



Statistical Control Charts to Monitor Part Sales

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Definition

PACCAR is a Fortune 500 company and is among the largest manufacturers of medium- and heavy-duty commercial vehicles in the world

Problem: PACCAR needs an early identification tool to quickly and efficiently detect issues relating to part sales

Solution: Build an tool to provide a visual representation of data and monitor part sales data using statistical control charts

Stakeholders:

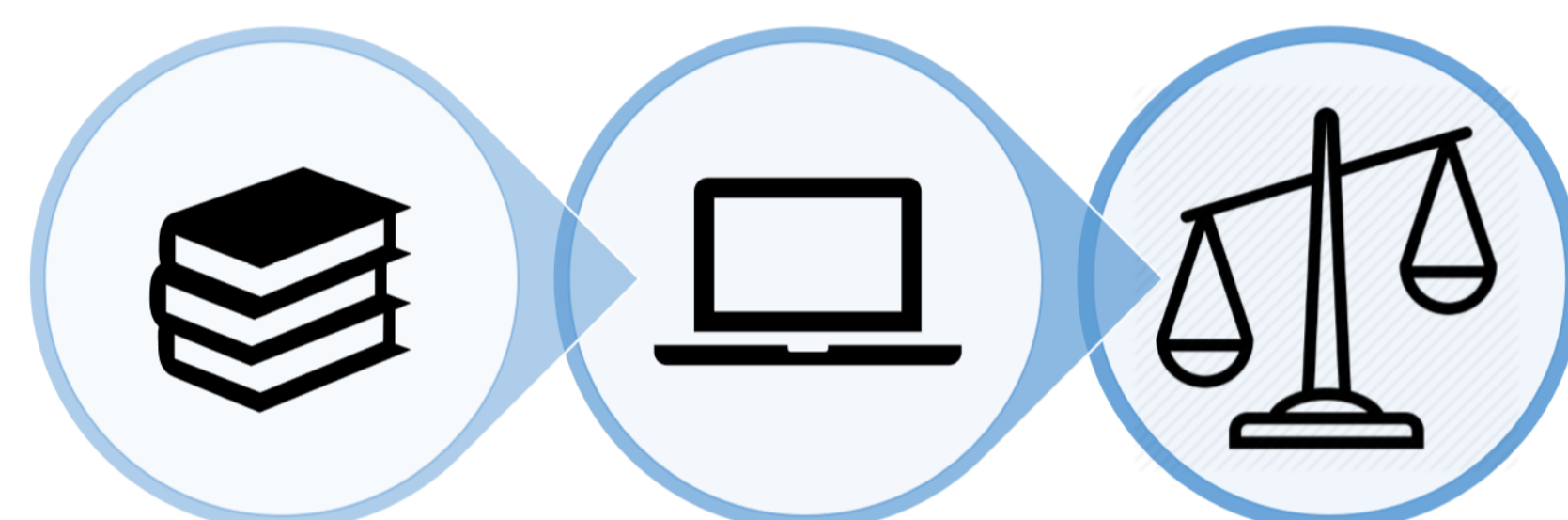
- UW, ISE department
- Professors and mentors
- Advanced Analytics Team
- PACCAR management
- Customers and vendors
- The environment and the public



Raw Data:

