Machine Learning in the Oil & Gas Supply Chain

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AGENDA

1. MACHINE LEARNING OVERVIEW
2. CASE STUDY – DATA CLASSIFICATION
3. LEARNINGS
4. FUTURE USE CASES
5. QUESTION & ANSWERS

USE CASE – Accurate Categorization of Supply Chain Data

eCommerce-enabled companies have immense volumes of digital, yet unstructured data.

```
<pidx:LineItemDescription>
    5/8 x 3-3/4 b-7 stud bolt w/nuts
</pidx:LineItemDescription>
```

x (millions of records)

GL

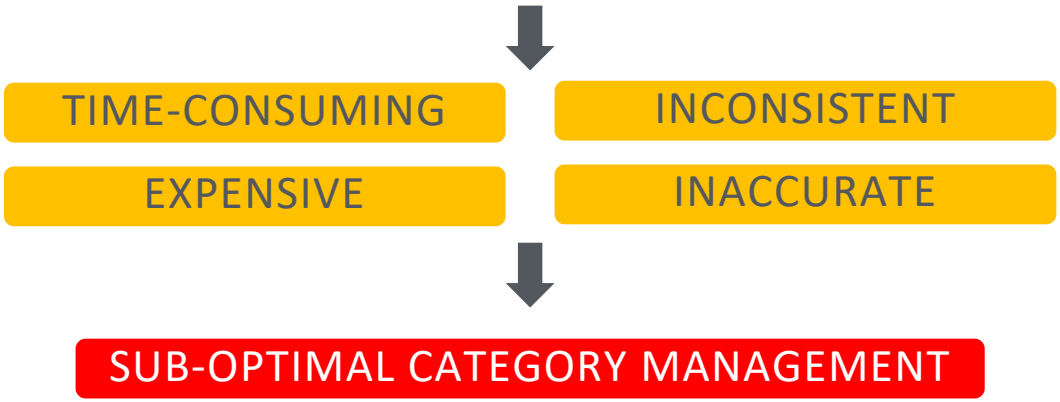
unspsc

Other Taxonomy/ Spend Heirarchy

How do we accurately, consistently, and efficiently classify this data to a taxonomy?

Current Approaches to Data Classification

1. Manual Coding	Manual taxonomy assignment of: • Contract/catalogue item • Purchase Order item • Invoice line item
2. Rules-based Engines	`IF 'VLV' THEN 'Pipes/Valves/Fittings'`
3. Offshore Post Processing Service	Usually a combination of #1 & #2



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A Supervised Approach: Data-Driven Hierarchy

Model Input

Contents of ~2.7 million invoices from were provided

- Vendor information
- Description of items / services

Used categories assigned to these invoices to supervise the machine learning process

Model Approach

Trained an artificial neural network to learn the categorization logic from invoice contents to categories

- A word embedding technique was applied in the artificial neural network to process natural language
- Classification of invoices was based on processed natural language content and vendor information

Model Performance

The artificial neural network learned semantic patterns and categorization logic from historical data successfully

A system to filter human errors

- ~10% historical invoices are flagged as being mislabeled or contents being too vague

Insights from model outputs useful to guide improvement of data hierarchy

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Key Findings

Artificial Neural Network (ANN) model learned categorization logic
There was a 10% difference between model categorization and human categorization of vendor invoices

The data suggests that the model better / more accurately categorizes invoices (for procurement purposes)

Given these findings, automated machine learning invoice mapping would likely help enable:

More efficient and effective analysis and management of procurement spend

A significant increase in the productivity and accuracy of invoice categorization

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Questions

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