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The 7 'Quality Tools'

Pareto Analysis, Cause and Effects Analysis, **Checksheets**, Control Charts, Flow Charts, Histograms and Scatter Diagrams

Aim of session

The aim of this session is for you to understand the use of Check Sheets as a quality and process/continuous improvement tool.

At the end of the session, you should be able to:

- Explain what a check sheet is and what it's used for
- Explain how to develop a Check Sheet
- Demonstrate the development of a Check Sheet

What is a Check Sheet?

A Check Sheet is:

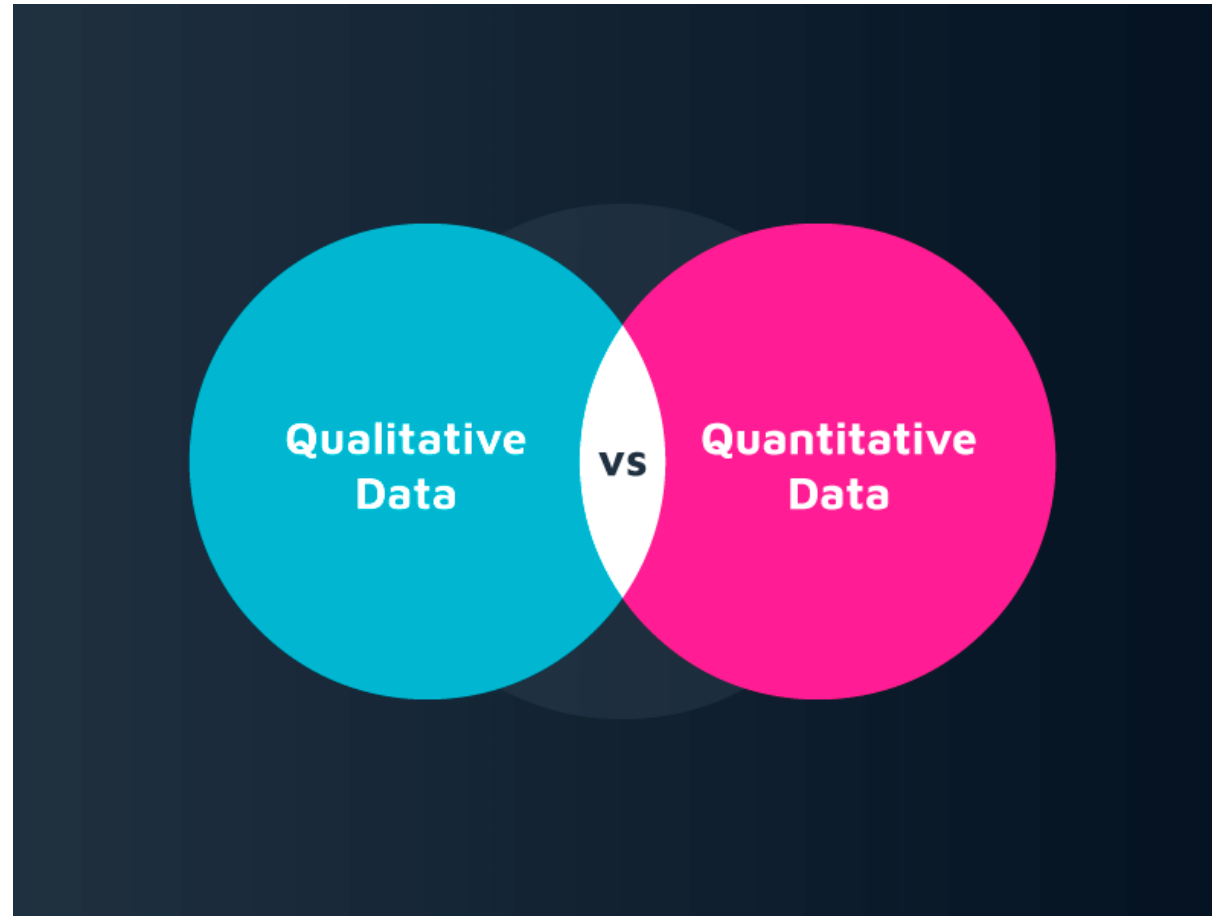
- A Structured form for collecting and analysing data
- It's considered to be one of the 7 'basic quality tools'
- A data collection tool which can be adapted for a wide range of purposes in quality systems management.

