



Case Study of Diamond Framework

Developing AI Quality App for Manufacturing Industry

SPJMER-Advanced Project Management

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Executive Summary

Few years ago, majority of quality management practices followed by manufacturing firms (metals manufacturing as well) were reactive in approach, leading to high COQ (cost of quality) eating up major chunk of production cost.

Over last 4-5 years, these approaches have slowly evolved from reactive to pro-active or predictive approach. Manufacturers are more attracted towards predictive quality approach (predicting quality even before the production starts) but, success rate in this regard is minimal due to various challenges.

Although, lately most of the advanced manufacturing firms have sensors in all their equipment & mills but, they lack capability to make best use to derive insights pertaining to quality of products due to limited Data Science or AI capability.

Quality managers lack a holistic data driven framework which can provide them advance alert with regard to any upcoming probable quality issues (defect scenarios based on sensor data) because of they are relying more on heuristic techniques than data driven ones.

AI Application

AI Application is designed to reduce the Cost of Quality for Manufacturing firms (by around 8-10 %) and to avoid processing of substandard intermediate products to the next process step or finished product to the final customer

It enables Quality Managers/Engineers, Metallurgists, Production/Operation Managers, and Quality Inspection teams in Metal Manufacturing organisations:

- To accurately Predict & Control the Quality of manufactured products by proactively predicting probable defects
- To monitor and Ensure Quality Standards for products are up to the required conformance level
- To take Pre-emptive Actions and Prevent any defects or variance in target product specification for upcoming production batches

Scope

Scope of AI product will include prediction, diagnosis and control of quality for metal manufacturers. As a part of quality, product will address both variances and defects.

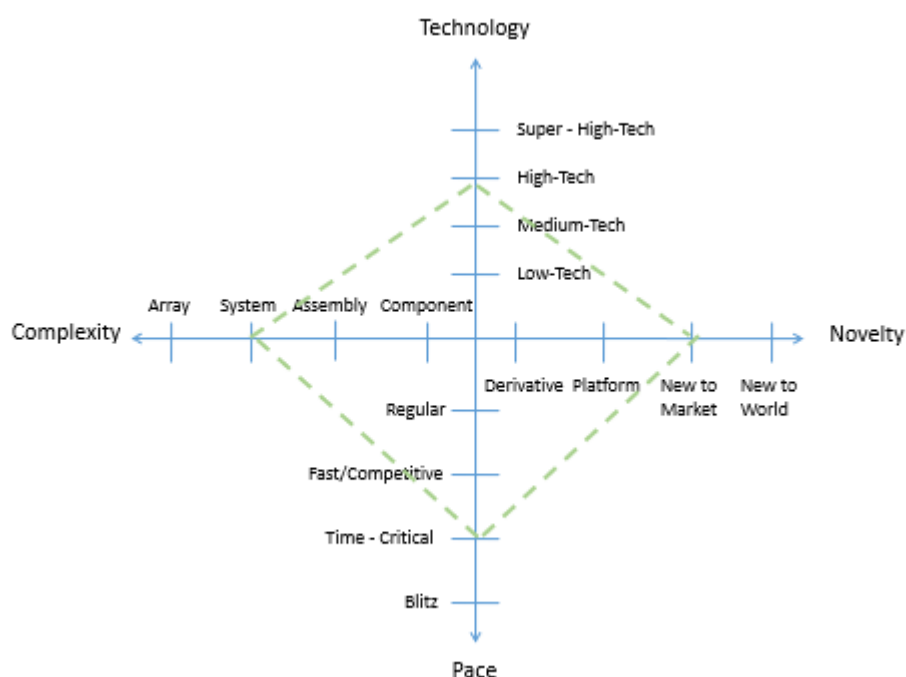
- Variance: Variance is defined as a condition when quality parameters of the product does not meet target specification even if there are no defects. Variances can following in nature.
- Variance w.r.t Customer product specification on mechanical properties, chemistry, dimensions or internal/external defect density
- Variance w.r.t Manufacturer product specification mechanical properties, chemistry, dimensions or internal/external defect density
- Defects: Defect is defined as in imperfection or abnormality that impairs the quality, function or utility of product. Scope of Quality AI product will include following types of defects for metals.
- Mechanical Defects: Yield Strength, Tensile Strength, Elongation
- Chemistry Defects: Composition of various alloying elements (e.g. Mn, Si, etc. in Steel) outside of prescribed limit of metal grade OR composition of tramp elements (eg. Cu on Steel) or impurities (e.g. P, S in Steel) more than prescribed grade limit

- Dimensional properties: Width, Thickness, Flatness, Cross Section, Length
- Surface defects: Various types including corner cracks, border cracks, longitudinal cracks, inclusions, surface blowholes, etc.
- Welding defects: metal deposition, crack, undercut, overlap, etc.

NTCP Analysis

The sub projects vary in the approach and customer expectations. They will follow separate methodology, use of technology and has their own priority. The scope estimation and prioritizing of scope is done once the developmental approach is finalized. But the total project has been integrated under a common project management framework.

The diamond framework analysis is as follows:



Summary of Diamond Framework: -

- **Novelty:** - Project is new to market as earlier this was done manually by Quality Manager. Who use to see past data and predict and which use to be 40-50% correct with this plan is to improve the prediction to 90+%.
- **Technology:** - From a tech. perspective, this project is high tech as we are using Machine learning and Data Science knowledge and adding those knowledges to predict the Waste.
- **Complexity:** - This project was complex as it involved 11 different processes, also this domain was new to us from an offering perspective
- **Pace:** - Project was expected to be delivered within 8 months of time as Steel mills have lot of data change every year and the contract between our Client says to deliver. This meant that we need to setup a fully functional Operations team which included different aspects like process training, Soft go-live, full go-live & stabilization phase.

Conclusion

The details of location has been kept confidential due to the contractual norms. It is currently under planning and I am a member of the Technical Project Management team for initializing the project discussion and planning. The article provides the specific details in relation to my approach on the planning of this project. Being a part of the project team from the bidding stage it will help me to recognize the relevant sub projects in the future planning stages and the utility of diamond framework in this respect.

Project Vision

To reduce overall cost of quality and defect rate for quality teams by enabling them to predict, diagnose and control quality.

Project Objective

To minimize Total cost of Quality by reducing defect rate and variance in target specification in 2020.

SWOT Analysis

