ASME STB-1-2020

Guideline on Big Data/Digital Transformation Workflows and Applications for the Oil and Gas Industry

ASME
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GUIDELINE ON BIG DATA/DIGITAL TRANSFORMATION WORKFLOWS AND APPLICATIONS FOR THE OIL AND GAS INDUSTRY

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FOREWORD

Guideline Description

This guideline is the culmination of the efforts of ASME industry professionals in oil and gas to define Big Data and its useful applications to upstream, midstream and downstream businesses.

The concept of Big Data intimidates decision-makers and business leadership. While the introduction of new digital technologies is the cornerstone of the industry's digital transformation, use of Big Data requires the sharing of asset-specific or operational data of a size and scope that is difficult to grasp. Industry data may also be of poor quality, requiring significant effort and resources to cleanse and aggregate prior to its analysis. In addition, the gathering, aggregation, analysis, and data storage and maintenance is very expensive. The industry needs a standardized and efficient end-to-end workflow to validate the quality of the data, and subsequently, the accuracy of the results from the analysis.

The goal of this document is to alleviate that intimidation by providing a framework for understanding and a workflow for utilizing data analytical techniques to solve business problems; without requiring the reader to be a full-time statistician or data scientist professional.

Who Should Use this Guideline?

The design of this Guideline is intended to be universal in its application to Big Data challenges in the oil and gas industry. It is written not only for oil and gas professionals who are beginners to Big Data techniques but also for data professionals looking to contribute to unique oil and gas applications.

Specific users can be characterized as:

Citizen Data Scientist: a subject matter expert in engineering, operations, supply chain, planning, project management or operations that requires data insights.

Early Career Engineer: a young professional that is looking to improve his or her career by adding a data dimension to their problem solving.

Data Scientist Professional: a data science professional that is looking to apply his or her deep experience in data analytics by learning the unique sets of data and operational challenges of the oil and gas industry.

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1 PURPOSE, DEFINITIONS AND REFERENCES

1.1 Scope

This guideline explains the current use and application of data analytics and data science in the oil and gas industry. It is designed to provide guidance on how to utilize data analytics and machine learning/artificial intelligence (ML/AI) to address a given business need, resulting in value-creation. Within the guidelines will be descriptions of various data analytics techniques and the recommended tools for the respective techniques.

1.1.1 How to Use This Guideline

(a) Basics
This document is designed as both a "how-to" and a reference document. The chapters are arranged in a building block sequence that parallels the journey of a business data project. These building blocks should help provide a roadmap to data-driven projects.

Each chapter is also a standalone reference for its respective topic. The reader can reference these individual chapters as needed to fill gaps in his or her understanding of either data techniques or oil and gas.

(b) Chapters
In this first chapter, the user is introduced to definitions and acronyms common to both oil and gas and to the data analytics strategies highlighted in this guide.

Chapter 2 provides background to the various types of data in the oil and gas industry, including how they are curated, described, used, and safeguarded.

Chapter 3 describes the Digital Facility and the related oil and gas activities and operations that produce data. It also defines the types of data produced by each operation and potential applications for data-driven insights.

Chapter 4 explores the types of data analytics tools available to a data project leader and how they can be utilized. This chapter is where the user can find information about topics such as regression models, classification, machine learning, optimization, and data visualization.

Chapter 5 is a description of a full data project. The user will learn how to structure a project, assemble the appropriate team resources, frame the questions to be answered, model and execute the project, and usefully deploy the resulting model.

Two sets of Appendices are included for references and details that supplement the discussions of the chapters. The Mandatory Appendices are presented to help understand data projects and the team members required to execute them. Nonmandatory Appendices are included to provide the user with additional definitions, sample case studies as examples, and a description of relevant certifications available if the reader wishes to increase his or her knowledge and proficiency in data analytics.