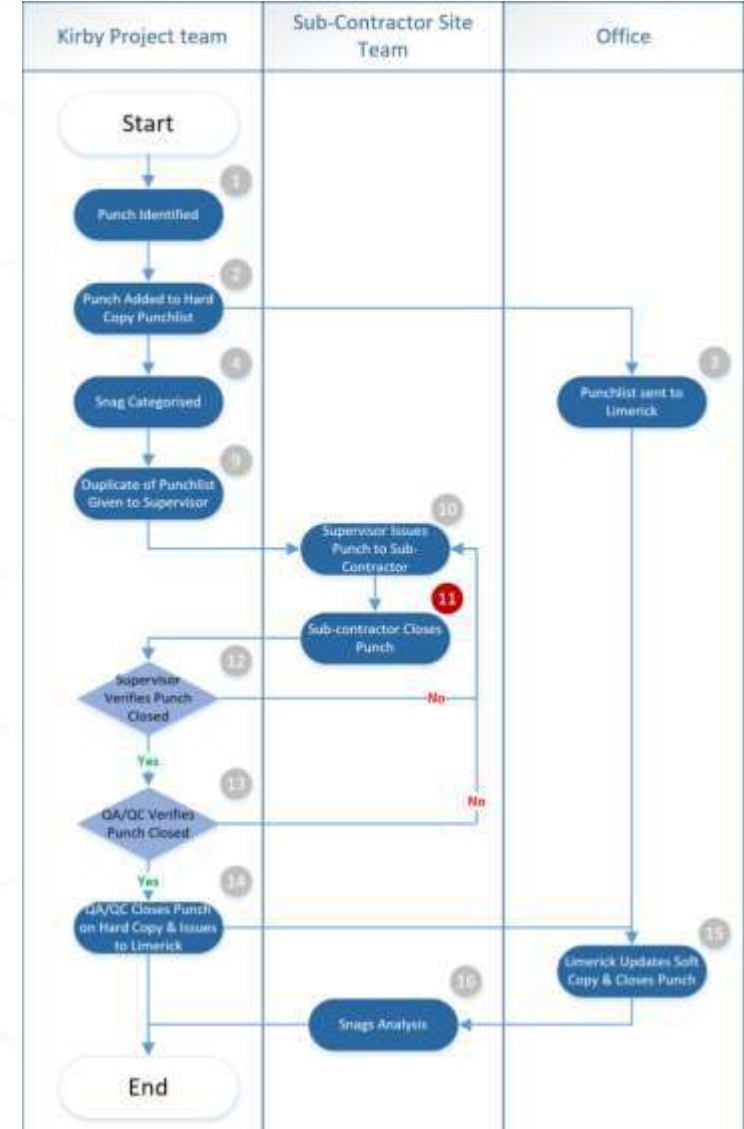
Process Mapping

The process was mapped from beginning to end to identify the stakeholders and the steps that they completed.



2 – Develop a solution

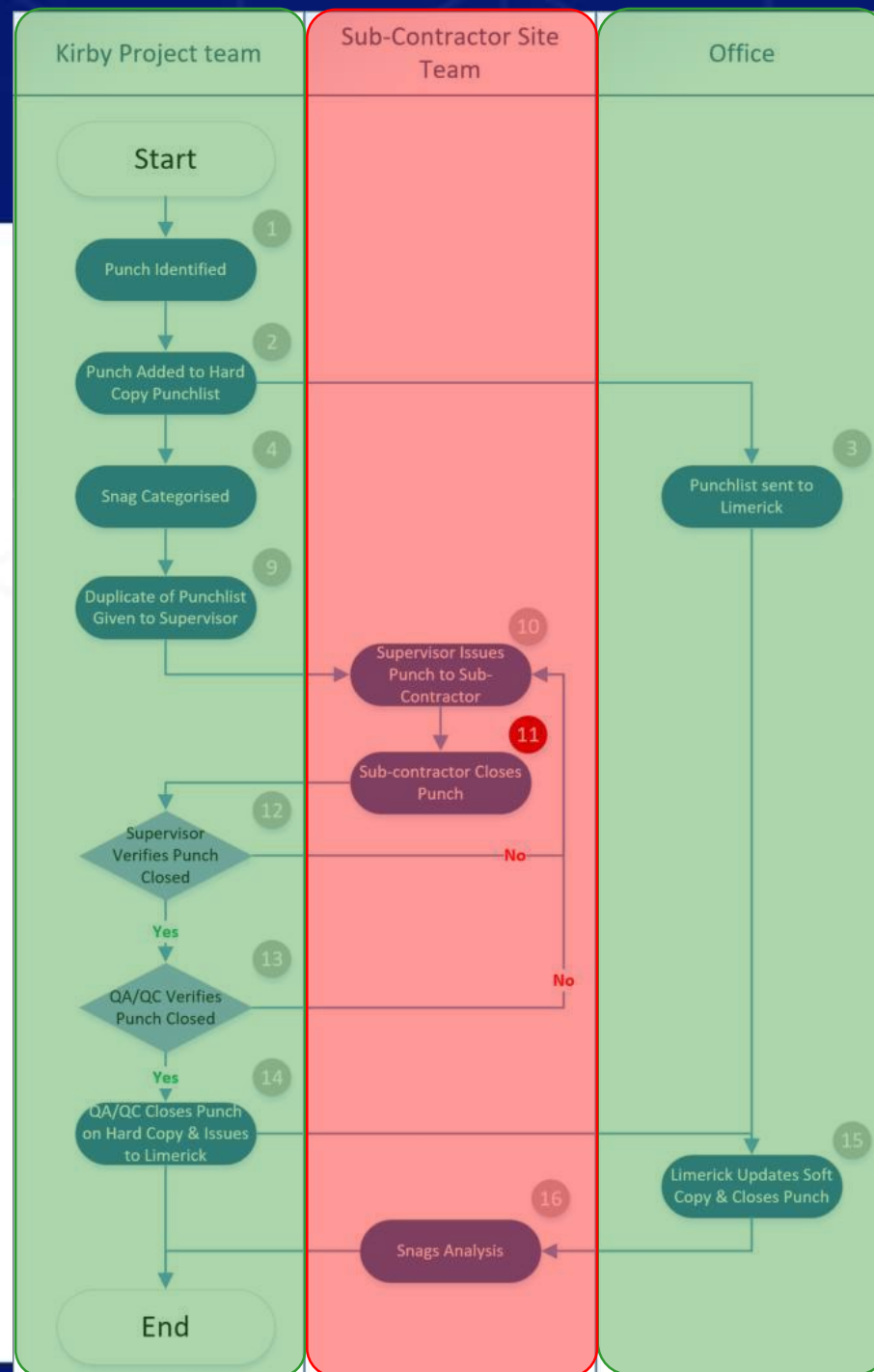
‘As Is’ Process
What can be improved?



2 – Develop a solution



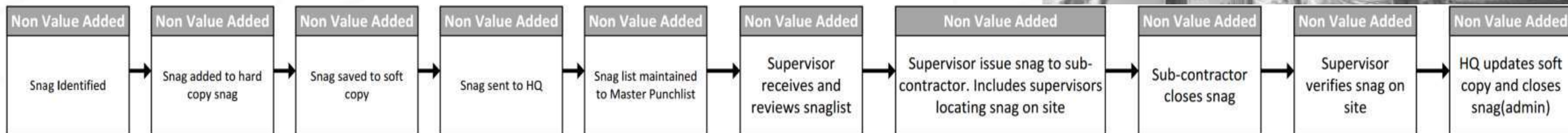
Administration costs were targeted rather than direct costs of fixing the snagging.



2 – Develop a solution

Value Stream Mapping

Initial areas for waste elimination and potential improvement were identified. Management of defects is inherently a Non Value Added process.



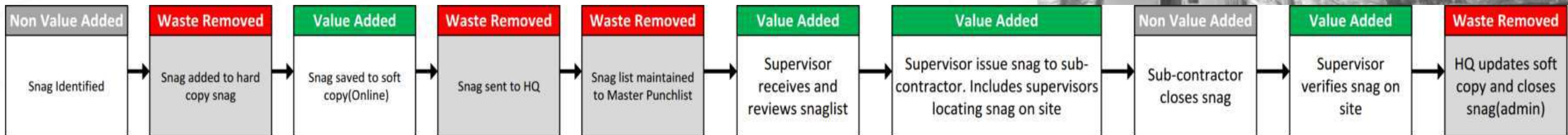
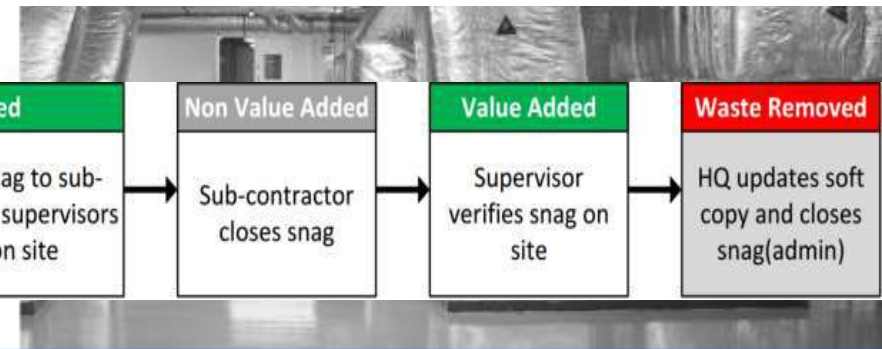
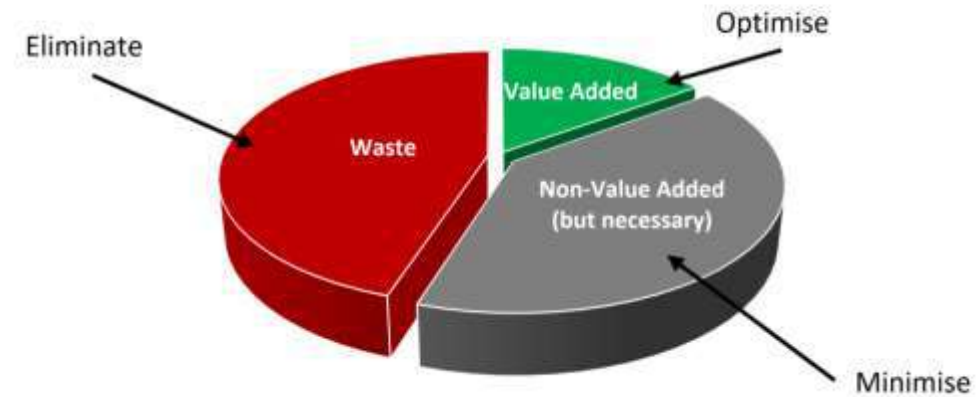
2 – Develop a solution



Waste Walks

These were completed to determine what could be removed as **Waste** or improved upon as **Value Added**.

