

# Should I bring my umbrella to Manchester?

## Analogy of a Process Monitoring

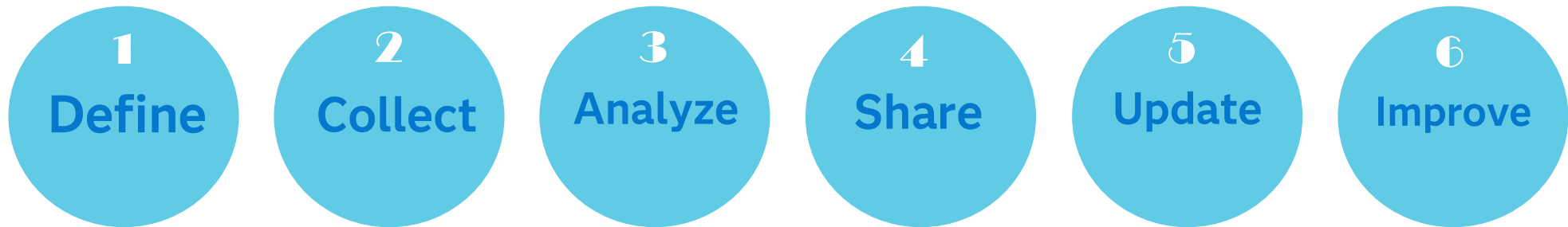
Discovery Summit 2024  
2024-EU-30MP-1550



Florence KUSSENER  
Principal Systems Engineer - JMP



# Agenda - Process Monitoring Steps



1

# Definition

Situation assessment: Should I need an Umbrella?

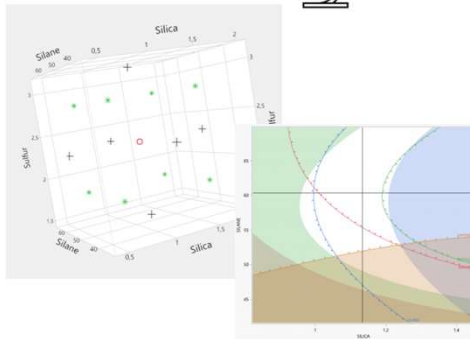


1

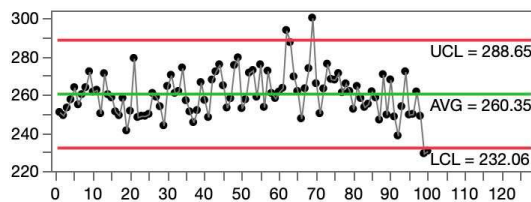
# Define

## Maximizing quality using design space profiling

DOE 



Historical Data 



Situation

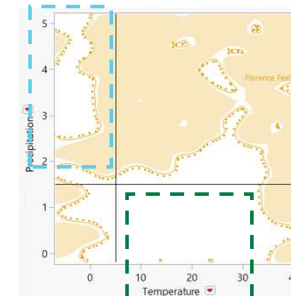
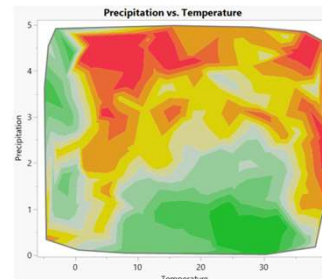
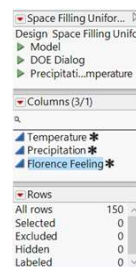
Need to be informed about daily weather to take appropriate decision

Response: Feeling (rate 1-10)

Factors: Temperature & Precipitation

Data Driven Decision

DOE: Space Filling Uniform Design & Gaussian Process Model



Precipitation < 1.5  
8 < Temperature < 30

2

# Collect

## Connection to database

### Data connection

#### Import data >

- Text
- Excel
- XML
- JSON
- SAS
- Multiple files
- PDF
- CSV
- R
- Python
- MATLAB

#### Query database >

- Data warehouse
- Data lake
- Data historian
- SQL
- ODBC

#### Web data access >

- **API**
- Internet open
- Google Sheets

#### Data connector >

- Custom data interface
- OSIsoft PI connector

### Data provided by Visual Crossing website:

<https://www.visualcrossing.com/weather/weather-data-services#>

The extraction is done by using HTTP Request

Manchester Next 15 days 13/12/2023 27/12/2023 Metric (°C, km)

Addresses, partial addresses or lat,lon History or forecast data Data units

Query options

Data sections Weather elements Degree days Wind & solar Agriculture Weather stations

