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Under the Theme:
**Enhancing Maintenance
Through Big Data Management**

►► **Comparison of Traditional and Big Data Maintenance Environment in Predictive Manufacturing Systems**

▶▶ INTRODUCTION

Definitions:

- **Manufacturing system**

  Arrangement and operation of machines, tools, material, people and information to produce a value-added physical, informational or service product whose success and cost is characterized by measurable parameters.
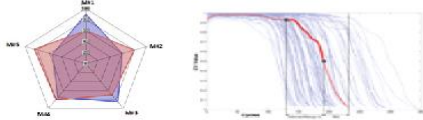
- **Modern manufacturing facilities**

  Data-rich environments that support the transmission, sharing and analysis of information across pervasive networks to produce manufacturing intelligence.

DATA PRODUCTION AND MANAGEMENT

- Large data productions is a result of high number of equipment developed over the years
- The frequency of data taken over a period of time also will affect the amount of data
- Nowadays, these raw data can be consumed by analytics and modelling applications to enable manufacturers to develop a better understanding of their activities and processes to derive insights that can improve existing operations
- These ideology adoption is the foundation in Predictive Maintenance of setting smart sensors networks or smart machines

Applications and techniques associated with the manufacturing systems of the 5C functions.

TRADITIONAL MAINTENANCE

- Generally, traditional maintenance deals with physical checks on equipment and action will be taken based on the condition observed
- HOWEVER, machine failures usually being treated as a random event or ignored
- OEE that was the indicator of this activity but it only show the status of production efficiency
- Machine condition data is not synchronised with the controller and inspection data to differentiate between process and machine degradation

PM and CBM

- **Predictive Maintenance (PM)**
  Prediction based on data collected – reduces the uncertainty of maintenance activities – allow to identify problems before it happens
- **Condition-based Maintenance (CBM)**
 Examples of data collected in CBM are ferrography, oil analysis, thermography, and vibration monitoring
- **CBM has 3 keys in its implementation**
  i. monitoring and processing
  ii. diagnosis and prognosis
  iii. maintenance decisions

BIG DATA ENVIRONMENT

- **Advancement of smart sensors is a huge help in obtaining data**
  Needed to be managed properly to make sure the right information is used for the right purpose in the right time
- **Watchdog Agent® Analytics developed at National Science Foundation (NSF) in 2001 divide its operation in 4 sections**
  i.   Signal processing and feature extraction
  ii.   Health assessment
  iii. Performance prediction
  iv. Fault diagnosis
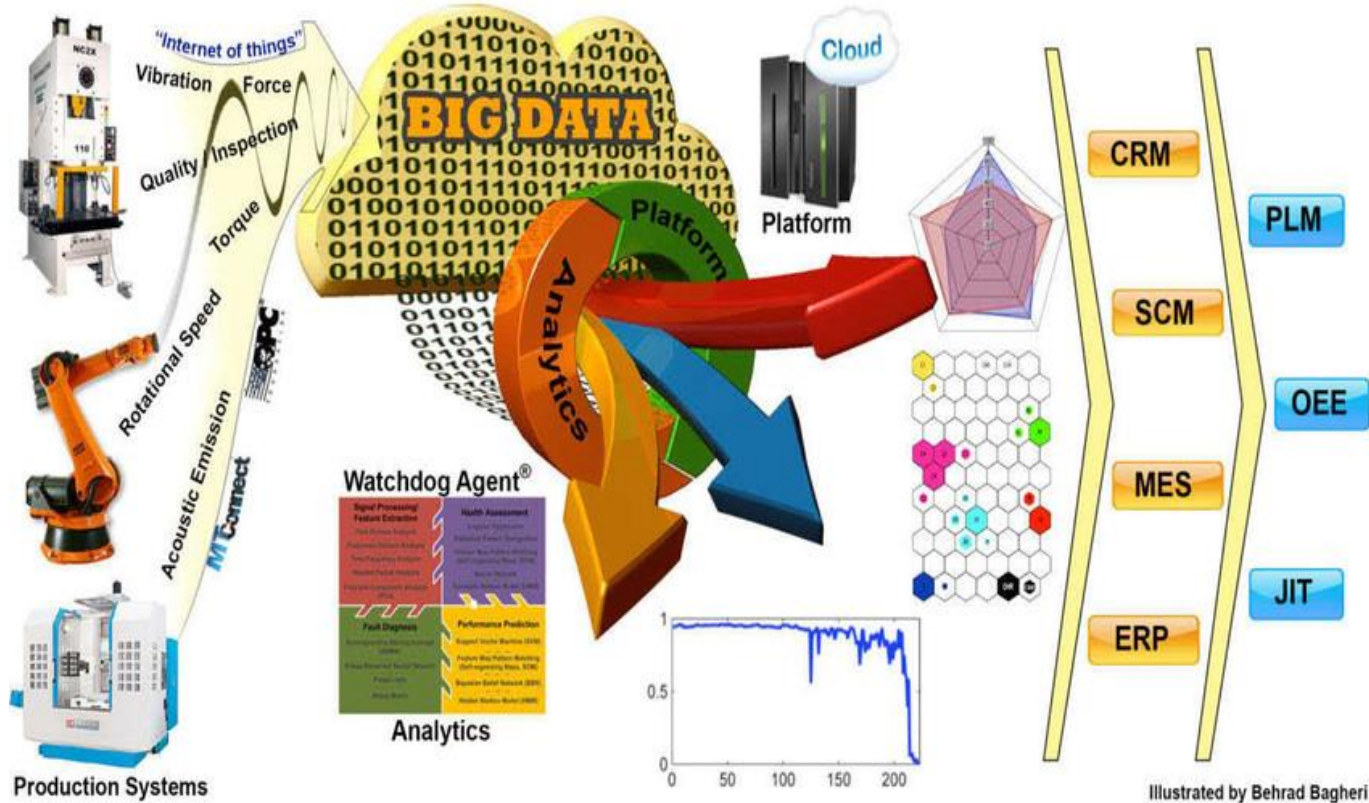
Predictive Manufacturing System Framework using Watchdog Agent® Analytics.

CONCLUSION

- **There are also challenges apart from its benefits which are:**
  i. Huge sets of unstructured data to be selected and processed
  ii. Determine which data is useful on the situation
  iii. The need of experts to execute the operation swiftly especially in determine, separate, and classified the data effectively

Comparison of Big Data Maintenance Environment and Traditional Maintenance

	Real-time active maintenance and operation	Traditional maintenance and operation
Relationship between equipment, workshop, and factory	Flattened relationship	Hierarchical relationship
Management mode of operation maintenance	Centralized and unified	Decentralized operation and maintenance
Response time of operation and maintenance	Short	Long
Response mode	Active reporting	Reporting afterwards
Monitoring model	Visualized and unified presentation	Layer-level reporting