invoice_num	invoice_dat	order_num	order_date	sales_terri	abcd_codi	allocation	item_iden	item_class	item_type	product_u
6175576	5/31/2017	DD31318	5/30/2018	64	U	Y2016122	CORE	0	I	MA001NU
7880346	1/2/2018	DD34255	1/2/2018	80	U	Y2018010	DAV1E4	008C	I	FD025A
7881663	1/2/2018	DD34256	1/2/2018	20	U	Y2018010	DAV1E4	008C	I	FD025A
7884638	1/2/2018	DD34257	1/2/2018	62	U	Y2018010	DAV1E4	008C	I	FD025A
7882846	1/2/2018	DD34258	1/2/2018	68	U	Y2018010	DAV1E4	008C	I	FD025A
7879440	1/2/2018	DD34259	1/2/2018	110	C	Y2018010	M100580	172	I	FD035A
7881420	1/2/2018	DD34260	1/2/2018	53	U	Y2018010	DAV1E4	008C	I	FD025A
7883243	1/2/2018	DD34261	1/2/2018	79	U	Y2018010	DAV1E4	008C	I	FD025A
7882585	1/2/2018	DD34262	1/2/2018	72	U	Y2018010	DAV1E4	008C	I	FD025A
7881500	1/2/2018	DD34263	1/2/2018	31	U	Y2018010	DAV1E4	008C	I	FD025A
7883066	1/2/2018	DD34264	1/2/2018	77	U	Y2018010	DAV1E4	008C	I	FD025A
7903127	1/4/2018	DD34265	1/3/2018	64	U	Y2017122	M15C-CHA	0	I	QA001N
7902227	1/4/2018	DD34266	1/3/2018	77	U	Y2017122	M15C-CHA	0	I	QA001N
7903459	1/4/2018	DD34267	1/3/2018	66	U	Y2017122	M15C-CHA	0	I	QA001N
7897246	1/4/2018	DD34268	1/3/2018	11	U	Y2017122	M15C-CHA	0	I	QA001N