</> API Grid Chart JSON CSV

Weather Data Daily Hourly Current Events Alerts Info Stations Questions about the data? Download

Available weather data for Manchester, England, United Kingdom. These results are filtered by your query options.

datetime	tempmax	tempmin	temp	feelslikemax	feelslikemin	feelslike	dew	humidity	precip	precipprob	precipcover	preciptype	snow	snowdepth	windgust	windspeed	winddir	pr
2023-12-13	7.1	0.9	5.5	5.4	0.9	3.3	2.7	82.9	0.4	100	8.33	rain	0	0	39.6	24.2	344.9	10
2023-12-14	8.1	0.4	4.6	7.5	0.4	4	3.4	92	0.7	25.8	25	rain	0	0	17.6	7.9	206.6	10
2023-12-15	9.9	3.9	7.1	9.8	2.4	5.9	5.8	91.9	0.7	25.8	16.67	rain	0	0	27.4	11.9	231.3	10
2023-12-16	11.3	8.3	9.5	11.3	6.5	8.3	7.9	90.4	0.1	6.5	4.17	rain	0	0	34.2	15.1	228.1	10
2023-12-17	11.5	8.7	9.6	11.5	6.8	8.5	7.5	87	0	41.9	0	rain	0	0	46.8	17.3	203.5	10
2023-12-18	12.4	10.4	11.4	12.4	10.4	11.4	9.3	86.7	0.1	58.1	4.17	rain	0	0	62.6	26.3	212	10
2023-12-19	9.7	5.6	6.7	6.5	1.8	3	1.8	70.8	6.2	58.1	20.83	rain	0	0	72.5	31.8	261.7	10

2

## Collect

## HTTP Request()

```
myAPI_key="theKeyGeneratedByTheWebsite";// CREATE AN ACCOUNT AND GET YOUR OWN API KEY HERE: https://weather.visualcrossing.com/
```

```
Town="Manchester"; // CHOOSE YOUR LOCATION
```

```
url="https://weather.visualcrossing.com/VisualCrossingWebServices/rest/services/timeline/"||Town||"/next7days?unitGroup=metric&elements=dateTime%2Ctempmax%2Ctempmin%2Ctemp%2Cfeelslikemax%2Cfeelslikemin%2Cprecip%2Cprecipprob%2Cwindspeed%2Cwinddir%2Csolarradiation&include=days%2Chours%2Ccurrent&key="||myAPI_key||"&contentType=json";
```

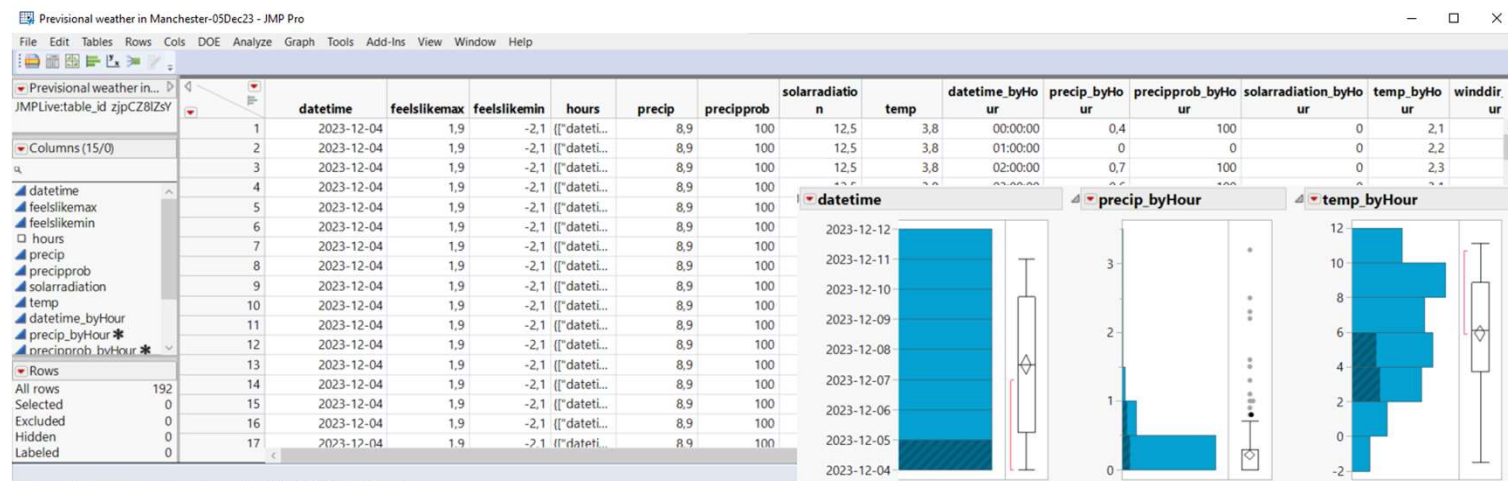
```
request=New HTTP Request(URL(url),Method("Get"));
data=request<<Send;
```

```
json_jsonl = Parse JSON( data );
```

```
aa_json=associative array(json_jsonl);
```

```
keys=aa_json<<Get Keys;
val=aa_json<<Get Values;
```