When are Check Sheets Used?

- ✓ For gathering data from a production process
- ✓ Use while data can be witnessed and collected recurrently by the same individual or at the same location
- ✓ Collecting data in real-time and at the site where the data is generated
- ✓ Qualitative data
- ✓ Quantitative data

Quantitative and Qualitative Data

Data



Quantitative and Qualitative Data

Data  Qualitative

Quantitative and Qualitative Data



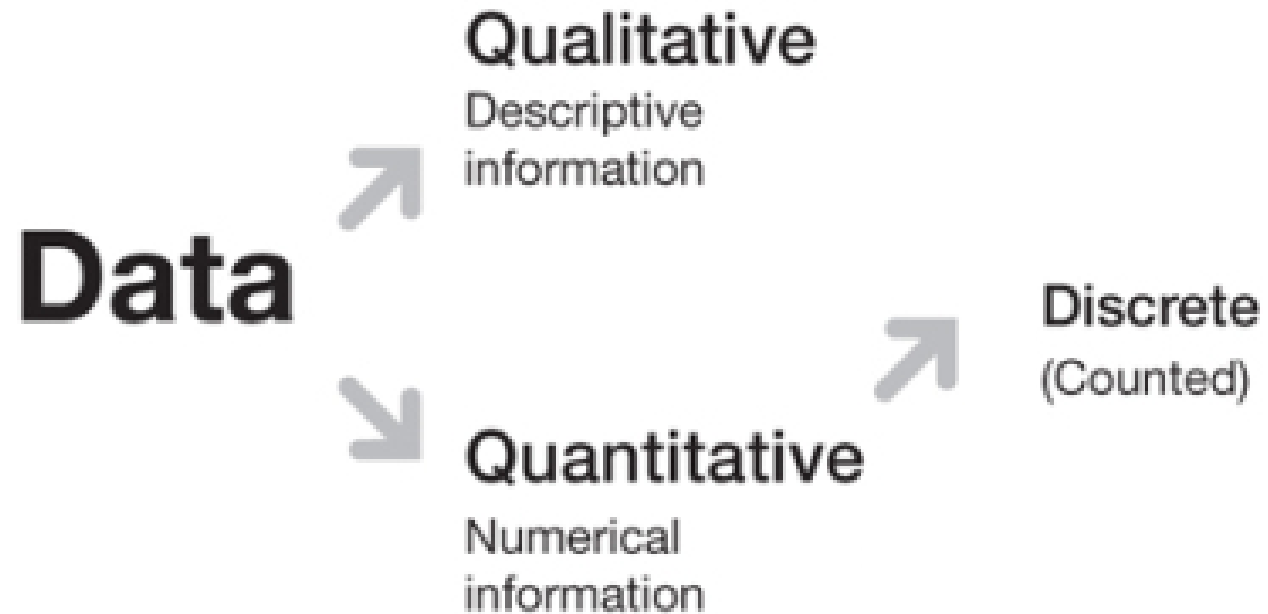
Quantitative and Qualitative Data



