Failure Prediction in Japan: Key Research Findings 2017

◆ Research Outline

> **Yano Research Institute has conducted a study on the trend of domestic failure prediction with the following conditions:**
> 1. Research period: From December 2016 to July 2017
> 2. Research targets: Vendors of equipment, plant, and IT solutions
> 3. Research methodologies: Face-to-face interviews by expert researchers, and literature research

◆ Key Findings

■ Utilization of AI in Manufacturing/Maintenance Require Discretion

AI (artificial intelligence) has mainly used for web marketing and other commerce-related matters, against a backdrop of big data.   Currently, attempts of utilizing AI have been made in the areas of manufacturing and maintenance, but the progress has been slow, because higher accuracy is required to handle data and analyzed results compared with commerce.

■ With Many Challenges Ahead, Slow Progress in Utilizing AI in Failure Prediction

AI has particularly been paid attention in the field of failure prediction among various manufacturing and maintenance tasks, though there are many issues to be solved at the moment. To be specific, AI has such challenges as "accuracy", "correlation", and "individuality" for using it in the field.   Since failure prediction solutions are still in the sprouting period, such problems are expected to be solved as the studies develop.

■ Development of Failure Prediction Expected to Make CPS (Cyber-Physical System) Come True

The manufacturing industry is sure to go in the direction of CPS (Cyber-Physical System), a concept that closely associates with the real world and cyberspace.   In order for such a concept to take shape, modeling of physical phenomenon and solving the mysteries of the mechanism of such phenomenon is needed.   Interestingly, most of such mysteries are supposed to be made clear through the studies of failure prediction.   Therefore, probing into failure prediction can lead to significant meaning in the mid-to-long term perspectives.

◆ Report Format

Published report: "IoT Utilization at Manufacturing 2017"
Issued on: July 31, 2017
Language: Japanese
Format: 191 pages in A4 format
Price: 180,000 yen (The consumption tax shall additionally be charged for the sales in Japan.)

■ **Table 1: Difference of Utilizing AI by Manufacturing and Commerce**

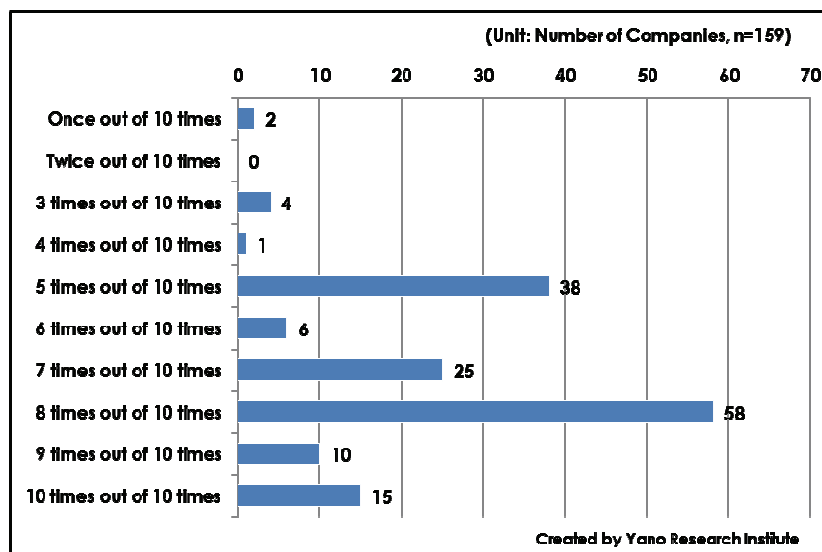|	For Commerce (Web Marketing, etc.)	For Manufacturing (Manufacturing, Maintenance, etc.)
Interpretation of Data (Correlation/Cause-Effect Relationship)	The importance lies in correlation and statistical significance	Relationship is important, like between the data points, and cause and effect relationship
Quantity and Quality of Data	Quantitative aspect of data is important, because correlation is determined by mass data	Importance lies in how many related data points can be covered (the logic is important)
Influence	Even if the analysis were wrong no particular influence occurs (Sales can be affected)	If the analysis were wrong, it may affect human lives
Others	Ever-improving attitude is required (or to ever-improve the recommendation)	Even if the data improve, they cannot be reflected in AI without validation, because it cannot ensure product quality. What is worth is uniformity.

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■ **Table 2: Challenges in Utilizing AI in Failure Prediction**

Challenging Items	Description
Issue of Accuracy	Although AI determined as "unusual," there is no knowing whether it is truly a sign of failure
Issue of Correlation	Although AI was able to predict failure, there is no knowing of what to do for the next step
Issue of Individuality	The individual models are different from each other, so that it is difficult to apply a case into some other cases

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■ **Figure 1: Degree of Accuracy that Manufacturers Allow Introduction of Failure Prediction System**

(Unit: Number of Companies, n=159)

Once out of 10 times	2
Twice out of 10 times	0
3 times out of 10 times	4
4 times out of 10 times	1
5 times out of 10 times	38
6 times out of 10 times	6
7 times out of 10 times	25
8 times out of 10 times	58
9 times out of 10 times	10
10 times out of 10 times	15

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Notes:
1. The survey was conducted in the period between Dec. 2016 to Jan. 2017, to 159 domestic manufacturers with their annual turnover 10 million yen or more out of total 217 manufacturers, excluding those that have not unveiled the annual turnover, by a way of questionnaire via telephone. Single response allowed.