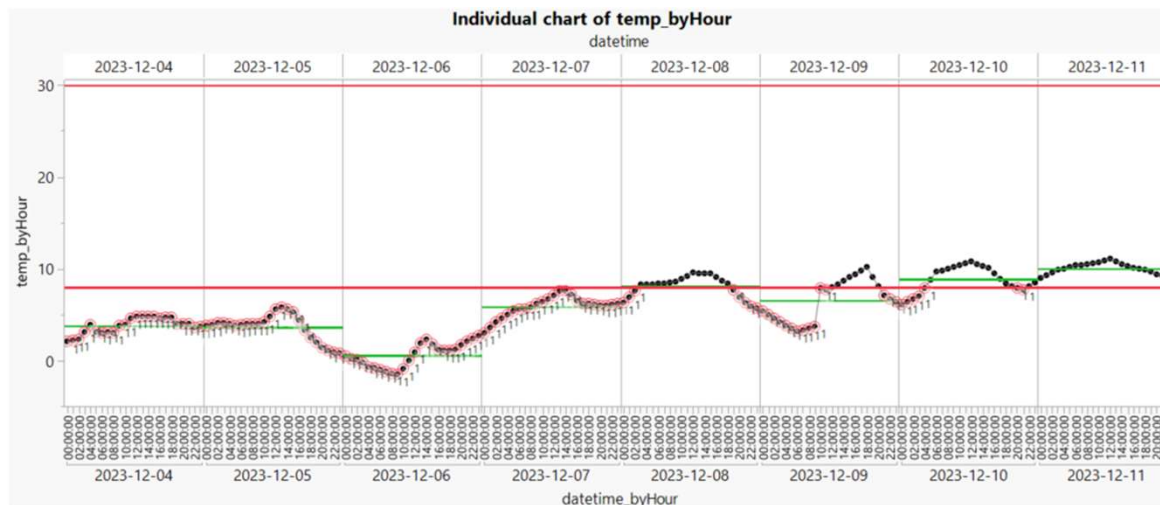
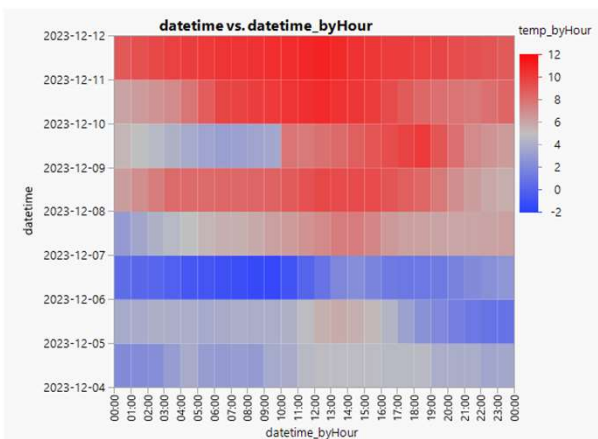
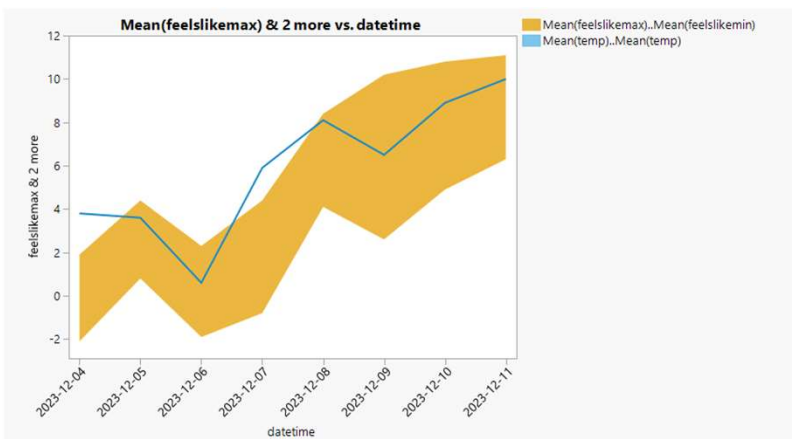
```
daykey=val[3]<<GetKeys;
dayvalue=val[3]<<Get Values;
```