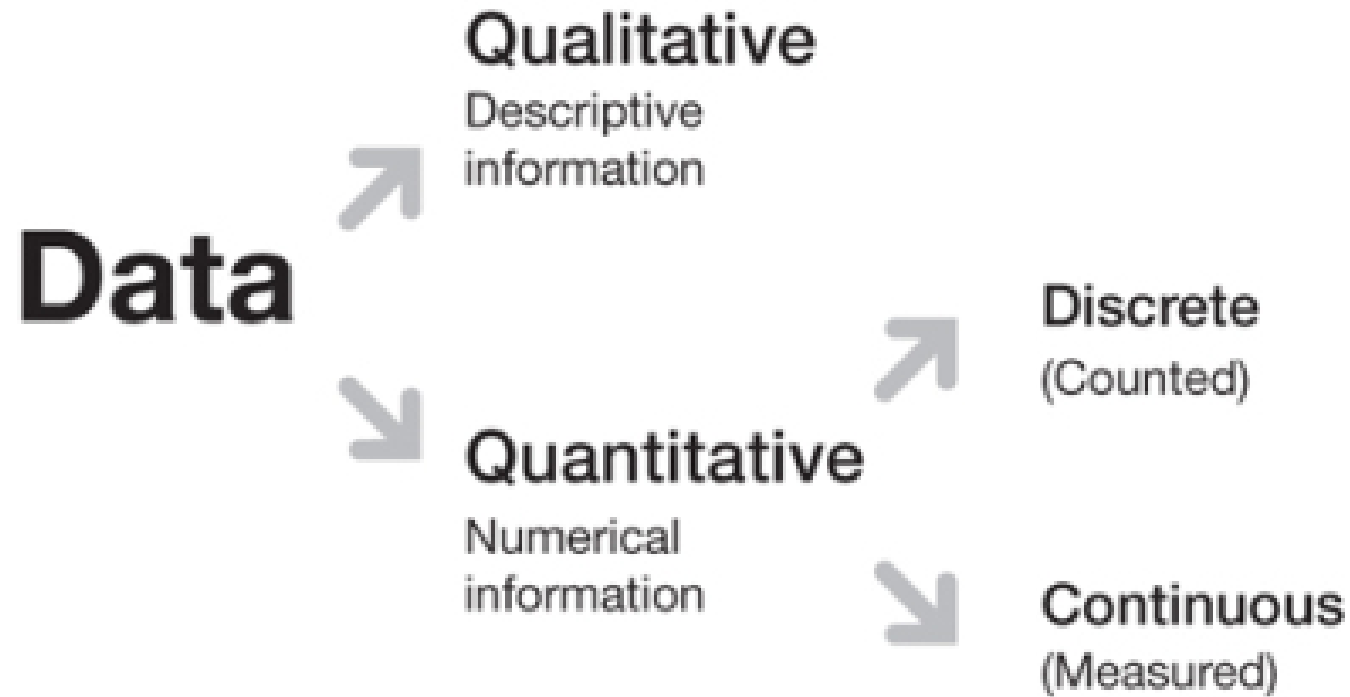
Quantitative and Qualitative Data



Quantitative and Qualitative Data



Quantitative and Qualitative Data



Quantitative and Qualitative Data



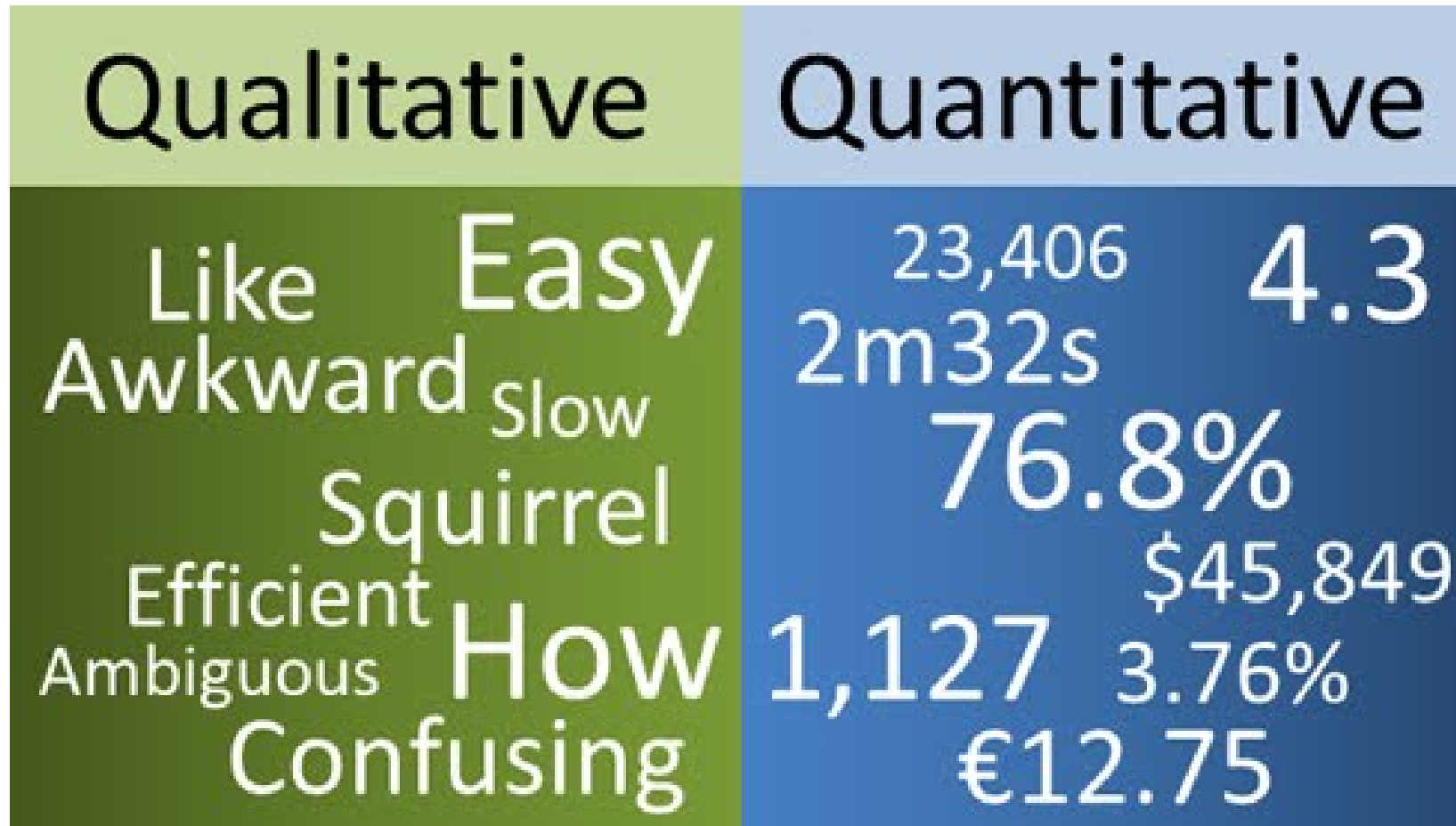
Quantitative and Qualitative Data



Quantitative and Qualitative Data



Quantitative and Qualitative Data



Qualitative versus quantitative:

When to use what?

Qualitative	Quantitative
Subject matter is unfamiliar	Subject matter clearly defined
Exploratory research, when relevant concepts are unknown or their definitions unclear	When measurement problems are minor and have been resolved
When meaning rather than frequencies are sought	When detailed numerical description of a representative sample is required
When flexibility of approach is needed to allow for discovery of unexpected; in-depth investigation	When repeatability of measurements is important
For studying selected issues, cases or events in detail	When generalizability of results and comparison across populations is needed