Analysis



Literature Review

Historical data processing

Alternative Analysis

Control Charts

Grouping

Signaling

Alternatives

Software

Interface Design

Development

Choose Part Sales File (.csv)
Browse... No file selected

Choose Priority List File (.csv)
Browse... No file selected

Item Class (can select multiple)
Nothing selected

Date Range (Start on Monday)
2018-05-27 to 2019-05-27

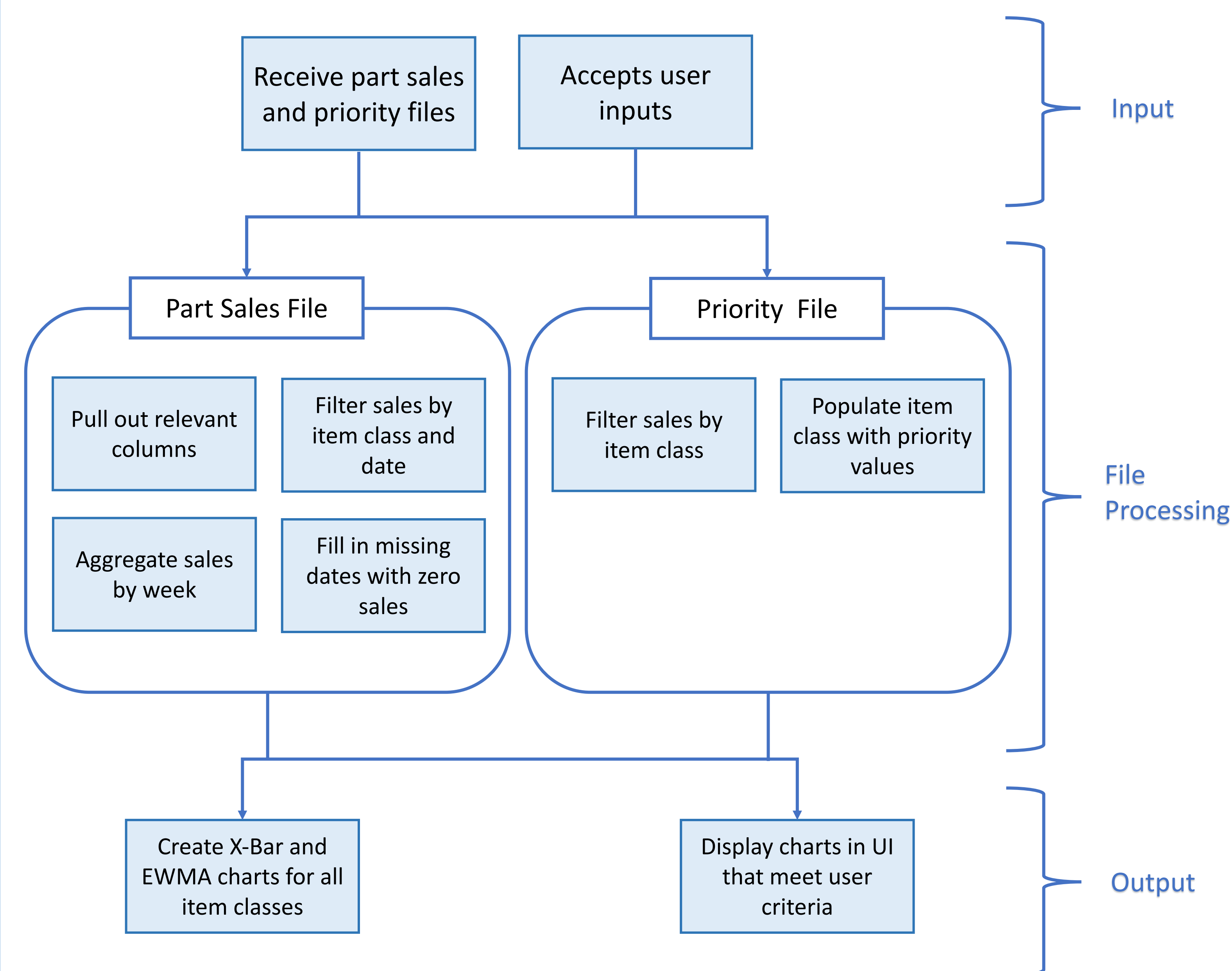
Recent Out of Control Point
5

Control Charts Limits
1 3 5

This determines which charts to be displayed based on the most recent out-of-control (OOC) point. Select the desired amount of weeks to go back. For example, to only display charts with an OOC point in the past 3 weeks, select '3'.

Chart Type
 x-bar
 EWMA-chart

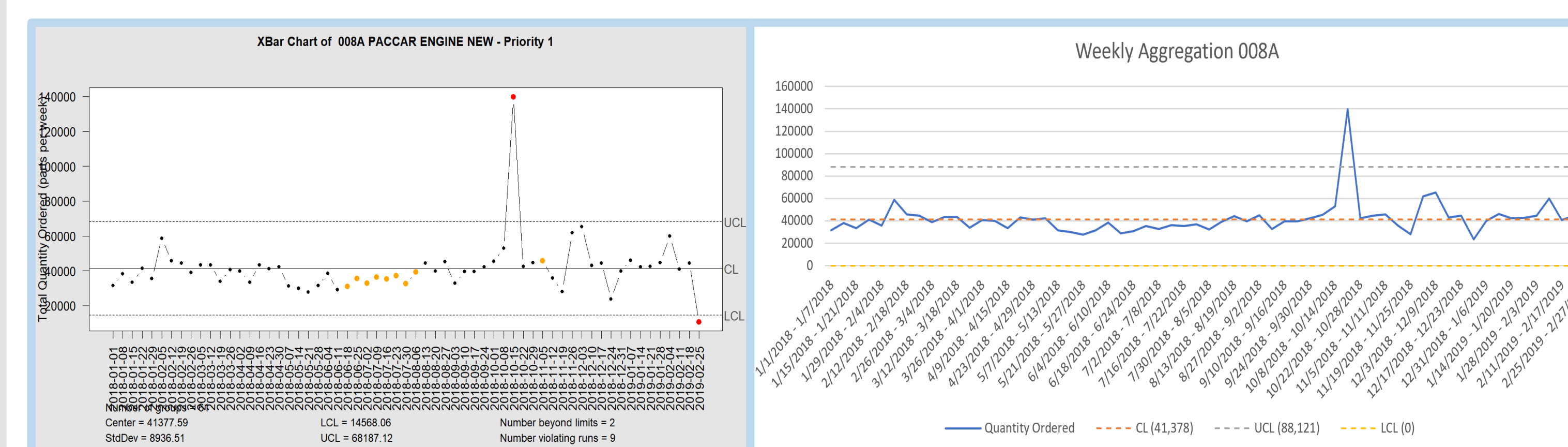
Process Flow Chart



Customer Requirements:

- Control Charts shall show OOC signals accurately
- The program shall be written for readability and quick execution
- The interface shall be compatible with PACCAR's current system
- The charts shall assist the AA team and other engineers to identify issues
- The R code and results drawn from the charts shall be shared securely within PACCAR