3

# Analyze

## SPC tools



### Process Screening

Indiv and MR

Column	Stability Index	Variability			Summary		Control Chart Alarms			Capability			
		Within Sigma	Overall Sigma	Specified Sigma			Alarm Rate	Test1	Latest Alarm	Ppk	Cpk	Out of Spec Count	Out of Spec Rate
temp_byHour	10,90	0,29788	3,24715	3,66667	5,91927	192	0,00000	0	.	-0,214	-2,328	126	0,6563
windspeed_byHour	6,82	0,94423	6,4401	5	12,1464	192	0,00000	0	.	0,629	4,288	0	0
precipprob_byHour	6,22	4,94849	30,785	.	56,6734	192	0,47396	91	30	-0,289	-1,797	147	0,7656
winddir_byHour	5,51	16,4073	90,3453	.	162,851	192	0,61458	118	1	.	.	.	.
solarradiation_byHour	5,00	6,02263	30,1221	113,333	12,9896	192	0,00000	0	.	0,144	0,719	0	0
precip_byHour	2,12	0,21622	0,45801	0,25	0,21667	192	0,05208	10	39	0,158	0,334	5	0,026

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# Share

## Report Generation

### Data Table || JSL || Add-ins

Flexibility  
Automation  
Validated  
Interactif



Difficulty to maintain  
Need JMP



### Static Reports



Easy to share  
Unrestricted usage



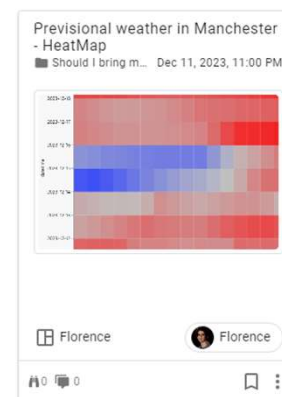
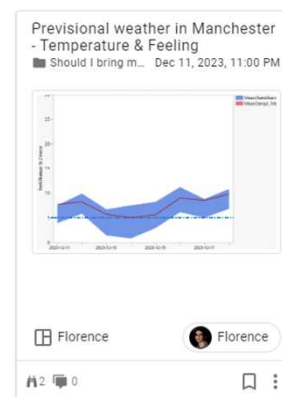
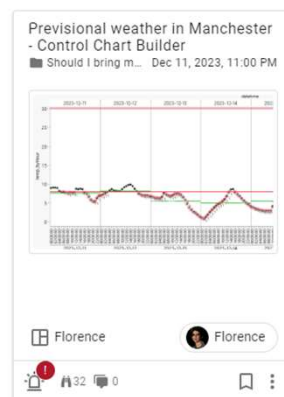
Static report  
Handling



### Web Report



Easy to share  
Unrestricted usage  
Flexibility  
Automation  
Validated  
Interactif





Previsional weather in Manchester



- Process Screening


Should I bring m... Dec 11, 2023, 11:00 PM

ability index	Variability				Summary	Count
	Within Sigma	Overall Sigma	Specified Sigma	Mean		
4.51	6.157	36.8175	113.333	15.401	11	
6.08	0.94098	5.72069	5	8.56198	11	
4.62	0.07517	0.34726	0.25	0.07135	11	
4.46	6.31634	28.1802		19.1391	11	
8.00	0.28443	2.2748	3.66667	7.44427	11	

 Florence

 Florence





# 4

## Share

### Report Generation



#### **Share discoveries with confidence**

Distribute findings quickly and easily with report publishing that fits smoothly into your analysis workflow



#### **Collaborate across the organization**

Get the latest data into the hands of colleagues and management for effective collaboration and decision making..