LEAN Value Added Pie Chart



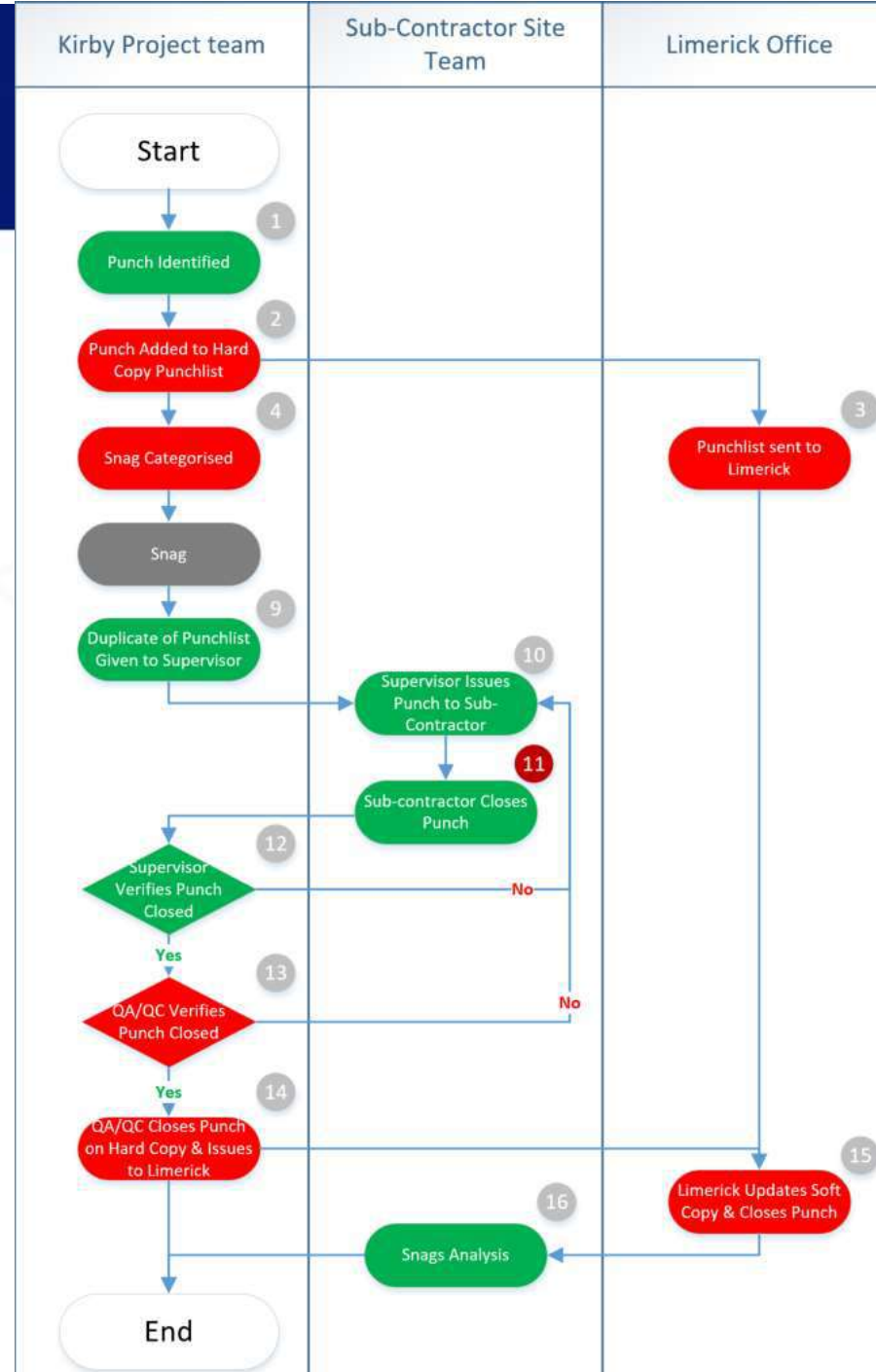
2 – Develop a solution



Legend:



Streamlined 'To Be' Process
 The process was redrawn to illustrate the areas of waste elimination and optimisation.



2 – Develop a solution

Baseline Measurements

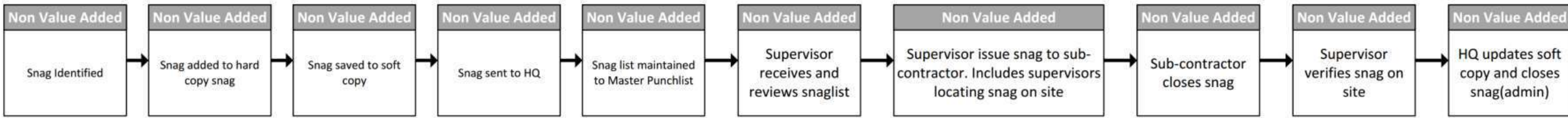
Cycle time measurements were taken for the 'As-Is' process.

Improved cycle times were estimated and a cost benefit analysis was completed.



2 – Develop a solution

Manual Snagging



Details:
Process Type: Manual
Cycle Time: 30s
Reoccurrence: per snag

Details:
Process Type: Manual
Cycle Time: 1 min
Reoccurrence: per snag

Details:
Process Type: Manual
Cycle Time: 2 min
Reoccurrence: per snag

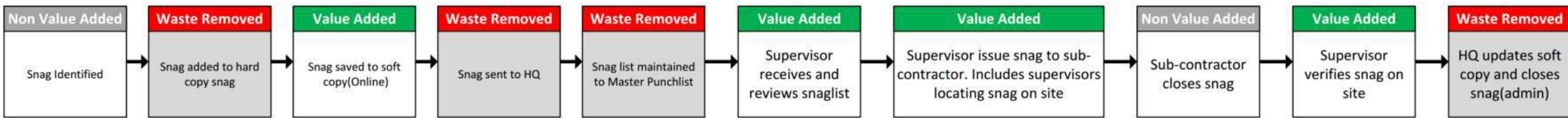
67% savings to be made due to the **removal or **optimisation** of Non Value Added steps.**

Details:
Process Type: Manual
Cycle Time: 3 min
Reoccurrence: per snag

Details:
Process Type: Manual
Cycle Time: 15 min
Reoccurrence: per snag

Details:
Process Type: Manual
Cycle Time: 5 min
Reoccurrence: per snag

Electronic Snagging



Details:
Process Type: Electronic
Cycle Time: 30s
Reoccurrence: per snag

Details:
Process Type: Manual
Cycle Time: 0 min
Reoccurrence: per snag

Details:
Process Type: Electronic
Cycle Time: 1 min
Reoccurrence: per snag

Details:
Process Type: Manual
Cycle Time: 0 min
Reoccurrence: per snag

Details:
Process Type: Manual
Cycle Time: 0 min
Reoccurrence: per snag

Details:
Process Type: Electronic
Cycle Time: 2 min
Reoccurrence: per snag

Details:
Process Type: Manual
Cycle Time: 5 min
Reoccurrence: per snag

Details:
Process Type: Manual
Cycle Time: 3 min
Reoccurrence: per snag

Details:
Process Type: Electronic
Cycle Time: 5 min
Reoccurrence: per snag

Details:
Process Type: Manual
Cycle Time: 0 min
Reoccurrence: per snag

Check Phase – Prove that it Works



3 – Prove that it works

Trial

2Nr. trial projects were selected to utilise the software. Baseline measurements were taken from a similar project where a manual process was implemented.



3 – Prove that it works

The data:

- Number of Snags per €1 million of value.
- Processing time of a Snag.
- Closeout time of a Snag.
- Number of Snags categorised as “Other”.