Testing and Validation



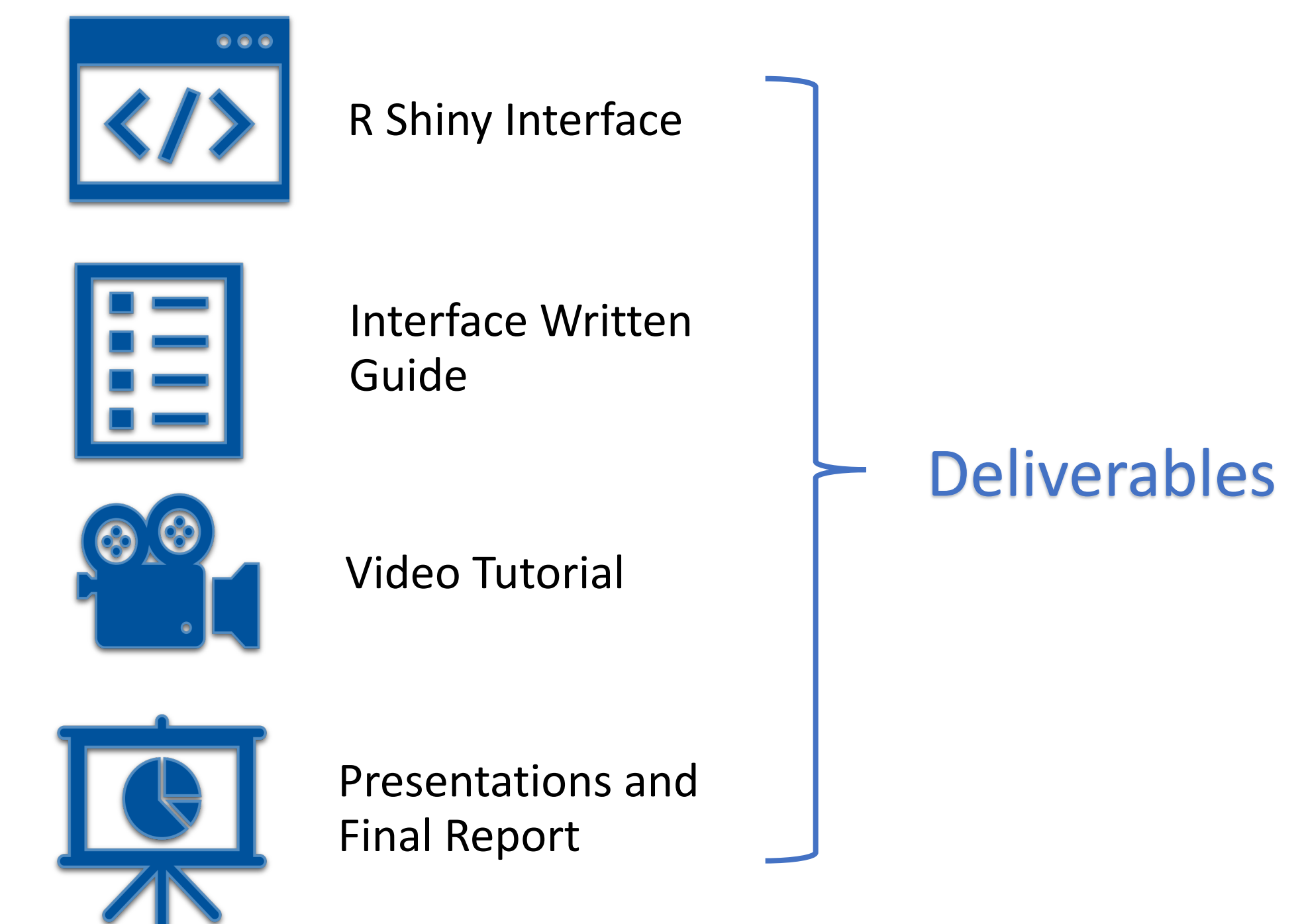
Verification:

- Output from our tool (left) was compared to output from Excel (right) and SQL (not shown)

Validation:

- Each iteration of our tool was sent to be tested by PACCAR's advanced analytics team for user acceptance testing