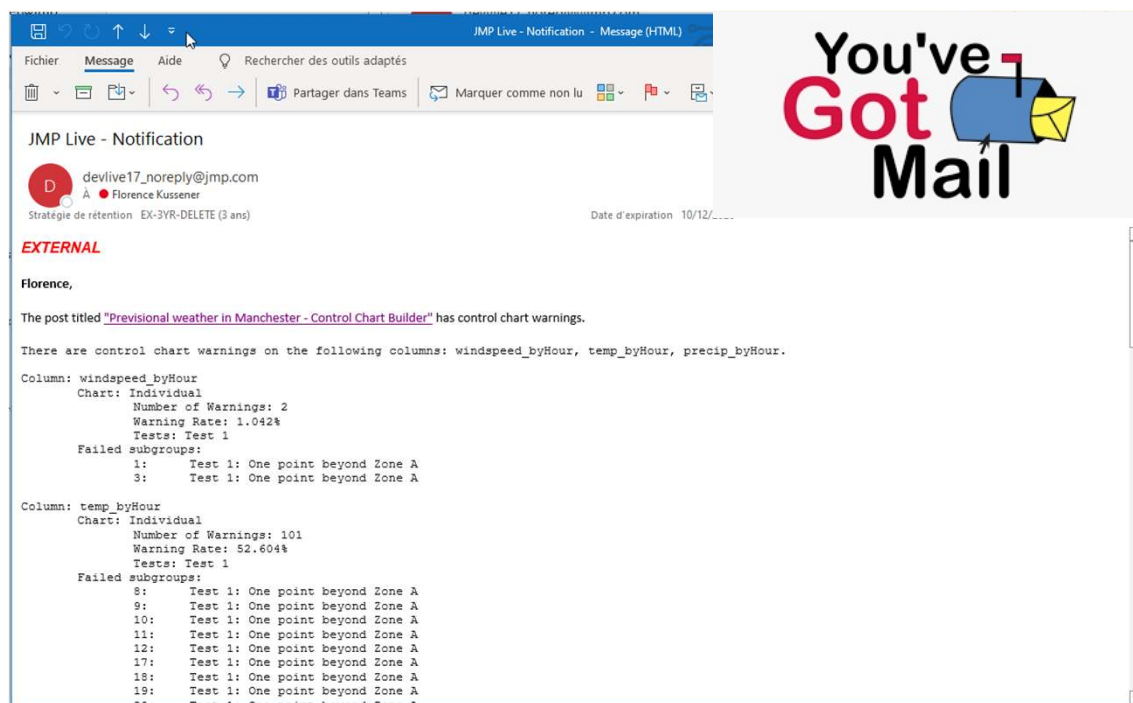
#### **Automate Publishing**

Enrich the impact of shared analyses by automating report publishing for the most current results in JMP Live, all the time.

5

# Update

## From Data Collection to Report Generation



### Automate Publishing

Enrich the impact of shared analyses by automating report publishing for the most current results in JMP Live, all the time.