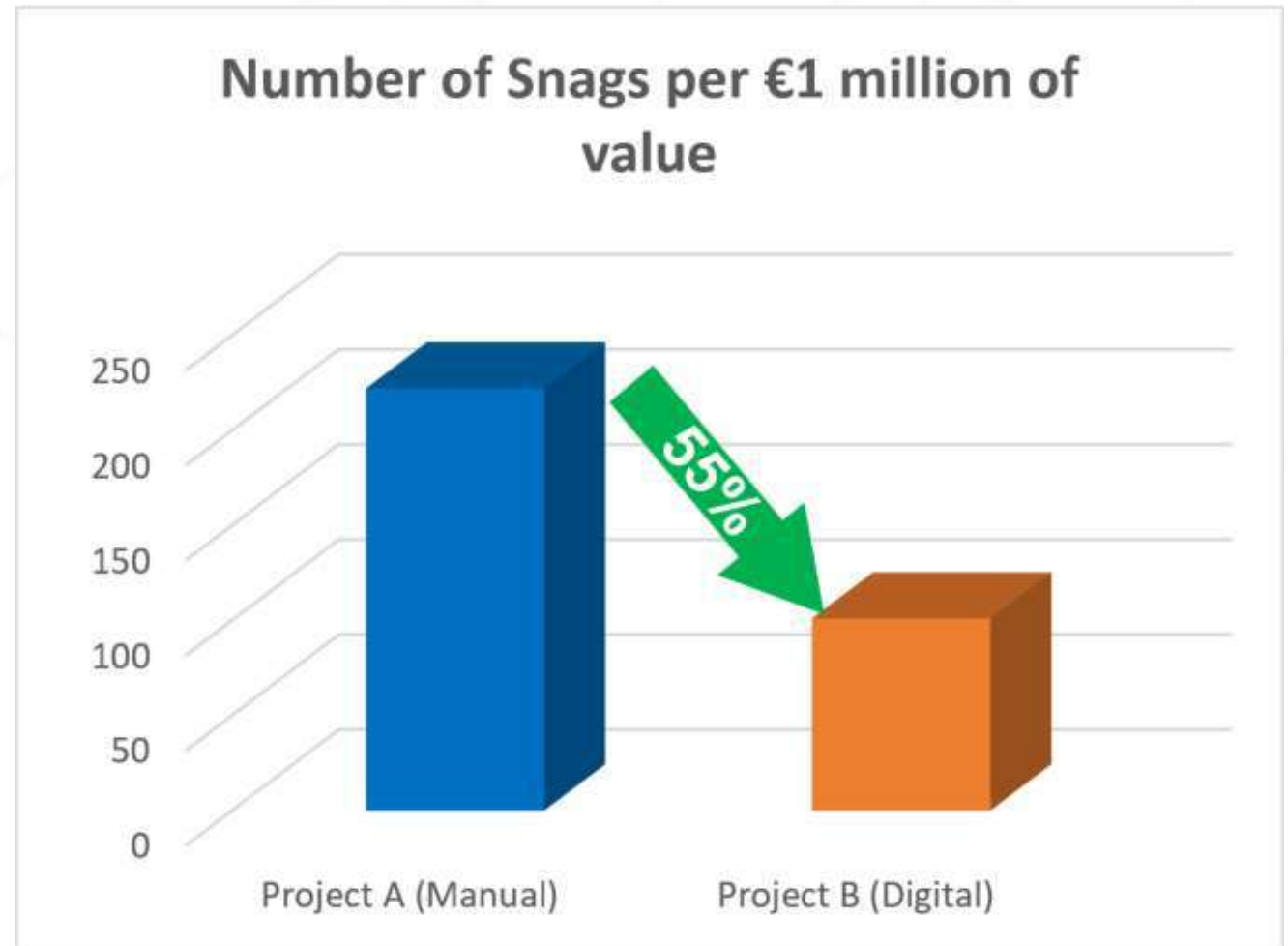


**On-Site
Advantages**

3 – Prove that it works – The Results

Tangible Benefits

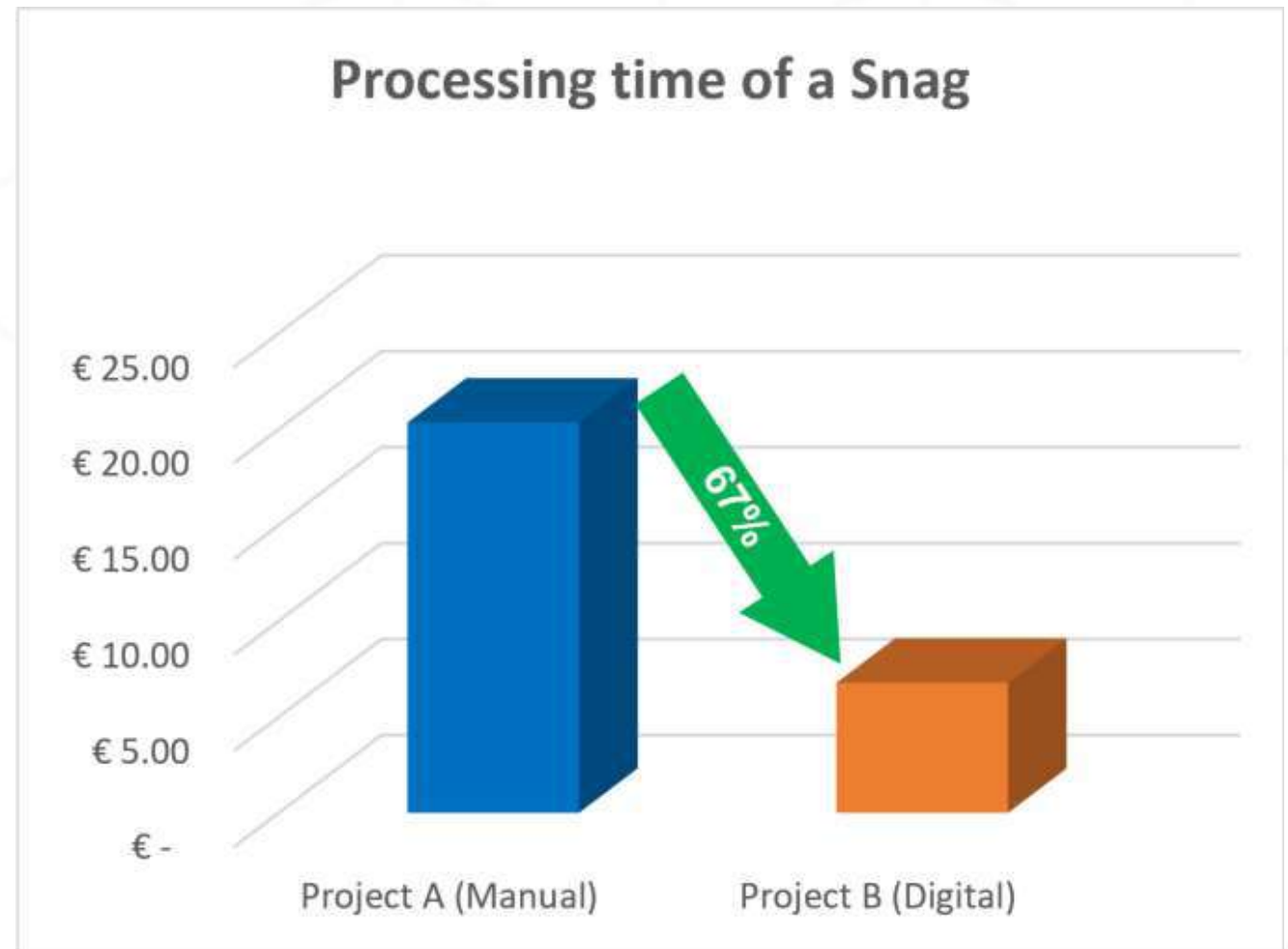
- Number of Snags per €1 million of project value. **55% reduction** recorded – Due to removal of duplication.



3 – Prove that it works – The Results

Tangible Benefits

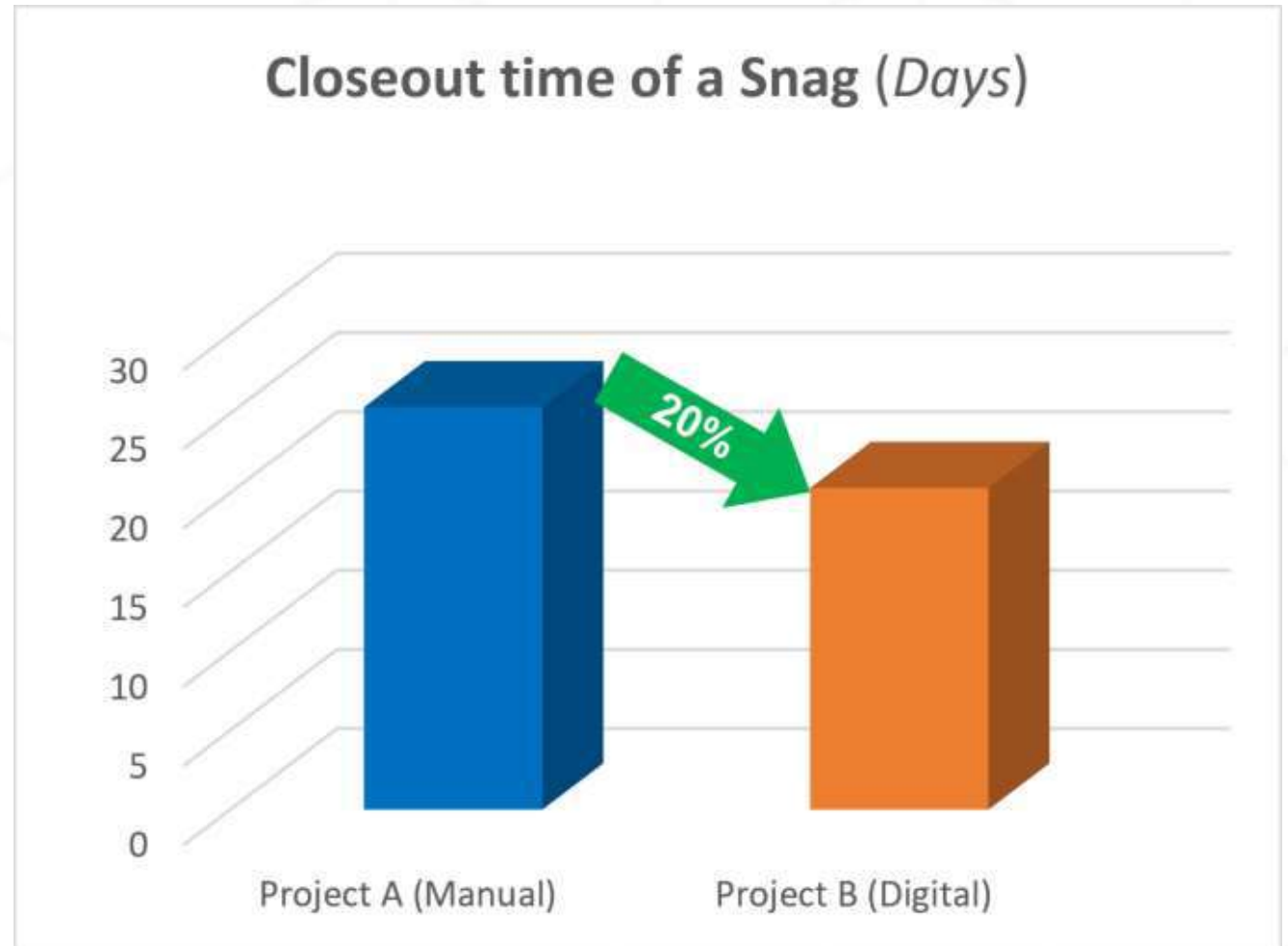
- Processing time of a Snag.
67% reduction in processing time – Removal of Waste and Optimisation of the steps.



