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Advantages of analytic solutions of sentience cloud platform.

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ADVANTAGES OF ANALYTIC SOLUTIONS OF SENTIENCE CLOUD PLATFORM

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Abstract: *The Internet of Things (IoT), Industry 4.0, and advanced analytics have generated enormous hype for their potential to transform businesses. This paper looks at different types of analytics and presents a pragmatic approach taken by Honeywell Connected Plant in application of analytics to gain insights from data in process industry.*

Keywords: *The Internet of Things (IoT), Industry 4.0, advanced analytics, Honeywell, Connected Plant*

Introduction

Most manufacturing companies globally are engaged in or planning for IIoT and Industry 4.0 journey. How to improve process understanding and accumulate effective knowledge plays an important role in all aspects of the process industry, such as sustainability design, system integration, advanced process/quality control, decision supports, etc. From the viewpoint of automation, data mining and analytics may serve as a basic tool to promote the process industry from machine automation to information automation and then to knowledge automation [1].

The term analytics is used for a range of different types of analytics on structured data from a simple graphics or self-serving dashboards, key performance index, adhoc, trending, query based visual analytics to advanced machine learning based data discovery and predictive analytics (refer to figure 1).

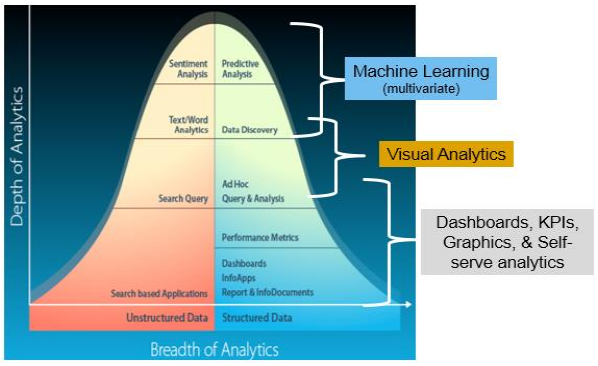

Figure 1. ***Types of Analytics***

There are lot of marketing hype, as depicted in the figure 2 around machine learning i.e. all you

need is data to help identify events that are actionable.

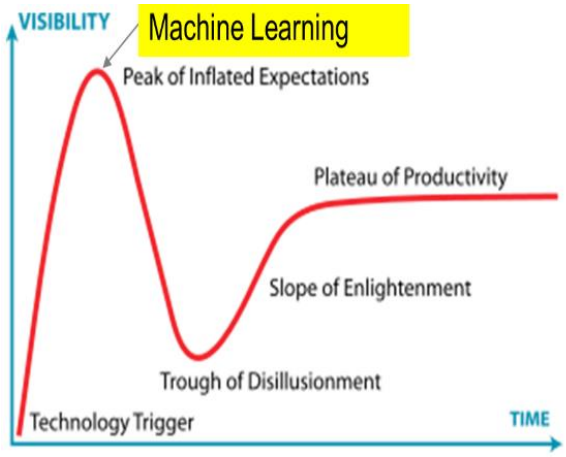

Figure 2. ***Gartner's 2016 Hype Cycle [2]***

1. Marketing vs. Reality

There are multiple observations from our experiences with analytics.

Observation #1 - Analytics is more than just the math. Hiring data scientists and providing them process data is not sufficient. The domain knowledge and process understanding is a must to make data useful for analytics.

Observations #2 - Companies under estimate the effort required for data preparation. To make data useful, it goes through an iterative process of discovering, structuring, cleansing, enriching, validating and publishing. As a thumb rule, 80% of effort in data analytics project is spent in wrangling data.

Observations #3 - If it is a data science project, it typically fails since there is no clear objective – "I have got data, what can do with it" vs. "I have got a problem; how do I solve it".

Observation #4 - Signal to perform a task is not always in data.

Observation #5 - Scalability. Models need to match operating situation at scale, imagine number of false positives on a large fleet of assets.

Observation #6 – Tuning or training of the models as equipment and operations change over time.

Some of the myths around analytics are:

- Big Data / Analytics replaces the need for process knowledge / engineering experience
- Data Analytics is a replacement for fundamental models
- You don't need GOOD data as long as you have a LOT of data
- You surely have enough data already to get value from big data analytics
- You don't need to change your work processes to get full value from big data
- All analytics software is about the same – it is all shareware downloaded from the internet.

2. Framework for sustained analytics

To alleviate the challenges and imbibe learnings obtained from observations stated earlier in this paper, Honeywell Connected Plant has put together a framework for sustained analytics.

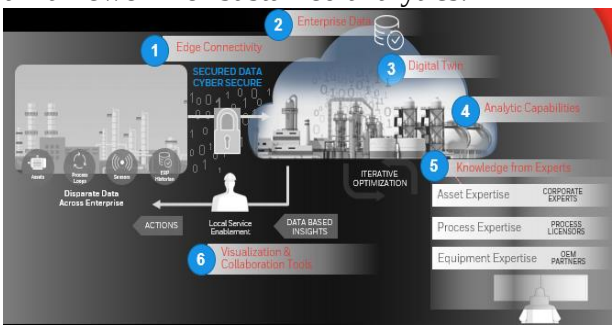

Figure 3. ***Framework for Sustained Analytics***

The framework does not solve new problems but solved old problem in a new, innovative and more efficient way.

The components to the framework are –

#1 - Edge Connectivity

Getting data from the sensors, assets, on-premise historians, other on-premise applications like ERP, LIMS, process loops etc. to the cloud through secure data exchange mechanism.