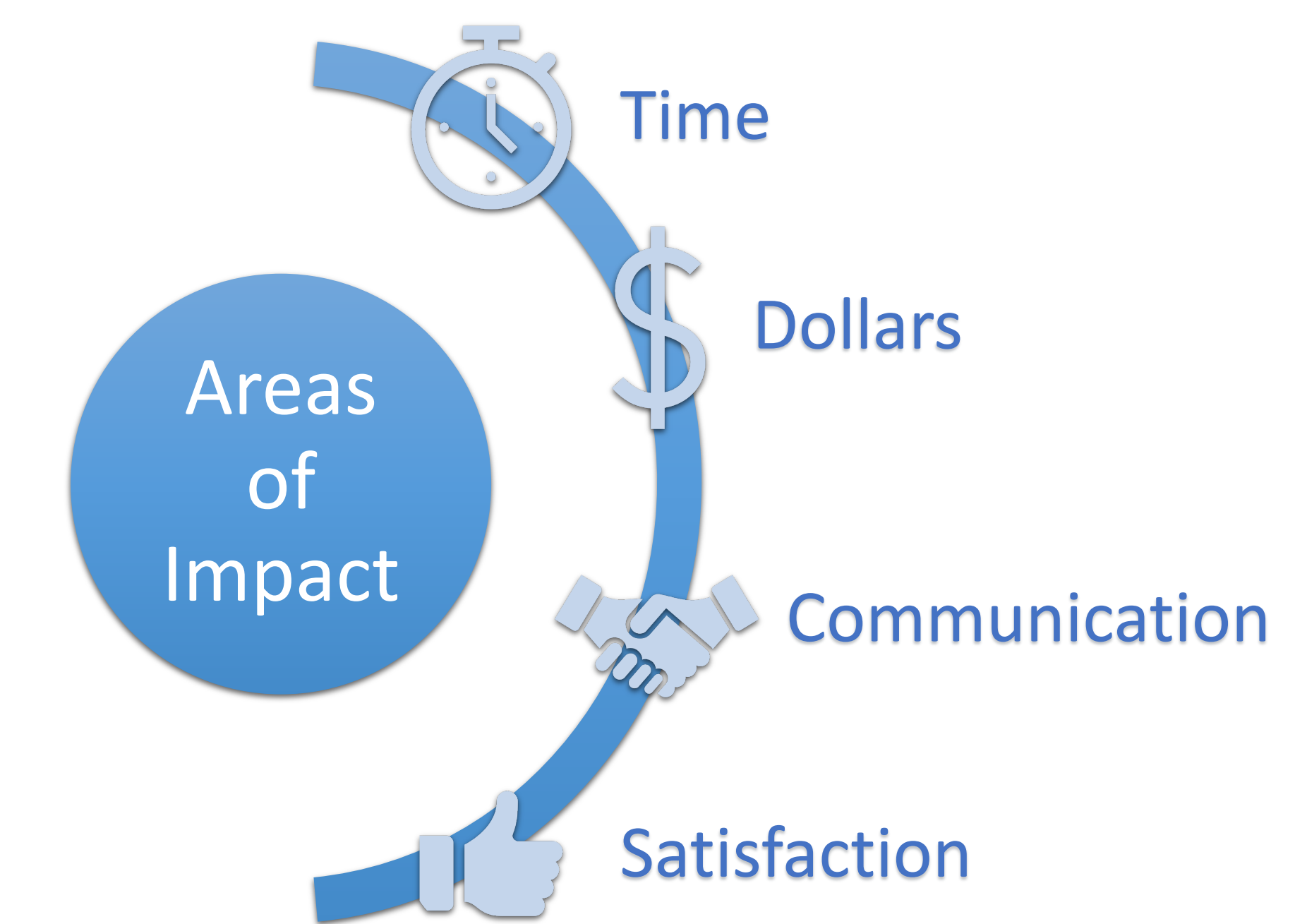
Implementation



Recommendations & Future Work

- Displaying detailed information of the OOC points
- Editing the view of the chart for aesthetics
- Add different types of control charts
- Perform historical data validation
- Optimizing data processing
- Set up server

Impact



- PACCAR is able to monitor trends in part sales
 - Reduce time to identify issues
 - Reveals projects to investigate based on OOC points
- Increase cross-functional collaboration between departments
 - Makes data more accessible and easier to understand
- Increases customer satisfaction
 - Potential savings on warranty costs
- Leverageable to different applications

Acknowledgements

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