Visual Inspection of paint/coating finish

Quantitative
Discrete Data

Quantitative
Continuous Data

Qualitative Data

Diameter of hole (mm) in a component

Quantitative
Discrete Data

Quantitative
Continuous Data

Qualitative Data



Number of components, during a production run, which required re-work

Quantitative
Discrete Data

Quantitative
Continuous Data

Qualitative Data



Mean time taken to rework a component during a production run

Quantitative
Discrete Data

Quantitative
Continuous Data

Qualitative Data

Written feedback from customer focus group

Quantitative
Discrete Data

Quantitative
Continuous Data

Qualitative Data

Surface Finish of Cold Rolled Steel Product

Quantitative
Discrete Data

Quantitative
Continuous Data

Qualitative Data



Temperature variance in furnace for adhesive curing cycle



Quantitative
Discrete Data

Quantitative
Continuous Data

Qualitative Data

DPMO metric for a given production line

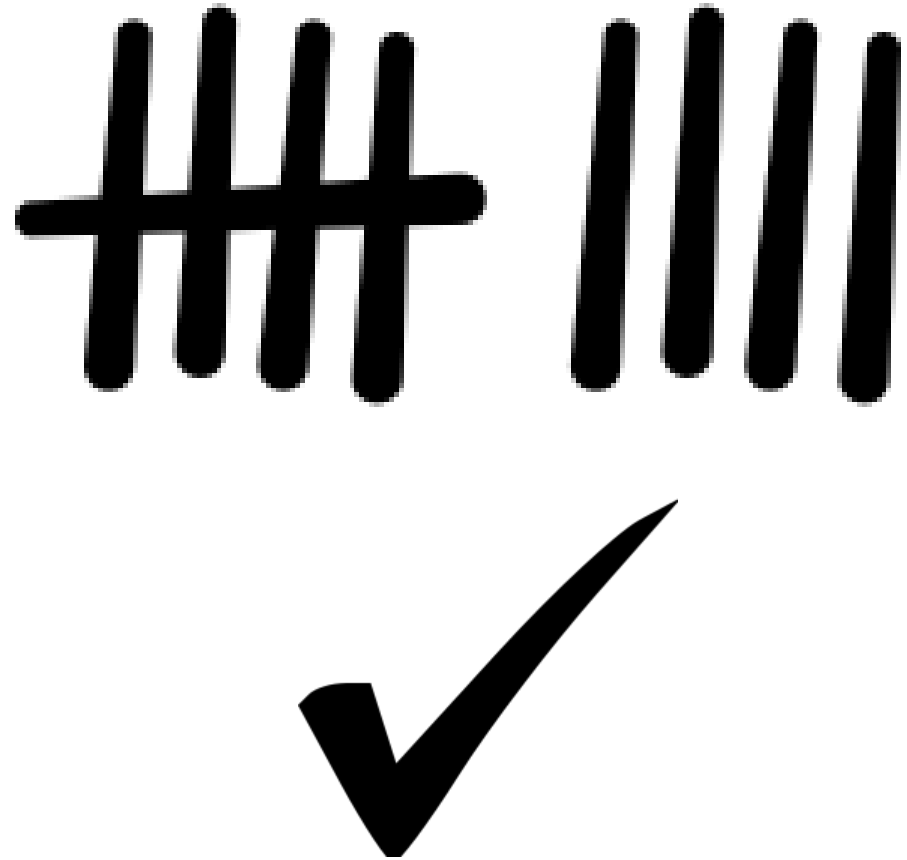
Quantitative
Discrete Data

Quantitative
Continuous Data

Qualitative Data

What is the defining characteristic of the check sheet?

An important distinguishing point of a check sheet is that information and data is recorded by making marks in the table.
E.g. checks or lines.



What are the different types of check sheets?

Check List:

Task items are documented for a particular process. As each item is completed, it is checked off.

What are the different types of check sheets?

Classification:

Tracks a defect or failure mode into categories.

What are the different types of check sheets?

Frequency:

Tracks the presence or absence of a trait or combination of traits:
and tracks the quantity of occurrences of a trait on a part.

What are the different types of check sheets?

Location:

Tracks physical location of a trait that is indicated on a picture of a part or item being evaluated.

What are the different types of check sheets?

Measurement Scale:

Tracks by intervals; measurements are specified by checking an appropriate interval.

