Integrating Machine Learning into Data Analysis and Plant Performance

BUSINESS PROBLEM

Manufacturing plants need to consistently find ways to reduce costs, improve product quality, and manufacture more efficiently in order to remain profitable and relevant. To understand it all, an enormous of data is generated. That data amount is continuously growing as new sensors and software are brought in. The main problem here was identifying steps to better handling data in order to generate insights into improvement opportunities.

APPROACH

It was essential to first understand the current state of the plant, their priorities, and what projects were already underway. By identifying where the gaps were in data handling and the resources available to work on it, we were able to identify a path forward.
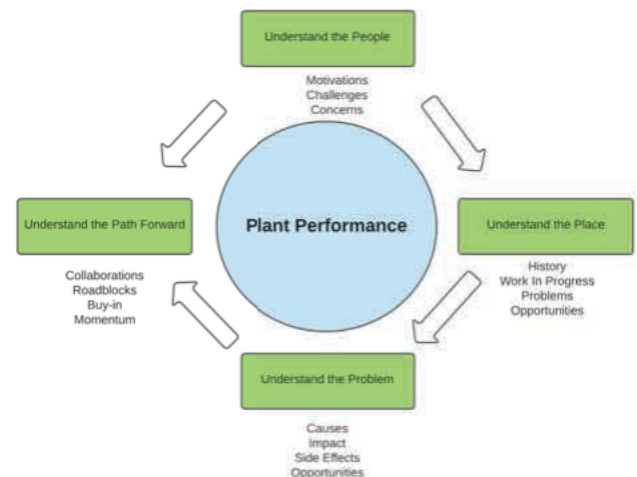
DATA SOURCES

Initially there were several barriers to getting data. The first was trust meaning were people willing to trust me with their data. The second was data architecture, meaning was the data in a format and place where I could access it. The final was knowledge meaning did I even know where to get it. The most useful data ended up coming from the industrial engineering team's reports and spreadsheets.

Data Types and Format

The main data used was plant performance rankings in a time series excel format.

IMPACT

We identified two major ways to add value to the company. The first way was to run a simple machine learning algorithm on critical benchmarking data to better understand what variables impacted overall plant performance. The second way was to utilize data visualization software like Tableau to generate dashboards that enabled understanding and decision making in the plant. While the thesis focuses on the machine learning application, both paths were an important part of the project.

DRIVERS

Two critical factors helped with my project: 1) Nissan has multiple sites and some data between sites is shared for benchmarking purposes 2) Nissan was undergoing a digital transformation and had an appetite for innovation and creativity These factors allowed me compare plant performance between locations and trial techniques like machine learning and dashboards in a receptive environment.

BARRIERS

1) Data ownership - where data was kept in a personal file rather than on an open server, it took time, especially in the exploratory phase where I was trying to figure out my project, to know what and who to ask, and gain sufficient trust to access data 2) Data islands - several important data sources were kept in databases that could not be queried or accessed easily 3) Knowledge - knowing who to go to and how to best utilize data 4) COVID

ENABLERS

1) The company knew it wanted to improve on data and so there was an appetite for ideas 2) My supervisor and plant manager had high influence and could help break down barriers 3) People in general were willing to talk, provide ideas, and collaborate

ACTIONS

1) Tried multiple ideas on the dashboard and machine learning front, gathered feedback 2) Communicated frequently with teams to ensure course alignment and buy-in 3) Pivoted to apply dashboard techniques to immediate plant COVID needs

INNOVATION

1) Dashboards - Piloted Tableau software rollout for plant leadership. Pivoted to help plant leadership with COVID needs proving the rapid deployment capability of the software as well as the decision enabling insights it could provide 2) Used data analysis to help plant better understand plant performance and ranking as well as how that could be applied in other areas

IMPROVEMENT

My solution provided: 1) A working dashboard that displayed relevant data on both current plant metrics as well as COVID-19 information 2) A machine learning proof of concept on plant performance and how that can be applied to many different areas at a plant, regional, or company level in the future

BEST PRACTICES

1) Try to speak with a wide variety of teams, individuals, and leaders up front to understand what concerns and opportunities are there 2) Find an opportunity where a need isn't being met but there is support to champion and maintain it 3) Quickly iterate by trying small things and running them by your supervisor or mentor 4) Talk to LGO classmates and network for help! 5) Even an imperfect idea or implementation can help. Don't scrap it.

OTHER APPLICATIONS

Dashboards - the dashboards I helped pilot can be used for everything from generating VP level overviews of the entire business unit to a single employee wanting to better understand a process. Simple trainings can enable better data