3 – Prove that it works – The Results

Tangible Benefits

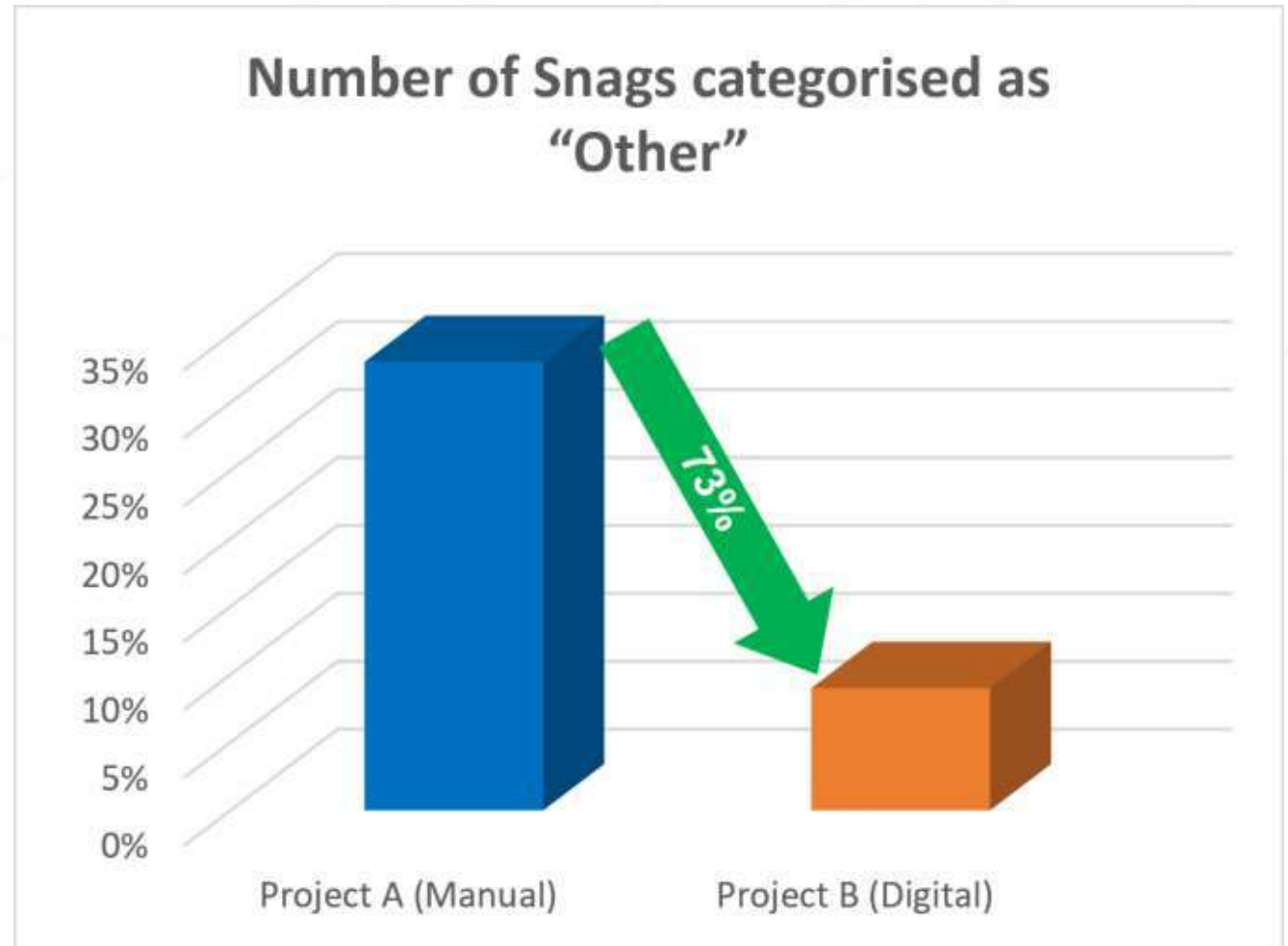
- Close-out time of a Snag. **20% reduction** in closeout Time – due to improved communication.



3 – Prove that it works – The Results

Tangible Benefits

- Number of Snags categorised as “Other”.
73% reduction in Snags recorded as “Other”.



3 – Prove that it works

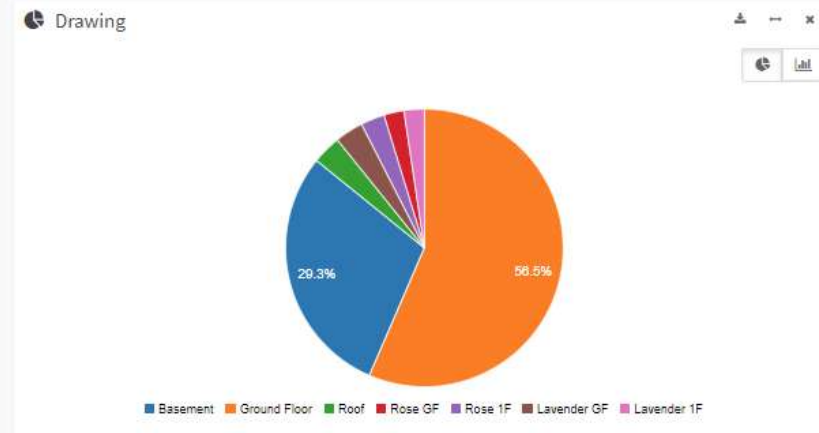
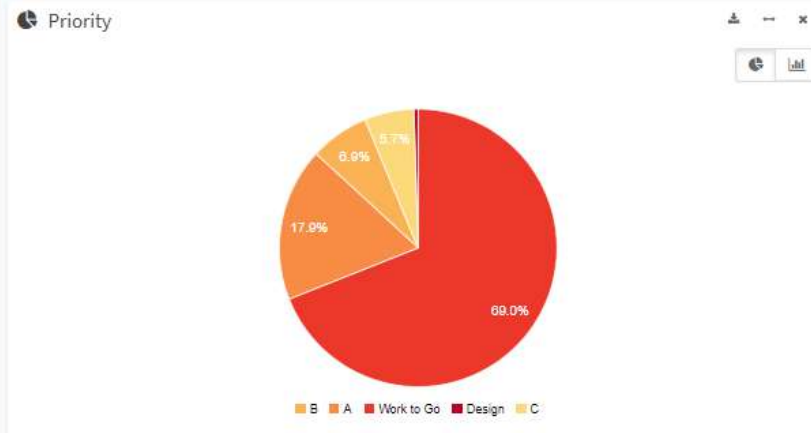
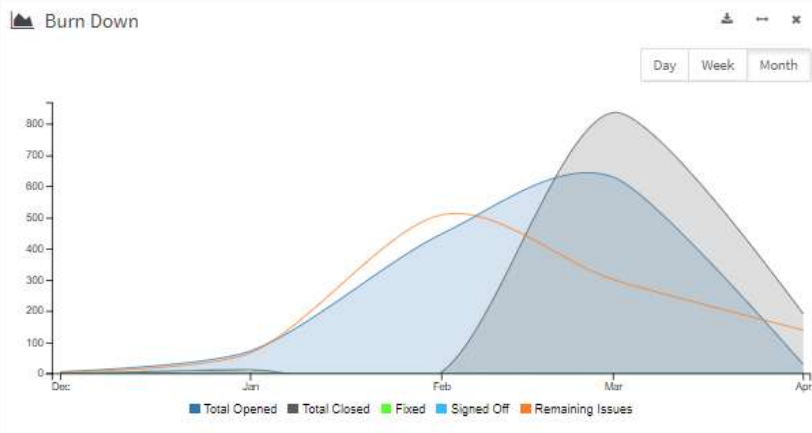
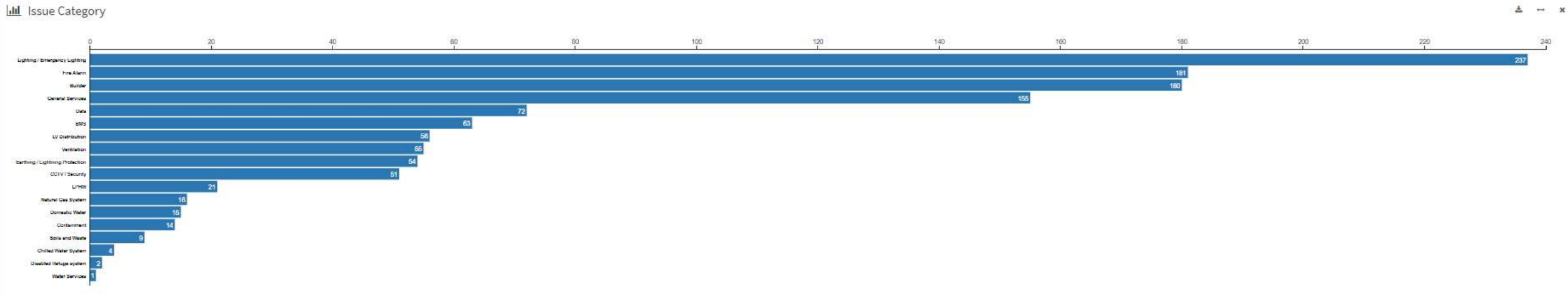
The Results – The Intangible Benefits

Improved quality of 'real-time' data:

- Site monitoring and reporting,
- **Defect analysis,**
- Information sharing and Communication.