Daily Number of Recommended Defects to Track

10 is the recommended number of defects to track per day

Creation Time to Allot for the Check Sheet Diagram

- From Start to finish typically allow 5 hours
- Data Collection: 1-3 hours
- Diagramming the Check List: 1 hour
- Walk through of Check List with Stakeholders: 1 hour

Motor Assembly Faults Check Sheet

Name of data recorder	Elon Musk							
Location	Fremont Plant, California							
Date of Data Recorded	20 th Jan 2020							
Defect Type/Event Occurrence	Dates							

Decide
what
event
will be
observed

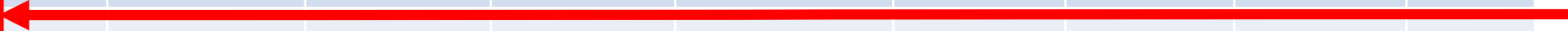
Motor Assembly Faults Check Sheet								
Name of data recorder	Elon Musk							
Location	Fremont Plant, California							
Date of Data Recorded	20 th Jan 2020							
Defect Type/Event Occurrence	Dates							
Total								

Develop
Operational
Definitions



Motor Assembly Faults Check Sheet								
Name of data recorder	Elon Musk							
Location	Fremont Plant, California							
Date of Data Recorded	20 th Jan 2020							
Defect Type/Event Occurrence	Dates							
Supplied parts rusted								

Develop
Operational
Definitions



Motor Assembly Faults Check Sheet								
Name of data recorder	Elon Musk							
Location	Fremont Plant, California							
Date of Data Recorded	20 th Jan 2020							
Defect Type/Event Occurrence	Dates							
Supplied parts rusted								
Misaligned weld								

Develop
Operational
Definitions

Motor Assembly Faults Check Sheet								
Name of data recorder	Elon Musk							
Location	Fremont Plant, California							
Date of Data Recorded	20 th Jan 2020							
Defect Type/Event Occurrence	Dates							
Supplied parts rusted								
Misaligned weld								
Inappropriate test procedure								

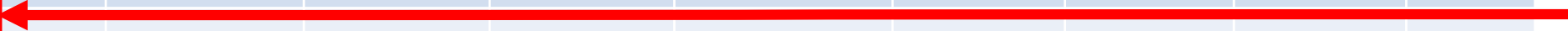
Develop
Operational
Definitions

Motor Assembly Faults Check Sheet								
Name of data recorder	Elon Musk							
Location	Fremont Plant, California							
Date of Data Recorded	20 th Jan 2020							
Defect Type/Event Occurrence	Dates							
Supplied parts rusted								
Misaligned weld								
Inappropriate test procedure								
Wrong part issued								

Develop
Operational
Definitions

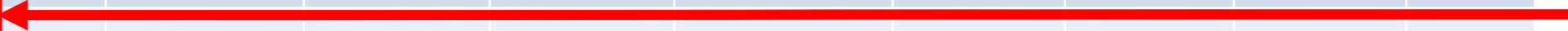
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Location	Fremont Plant, California							
Date of Data Recorded	20 th Jan 2020							
Defect Type/Event Occurrence	Dates							
Supplied parts rusted								
Misaligned weld								
Inappropriate test procedure								
Wrong part issued								
Film on parts								

Develop
Operational
Definitions



Motor Assembly Faults Check Sheet								
Name of data recorder	Elon Musk							
Location	Fremont Plant, California							
Date of Data Recorded	20 th Jan 2020							
Defect Type/Event Occurrence	Dates							
Supplied parts rusted								
Misaligned weld								
Inappropriate test procedure								
Wrong part issued								
Film on parts								
Voids in casting								