#2 - Enterprise Data

Platform to store the data from on-premise/edge connectivity. There are different types of data like process, equipment, quality, instrument (mostly time series), transactional, text, images, audio, video etc. Data model to contextualize information from different data sources.

#3 - Digital Twin

Also, known as runtime analytics. It is a first principle based or data driven model that represents/predicts the actual process plant or asset behavior.

First Principles – defines "common causes" and minimizes false positives.

Data driven model augments – don't know what you don't know.

Traditional approaches have used one or the other while Honeywell has adopted a hybrid approach to bring together the best of both worlds (refer to figure 4).

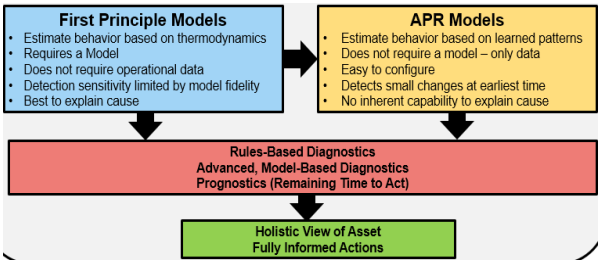

Figure 4. ***Hybrid approach to Digital Twin***

#4 - Analytical capabilities

There are many new and growing number of companies with varying level of capabilities. Goal is to help industries to apply tools, technologies, domain expertise to solve specific problems and create runtime analytics to operationalize insights. So, the key thing was to provide an ecosystem which helps reduce the data wrangling efforts, environment for packaged analytics app like Element Analytics, Seeq and access to 3rd party analytics like R, Python, domain specific, Power BI, falconry, flutura etc.

#5 - Knowledge from experts

Once the events or anomaly or failure is detected or predicted, corporate experts, process licensors or OEM experts can collaborate and recommend actions.

#6 – Visualization & Collaboration tools

A single pane of glass visualization and collaboration to get actionable insight and single version of truth from plant/operations data.

3. Realization of the concept

Figure 5 represents methodology which was used by customer organization for digitization journey in partnership with Honeywell Connected Plant

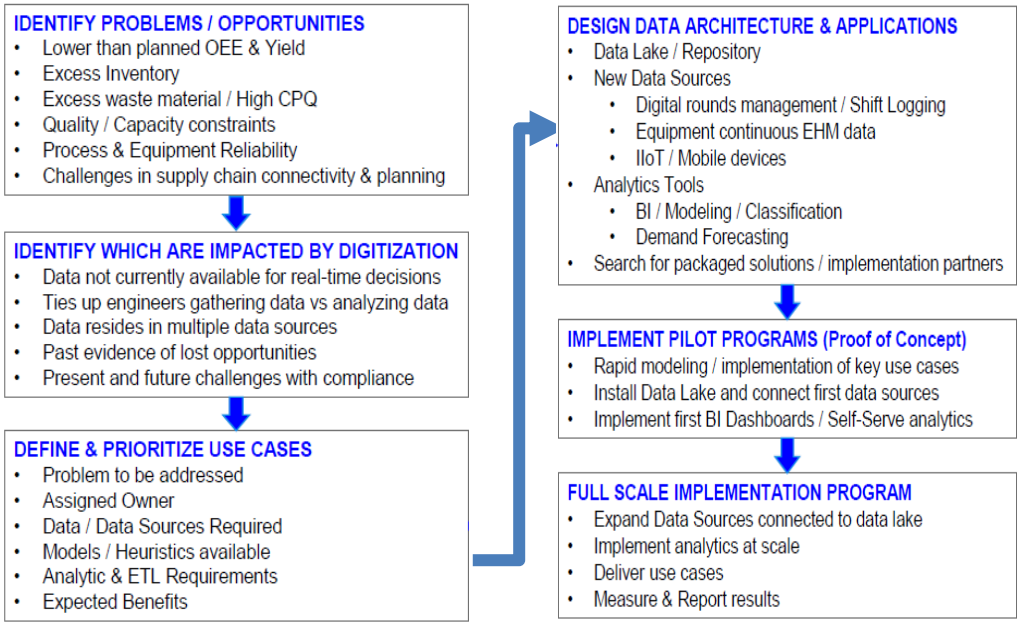

Figure 5. ***Digitization methodology from Honeywell Connected Plant***

Some examples where the sustained analytics framework has been used are –

#1 Mining Haul Truck Engine Failure Prediction

Need: Desire to augment prediction capability on engine failure

Solution: Merged alarm data (OEM and rule based alerts), oil analysis & engine failure data. Created correlation model (oil dilution, soot, and engine de-rate, after cooler, oil filter…)

Results: Combination of approaches (oil analysis, heuristic rules, & machine learning) increased fleet availability by 6% and reduced per-hr operating cost by 13%

#2 Honeywell Auxiliary Power Unit

Need: to improve prediction for 2 failure modes - Auto-shutdown (service interruption / unplanned maint) and Severe wear (high overhaul costs)

Solution: Merged operational data and maintenance (text data mining) Classifier for features/failures correlation:

- Random Forest – contributors
- SVM – separation of variables
- Naïve Bayes - probabilities

Results: 17% improvement in predictability of sever wear 43% improvement in predicting auto-shutdown.

Conclusion

To conclude, journey of using data analytics to gain insights is not simple and there is no single magic tool or technology. Based on the unmet needs of the industry, gathering learnings from customer successes, Honeywell Connected Plant has developed Sentience platform, a sustainable ecosystem for process industry to perform analytics to derive meaningful insights from data and act on decisions/predictions.

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