3 – Proof that it works



3 – Proof that it works

The Results – The Intangible Benefits
Better analysis of a Specialist Contractor /
project performance and promotion of a
continuous improvement culture.



3 – Proof that it works

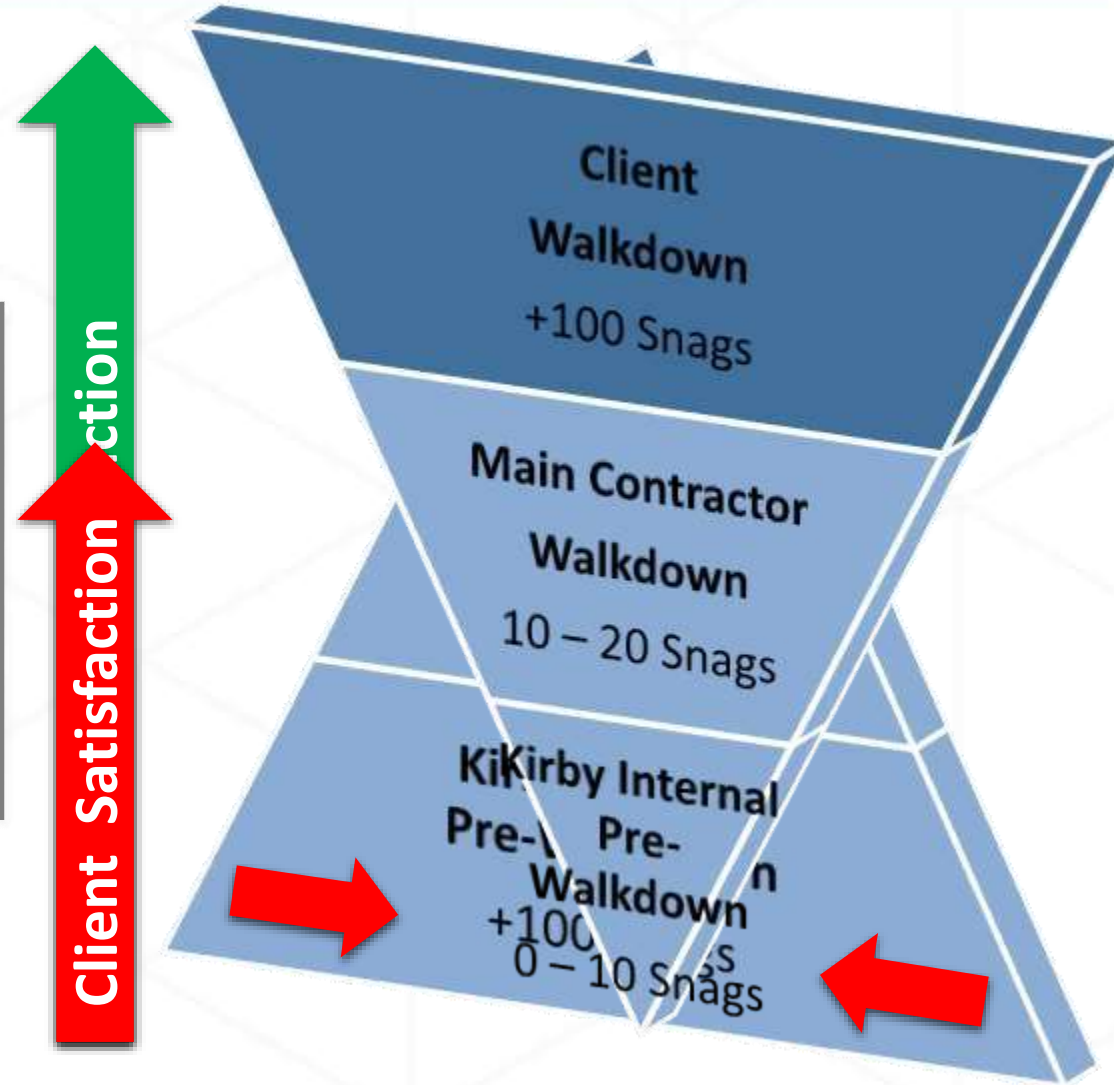
The Results – The Intangible Benefits

Digitised process / no paperwork / pin location of snags / time & date stamped photo i.e. less “touching” the snag, less duplication.



3 – Prove that it works

The Results – The Intangible Benefits
Improved customer satisfaction - more efficient/organised approach to snagging and project completion on time with no significant issues upon final handover.



3 – Prove that it works

The Results – The Intangible Benefits

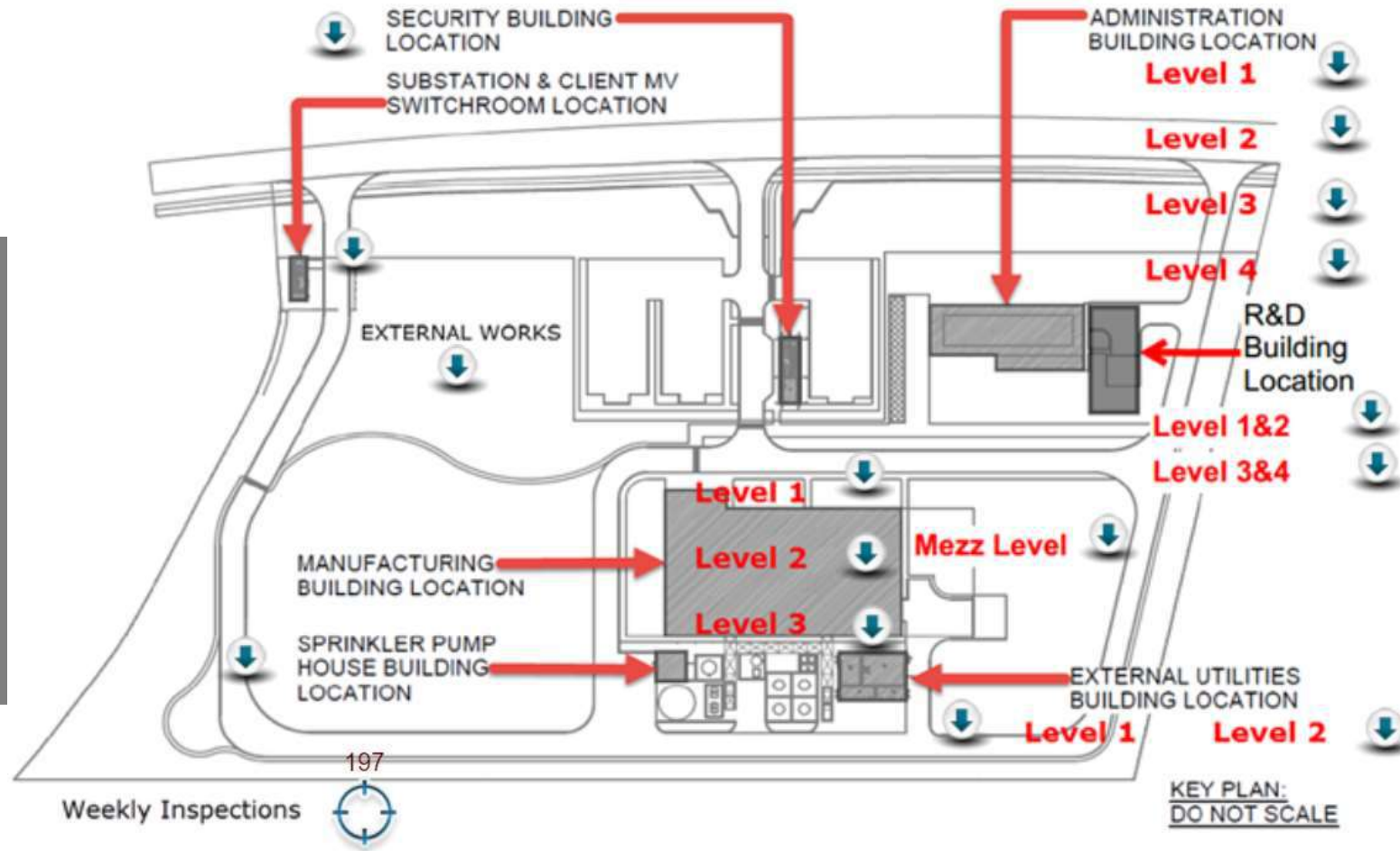
Improved attitudes towards change and introduction of mobile technology on sites through user friendly Applications.



3 – Prove that it works

The Results – The Intangible Benefits

Easy access straight in to our Software Application.





**Long Term
Strategic Advantages**

3 – Prove that it works

Additional Value Added

Project teams could identify repeat snags across multiple areas, resulting in Quality Toolbox Talks (QTBT) reducing the frequency of reoccurring snags across the project.



3 – Prove that it works

Additional Value Added

Reports with time stamped pictures demonstrated ongoing inspections.

Utilised to demonstrate BC(A)R Compliance.