6

# Improve

Better understanding || Data Exploration || Root cause analysis



Continuous  
Process  
Improvement

Firefighter mode



Impact of a  
change

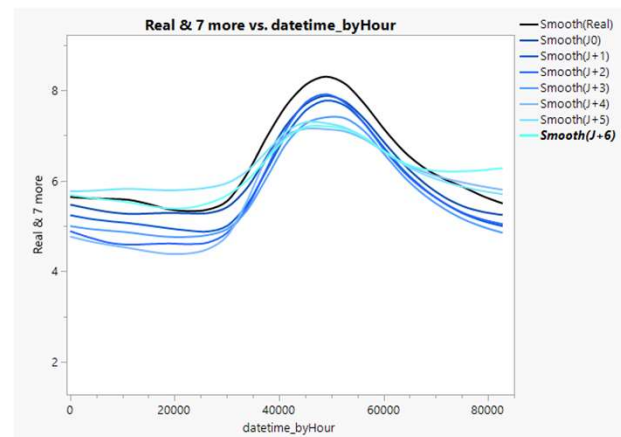
New constraints



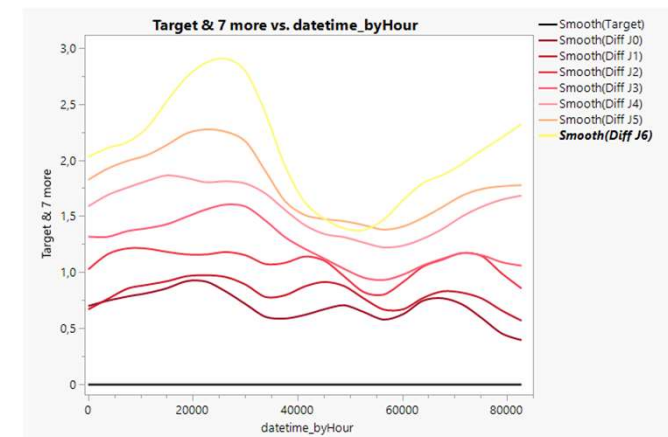
Define what  
metric is critical

## Cost of Data Acquisition -> Define appropriate frequency

Mean variation by Day Prediction



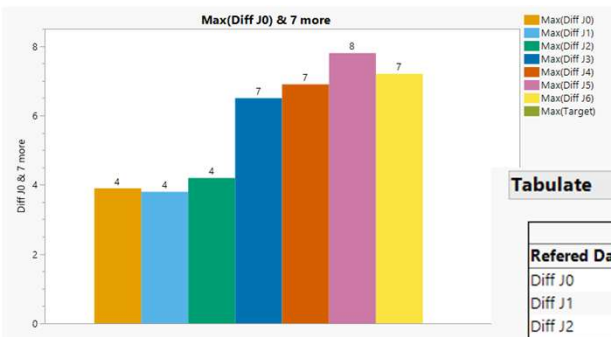
Distance variation by Day Prediction



6

# Improve

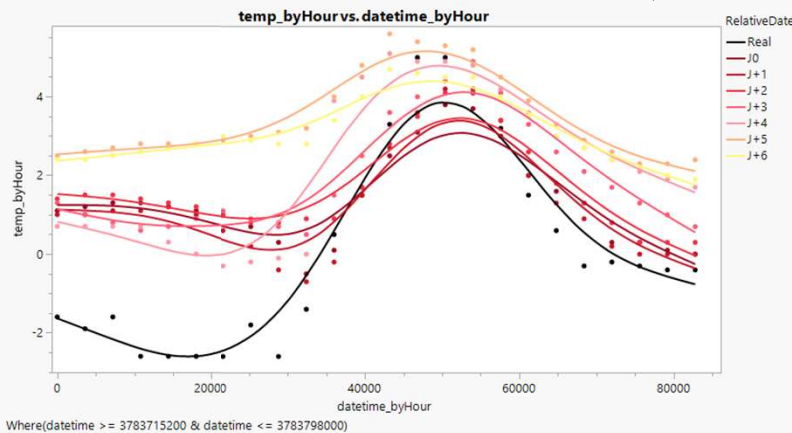
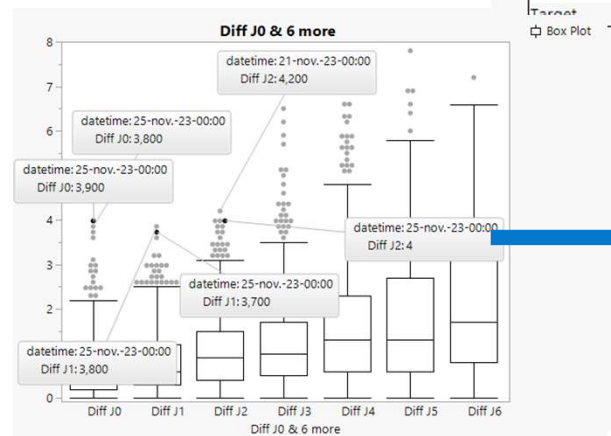
Better understanding || Data Exploration || Root cause analysis



## Tabulate

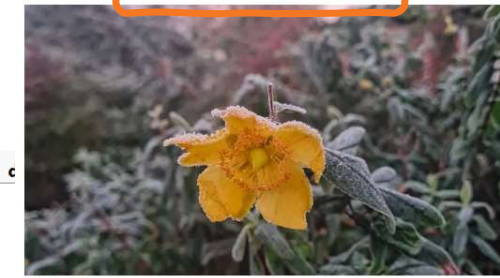
Referred Date	Difference of Temperature			
	Median	Mean	Max	Std Dev
Diff J0	0,6	0,7	3,9	0,59
Diff J1	0,6	0,81	3,8	0,7
Diff J2	0,9	1,07	4,2	0,83
Diff J3	1	1,25	6,5	1,02
Diff J4	1,3	1,57	6,9	1,3
Diff J5	1,3	1,79	7,8	1,53
Diff J6	1,7	2,09	7,2	1,56
Target	0	0	0	0