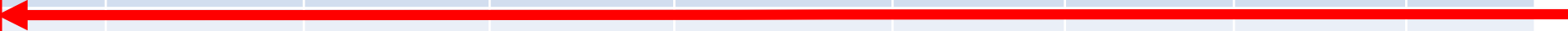
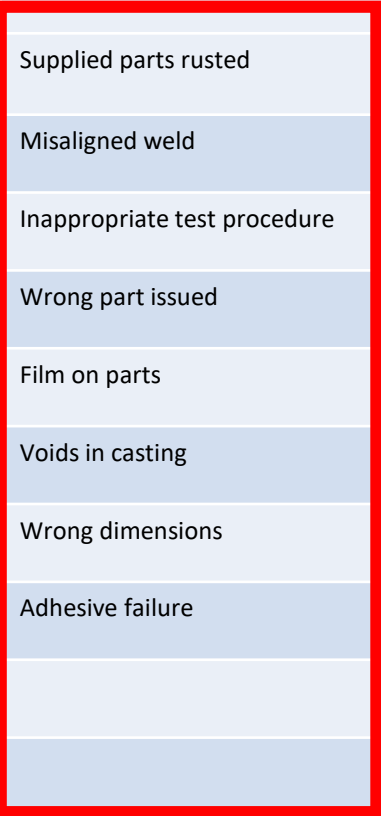
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Operational
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Motor Assembly Faults Check Sheet								
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Defect Type/Event Occurrence	Dates							
Supplied parts rusted								
Misaligned weld								
Inappropriate test procedure								
Wrong part issued								
Film on parts								
Voids in casting								
Wrong dimensions								

Develop
Operational
Definitions

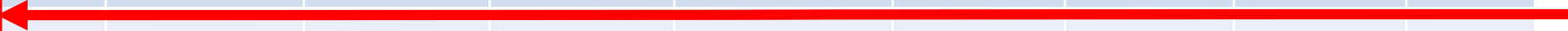
Motor Assembly Faults Check Sheet								
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Date of Data Recorded	20 th Jan 2020							
Defect Type/Event Occurrence	Dates							
Supplied parts rusted								
Misaligned weld								
Inappropriate test procedure								
Wrong part issued								
Film on parts								
Voids in casting								
Wrong dimensions								
Adhesive failure								



Develop
Operational
Definitions

Motor Assembly Faults Check Sheet								
Name of data recorder	Elon Musk							
Location	Fremont Plant, California							
Date of Data Recorded	20 th Jan 2020							
Defect Type/Event Occurrence	Dates							
Supplied parts rusted								
Misaligned weld								
Inappropriate test procedure								
Wrong part issued								
Film on parts								
Voids in casting								
Wrong dimensions								
Adhesive failure								
Insufficient masking								

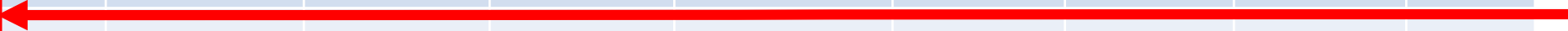
Develop
Operational
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Motor Assembly Faults Check Sheet

Name of data recorder	Elon Musk							
Location	Fremont Plant, California							
Date of Data Recorded	20 th Jan 2020							
Defect Type/Event Occurrence	Dates							
Supplied parts rusted								
Misaligned weld								
Inappropriate test procedure								
Wrong part issued								
Film on parts								
Voids in casting								
Wrong dimensions								
Adhesive failure								
Insufficient masking								
Spray failure								

Develop
Operational
Definitions



Motor Assembly Faults Check Sheet								
Name of data recorder	Elon Musk							
Location	Fremont Plant, California							
Date of Data Recorded	20 th Jan 2020							
Defect Type/Event Occurrence	Dates							
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
Supplied parts rusted								
Misaligned weld								
Inappropriate test procedure								
Wrong part issued								
Film on parts								
Voids in casting								
Wrong dimensions								
Adhesive failure								
Insufficient masking								
Spray failure								

Decide when data will be collected

Motor Assembly Faults Check Sheet								
Name of data recorder	Elon Musk							
Location	Fremont Plant, California							
Date of Data Recorded	20 th Jan 2020							
Defect Type/Event Occurrence	Dates							
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
Supplied parts rusted		HHH III	III	HHH	II			
Misaligned weld			III			II		
Inappropriate test procedure				III				
Wrong part issued		I		III	II			
Film on parts								
Voids in casting								
Wrong dimensions						II		
Adhesive failure								
Insufficient masking					I			
Spray failure			III					

Design the sheet so that data can be collected using check, lines or ‘X’ marks.