3 – Prove that it works

Additional Value Added

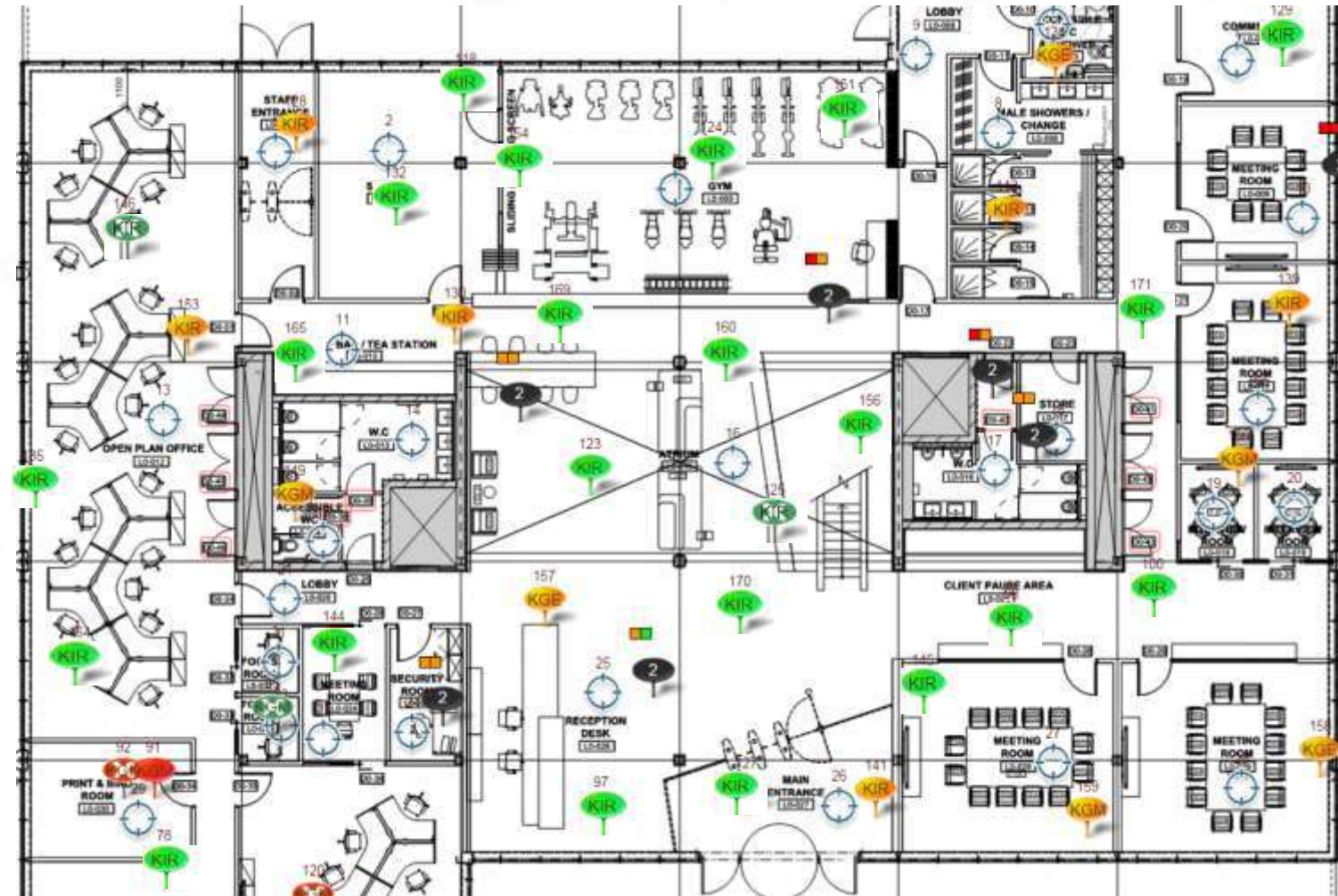
Improved Feedback to the supply chain enhanced engagement between both our supply chain and our project team.



3 – Prove that it works

Proof Points – Improved Analytics


Layout drawings identify problem areas on site and exact locations of Snags.



3 – Prove that it works

Proof Points – Improved Analytics

Project Summary identifies problems with Systems / Specialist contractors.



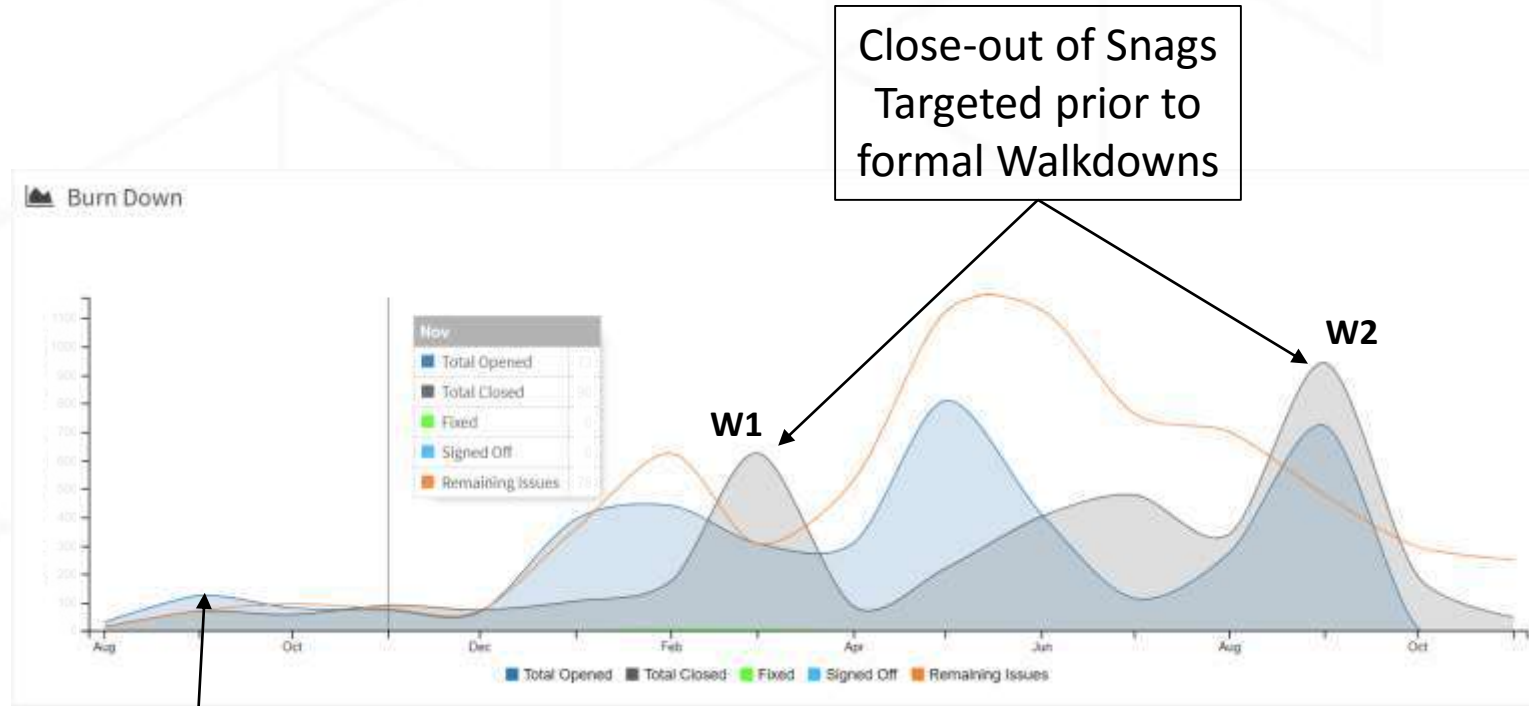
The screenshot shows a 'Project Summary' dashboard with a table of project categories and their status distribution. The table has columns for 'Open', 'In Date', 'Late', 'Fixed', 'Signed Off', 'Other', and 'Closed'. The 'In Date' column is highlighted in yellow, 'Late' in red, 'Fixed' in green, and 'Signed Off' in blue. The 'Open' column is highlighted in grey. The table lists 12 project categories with their respective counts and percentages for each status.

	Open	In Date	Late	Fixed	Signed Off	Other	Closed
	58	20%	1%	72%	72%	7%	67
Chilled Water System	13	5%	0%	81%	81%	14%	16
Containment	6	9%	0%	67%	67%	24%	10
Earthing / Lightning Protection	4	3%	2%	93%	95%	2%	2
General Services	2	30%	1%	69%	69%	0%	1
Generators	1	7%	0%	93%	93%	0%	0
Lighting / Emergency Lighting	3	11%	1%	86%	80%	0%	5
LV Distribution	8	18%	2%	80%	59%	0%	13
MV Distribution	5	26%	0%	74%	60%	0%	0
Ventilation	4	41%	1%	56%	50%	2%	8
Water Services	3	37%	0%	63%	55%	0%	6
Water Treatment	9	45%	0%	55%	50%	0%	6

3 – Prove that it works

Proof Points – Improved Analytics

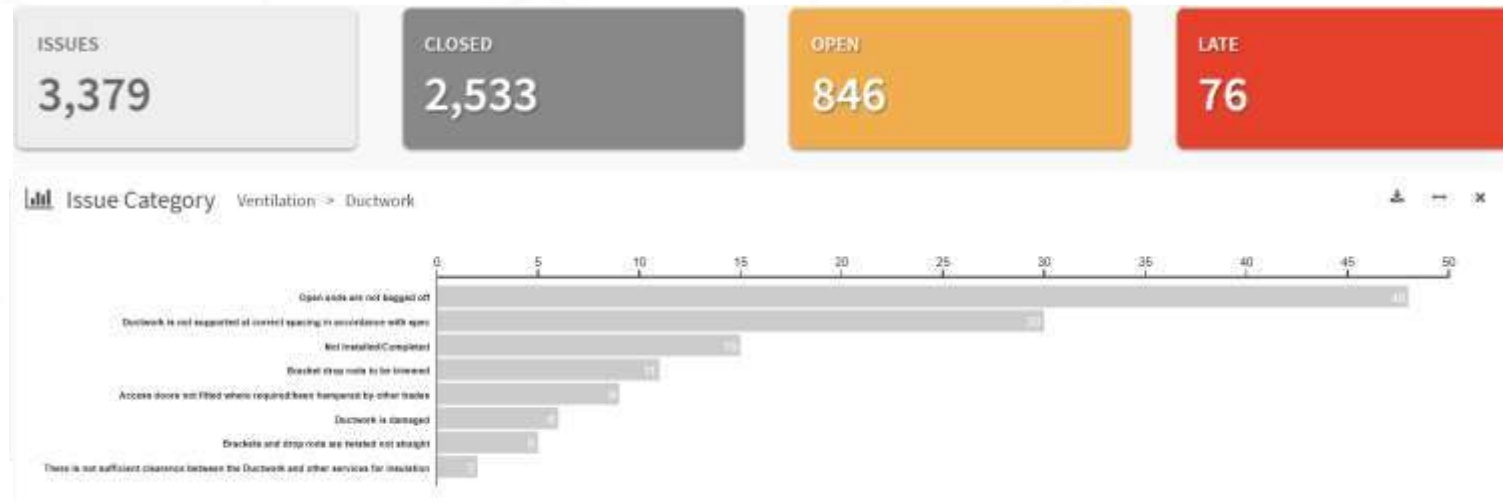
Real Time Trending demonstrates ongoing progress on site.