Box Plot



First autumn frost for much of the UK as temperatures drop below zero

WEATHER | FROST | Saturday 25 November 2023 at 6:46am



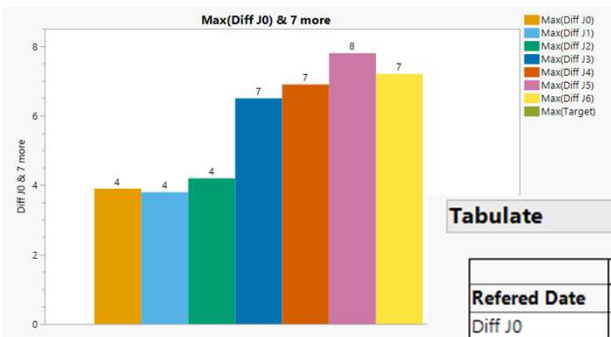
Much of the UK woke to its first frost of the autumn as temperatures dropped to well below freezing overnight. The sub-zero temperatures stretched as far south as Somerset, with only the north of Scotland and parts of the east and south west of England staying above freezing over Friday night.



6

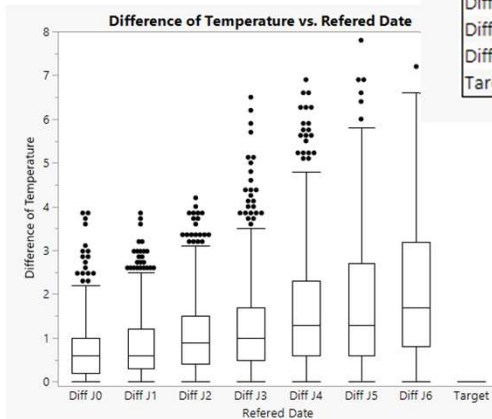
# Improve

Better understanding || Data Exploration || Root cause analysis

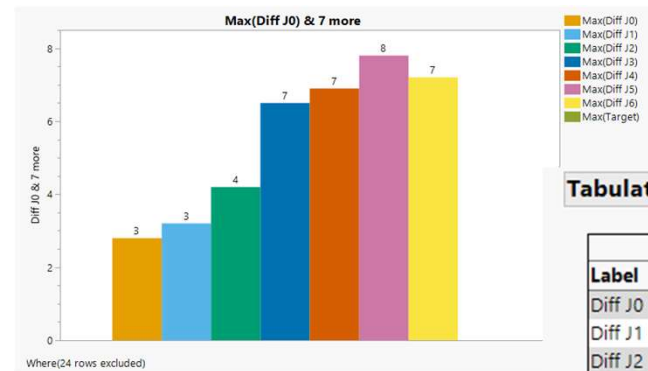


Tabulate

Referred Date	Difference of Temperature			
	Median	Mean	Max	Std Dev
Diff J0	0,6	0,7	3,9	0,59
Diff J1	0,6	0,81	3,8	0,7
Diff J2	0,9	1,07	4,2	0,83
Diff J3	1	1,25	6,5	1,02
Diff J4	1,3	1,57	6,9	1,3
Diff J5	1,3	1,79	7,8	1,53
Diff J6	1,7	2,09	7,2	1,56
Target	0	0	0	0

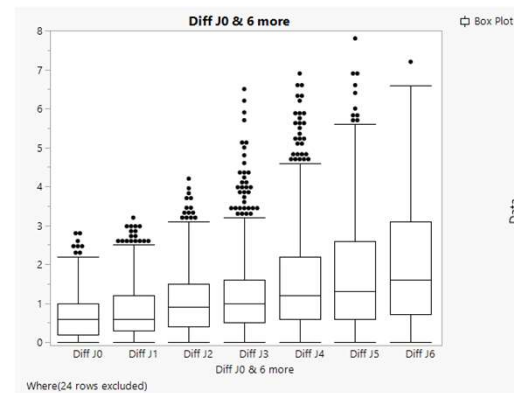


Without November 25th

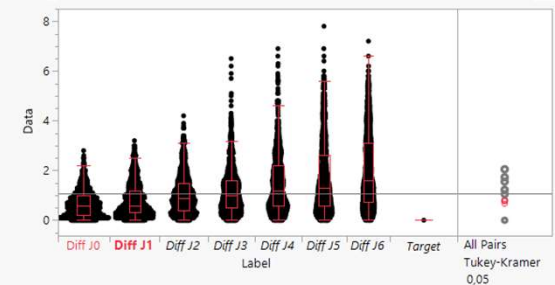


Tabulate

Label	Data			
	Median	Mean	Max	Std Dev
Diff J0	0,6	0,67	2,8	0,52
Diff J1	0,6	0,79	3,2	0,67
Diff J2	0,9	1,05	4,2	0,8
Diff J3	1	1,22	6,5	1,01
Diff J4	1,2	1,55	6,9	1,31
Diff J5	1,3	1,73	7,8	1,5
Diff J6	1,6	2,05	7,2	1,55
Target	0	0	0	0