Motor Assembly Faults Check Sheet								
Name of data recorder	Elon Musk							
Location	Fremont Plant, California							
Date of Data Recorded	20 th Jan 2020							
Defect Type/Event Occurrence	Dates							Total
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
Supplied parts rusted		HHH III	III	HHH	II			20
Misaligned weld			III			II		5
Inappropriate test procedure				III				3
Wrong part issued		I		III	II			7
Film on parts								0
Voids in casting								0
Wrong dimensions						II		2
Adhesive failure								0
Insufficient masking					I			1
Spray failure			III					4

Ensure
totals are
calculated
vertically

Motor Assembly Faults Check Sheet								
Name of data recorder	Elon Musk							
Location	Fremont Plant, California							
Date of Data Recorded	20 th Jan 2020							
Defect Type/Event Occurrence	Dates							Total
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
Supplied parts rusted		HHH III	III	HHH	II			20
Misaligned weld			III			II		5
Inappropriate test procedure				III				3
Wrong part issued		I		III	II			7
Film on parts								0
Voids in casting								0
Wrong dimensions						II		2
Adhesive failure								0
Insufficient masking					I			1
Spray failure			III					4
Total	0	10	12	11	6	4	0	

Ensure totals are calculated vertically and horizontally

Motor Assembly Faults Check Sheet								
Name of data recorder	Elon Musk							
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Defect Type/Event Occurrence	Dates							Total
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
Supplied parts rusted		HHH III	III	HHH	II			20
Misaligned weld			III			II		5
Inappropriate test procedure				III				3
Wrong part issued		I		III	II			7
Film on parts								0
Voids in casting								0
Wrong dimensions						II		2
Adhesive failure								0
Insufficient masking					I			1
Spray failure			III					4
Total	0	10	12	11	6	4	0	

Label all
spaces on
the form

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Name of data recorder	Elon Musk							
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Defect Type/Event Occurrence	Dates							Total
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
Supplied parts rusted		HHH III	III	HHH	II			20
Misaligned weld			III			II		5
Inappropriate test procedure				III				3
Wrong part issued		I		III	II			7
Film on parts								0
Voids in casting								0
Wrong dimensions						II		2
Adhesive failure								0
Insufficient masking					I			1
Spray failure			III					4
Total	0	10	12	11	6	4	0	

Trial the check sheet to ensure that it captures all data which is needed.

Motor Assembly Faults Check Sheet								
Name of data recorder	Elon Musk							
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Defect Type/Event Occurrence	Dates							Total
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
Supplied parts rusted		HHH III	III	HHH	II			20
Misaligned weld			III			II		5
Inappropriate test procedure				III				3
Wrong part issued		I		III	II			7
Film on parts								0
Voids in casting								0
Wrong dimensions						II		2
Adhesive failure								0
Insufficient masking					I			1
Spray failure			III					4
Total	0	10	12	11	6	4	0	

Scribe the document each time an event or defect occurs.

Bibliography

- Chaneski, W. S. (1998). Reviewing seven tools for quality management. *Modern Machine Shop*, 70(12), 50.
- Czajkowska, A., Stasiak-Betlejewska, R. (2015). Quality management tools applying in the strategy of logistics services quality improvement. *Serbian Journal of Management* [serial online]. September 2015; 10(2), 225-234. Available from Business Source Complete, Ipswich, MA. Accessed June 7, 2016.
- Gonzalez, M. E., Quesada, G., Davis, J., & Mora-Monge, C. (2015). Application of quality management tools in the evaluation of websites: The case of sports organizations. *Quality Management Journal*, 22(1), 30-46,
- Rich, C. R., & Valle, M. (2012). Quality Control Tools for Project Management: A classroom exercise. *Business Education Innovation Journal*, 4(2), 87-93.

Quick Run-Through Exercise

1. Design a Check List to Record Defects in a low cost torch after 1 week in-service trial.
2. Gather the data
3. What did your Check Sheet tell you?
4. Did your Check Sheet allow you to capture all defect types?
5. How would you modify your Check Sheet?
6. Present your data in a histogram