3 – Prove that it works

Proof Points – Improved Visibility

Pareto Analysis of Snags from Project to System level to identify specific problems.



3 – Prove that it works

Proof Points – Improved Communication
Streamlined to Specialist contractors via Automatically generated reports.

95 UKD 16377.A1.22Issue4 - Personnel Walkway
LPHW - Pipework
x:1226 Supports not fitted at correct intervals and plumb
y:975 W1 LPHW Walkdown : additional supports needed on pipework to RHB P2-16-02.
Do By: Mon, 20 Nov 2017 A 16 [Open](#)
Con: HARMAC MECHANICAL SERVICES



(Alan McGowan - 20/11/2017 16:46:00)

79 UKD 16377.A1.22Issue4 - Plant Mezz floor
Process Pipework - Pipework
x:560 Brackets loose/missing
y:925 W1 Walkdown snag (Purified Water system): Additional vertical pipework supports to be installed to prevent lateral movement of pipework.
Do By: Thu, 23 Nov 2017 B 5 [Open](#)
Con: Dunreedy Engineering



(Alan McGowan - 13/11/2017 16:41:00)

96 UKD 16377.A1.22Issue4 - Walk-on Ceiling
LPHW - Pipework
x:561 Air vent/bottle to be fitted
y:878 W1 LPHW Walkdown: AAV to be installed / relocated to high point as indicated at RHB P2-15-11.
Do By: Mon, 20 Nov 2017 A 7 [Open](#)
Con: HARMAC MECHANICAL SERVICES



(Alan McGowan - 20/11/2017 16:48:00)


108 UKD 16377.A1.22Issue4 - Walk-on Ceiling
Water Services - Pipework
x:545 Anchors not fitted correctly or to correct gradient
y:968 W1 PCWS & PHWS/R Walkdown: Supports unistrut is fixed to temporary civils ope wood platform. Unistrut to be fixed to concrete wall.
Do By: Wed, 22 Nov 2017 A 14 [Open](#)
Con: HARMAC MECHANICAL SERVICES



(Alan McGowan - 22/11/2017 17:04:00)

3 – Prove that it works

Proof Points – Improved Communication
Report automatically updates the snag and details of the change(s).



Site Report with Drawings

Training

96 UKD 16377.A1.22Issue4 - Walk-on Ceiling
LPHW - Pipework


x:561 Air vent/bottle to be fitted
y:878 W1 LPHW Walkdown: AAV to be installed / relocated to high point as indicated at RHB P2-15-11.

Do By: Mon, 20 Nov 2017 A 7 Closed


Con: HARMAC MECHANICAL SERVICES


Visit Description	Visit Date	Sync Date	Inspector	Closed
AAV installed at high point.	27/11/2017 13:48:30	27/11/2017 13:48:30	Alan McGowan	

Inspector Signature



Supervisor Signature





(Alan McGowan - 20/11/2017 16:48:00)



Act Phase – Implementation Plan

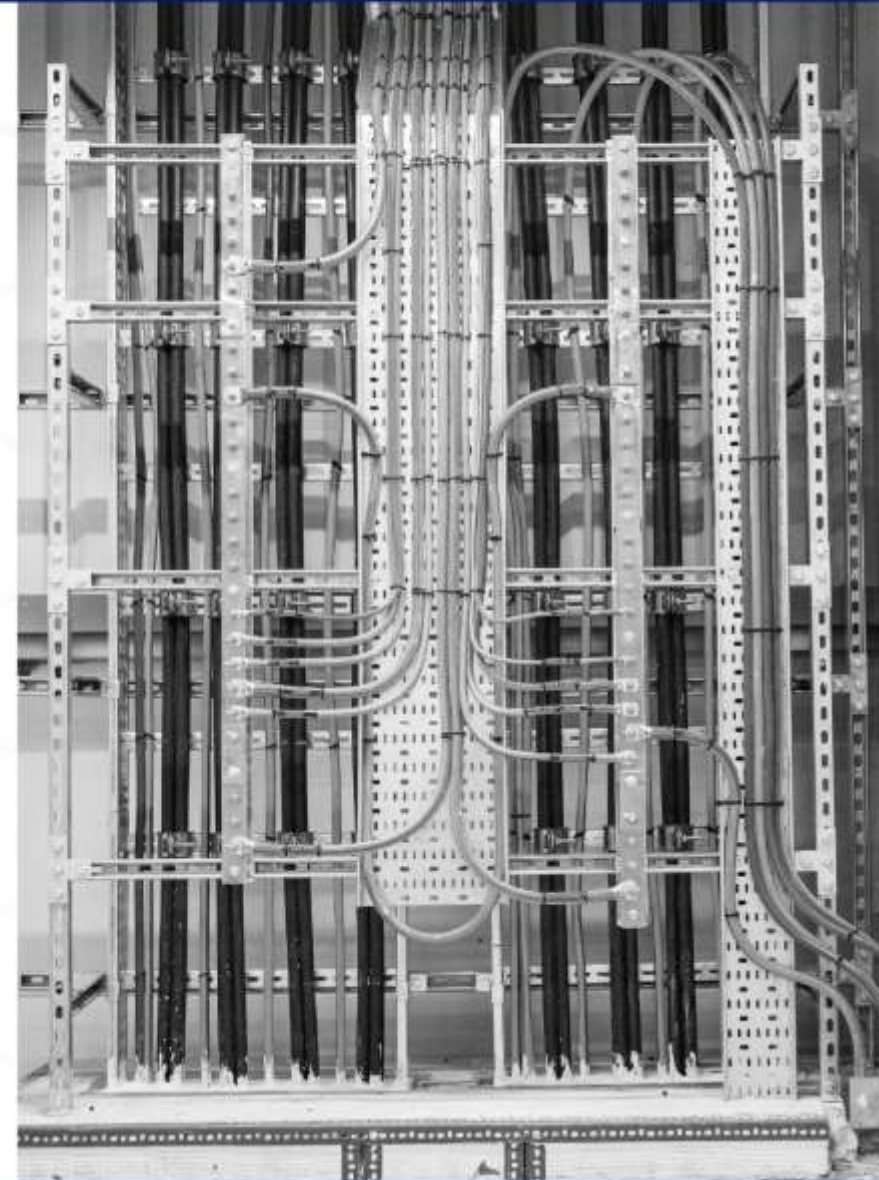


Steam
Boiler
SB 2.0

4 – Implementation Plan

40 Step Implementation Plan

- Appointed an Implementation Team.
- Stakeholder Engagement & Training.
- Regular Communication.
- Monthly Monitoring & Reporting.



4 – Implementation Plan



2 Year Implementation Plan
Year 1 – on 5Nr. Projects
~€32m in M&E value.
Managed change resistance
Provided Tablets & Training