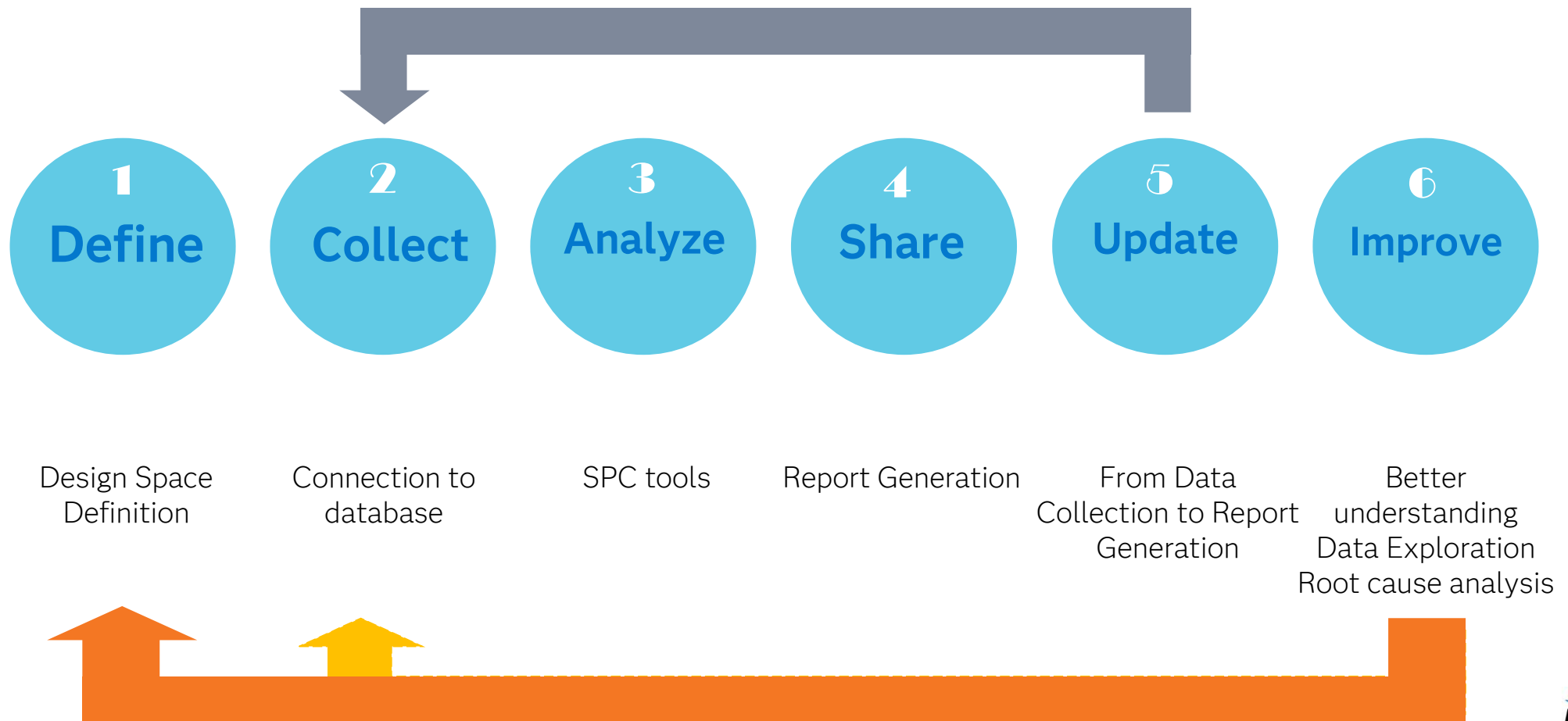
192 rows have been excluded.



-> Acquisition Every 2 days

# Process Monitoring Steps

Building an Automated Quality and Process Engineering Workflow







# Questions?

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