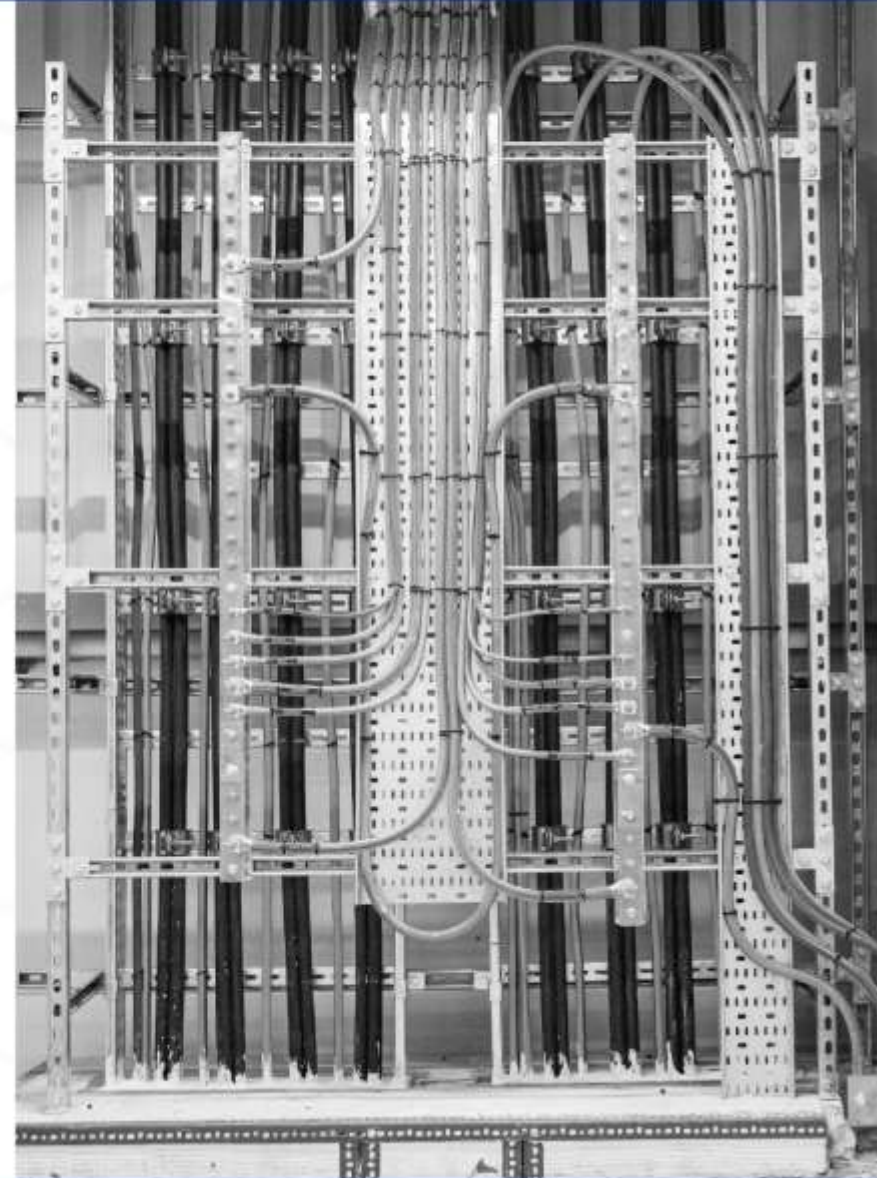
	Action	Owner	Deadline
1	Select 5 significant projects (value ~€32m) for implementing the new snagging solution in 2016.	JG	Feb 2016
2	Appoint a dedicated Implementation team.	GV	Feb 2016
3	Develop stakeholder analysis and communication plan (incl. change management).	GV	Feb 2016
4	Ensure the Directors send out a communication memo that the improved and automated snagging is going to be implemented company-wide through 2016/2017 highlighting the main benefits it will bring.	GV	Mar 2016
5	Meet the key stakeholders – project PM’s/Supervisors – to ensure there is buy-in. Manage resistance to change, where required.	EQ	Mar/Apr 2016
6	Add a clause to sub-contract to ensure all Specialist contractors sign up to using this solution on Kirby Projects.	GV	Mar 2016
7	Purchase Defect Software App (with required training) and the Tablets required for the 5 projects.	EQ	Mar 2016
8	Update “Kirby Integrated Project Execution Plan” with this automated snagging process.	JG	Apr 2016
9	“Kirbyise” full Defect Software App training manual.	EQ	Apr 2016
10	Quality/Engineering team (“Superusers”) to obtain required Software training.	EQ	Apr 2016
11	Set-up 5 projects on all Mobile Devices (Customisation – uploading architectural drawings, drop down lists).	EQ	Apr 2016
12	Develop a plan and schedule required training sessions for the Project Management teams / Specialist contractors on 5 projects.	EQ	Apr 2016
13	Provide Training to the Project Management teams / Sub-contractors (Tool box talks and interactive training sessions).	EQ	Apr/May/ Jun 2016
14 - 39
40	Investigate additional Defect Software App functionality and implement, if feasible.	EQ	Jan 2018

4 – Implementation Plan

2 Year Implementation Plan

Year 1 rollout on 1No. Flagship Project in each region (5Nr.).

Year 2 rollout on top 3 Projects in each region (15Nr.).



4 – Implementation Plan

Monthly Reporting

Provided a progress update to our Senior Management Team.





Additional Improvements

5 – Additional Improvements



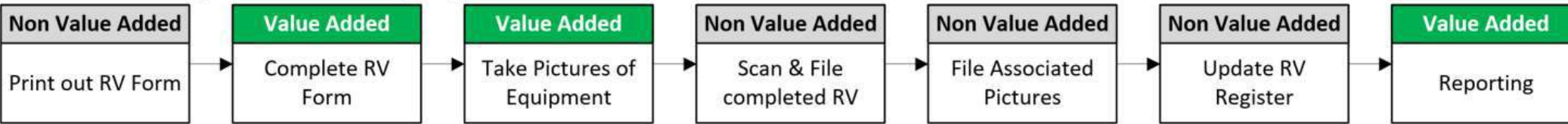
Inspection Management – the Now
The PDCA process was repeated to determine if the software could be utilised to complete high frequency, single use inspections such as Receipt Verifications.



5 – Additional Improvements



Manual Receipt Verification (RV) Process



Details:
Process Type: Manual
Cycle Time: 1 Min
Reoccurrence: Each RV

Details:
Process Type: Manual
Cycle Time: 15 Min
Reoccurrence: Each RV

Details:
Process Type: Manual
Cycle Time: 5 Min
Reoccurrence: Each RV

38% savings to be made due to the **removal or **optimisation** of Non Value Added steps.**

Details:
Process Type: Manual
Cycle Time: 30 Min
Reoccurrence: Monthly

Summary:
Process Type: Manual
Cycle Time: 32 Min / RV + 30 Min / Month
Waste: 12 Min / RV + 30 Min / Month

Electronic Receipt Verification (RV) Process



Details:
Process Type: Automatic
Cycle Time: 0 Min
Reoccurrence: Each RV

Details:
Process Type: Electronic
Cycle Time: 15 Min
Reoccurrence: Each RV

Details:
Process Type: Electronic
Cycle Time: 5 Min
Reoccurrence: Each RV

Details:
Process Type: Automatic
Cycle Time: 0 Min
Reoccurrence: Each RV

Details:
Process Type: Automatic
Cycle Time: 0 Min
Reoccurrence: Each RV

Details:
Process Type: Automatic
Cycle Time: 0 Min
Reoccurrence: Each RV

Details:
Process Type: Electronic
Cycle Time: 5 Min
Reoccurrence: Monthly

Summary:
Process Type: Electronic
Cycle Time: 20 Min / RV + 5 Min / Month
Saving: 12 Min / RV + 25 Min / Month

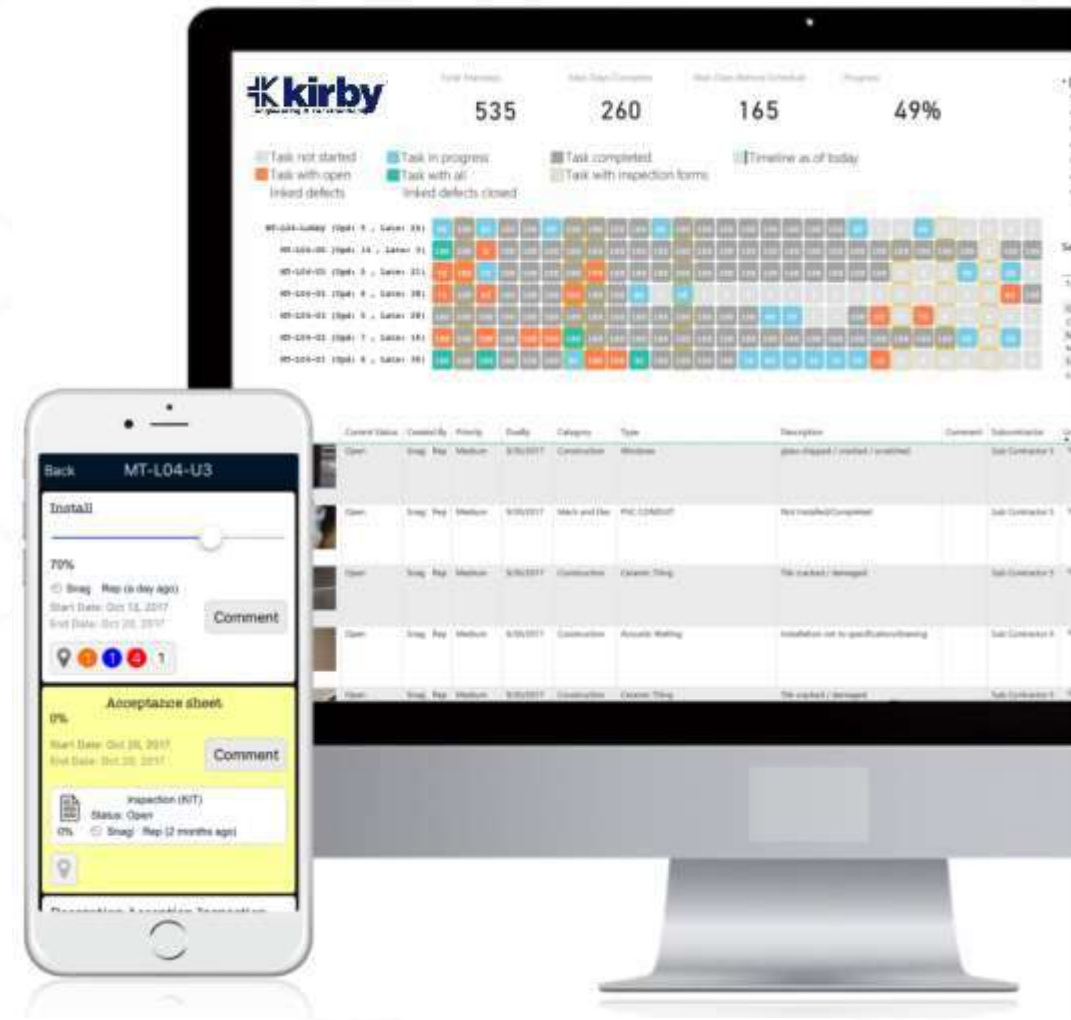
5 – Additional Improvements

Test Pack Management – the Now
Working with the software provider to enhance the inspection solution to improve the management of Testing and Handover Packs.



5 – Additional Improvements

Test Pack Management – the Now
Digitally managing the Project Testing / Handover Packs to enhance our visibility and tracking of progress on site.





Conclusion

6 – Conclusion

Cycle Time Reductions To Date
33 Mins. reduced per Snag.
12 Mins. reduced per Inspections.





Our Management are now focussed on further value adding activities for better performance.



Q&A

DUBLIN • GALWAY • LIMERICK • LONDON • GLASGOW • WARRINGTON • BRUSSELS