A trilogy of People, Business Processes and Technology centered on a Data Infrastructure to transform their world in the new Digital Age.

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PREFACE

A Quest for Operational Excellence

This is the story of Peter Argus, a newly-hired operations expert at the oil refinery company ProcIndustries. The company has been in operation for 35 years and is a recognized industry-leader, but the industry is changing. Global competition is fierce, energy costs are variable, and the price and availability of raw materials are more volatile than ever before. The established workforce is aging, and new workers enter the company with new capabilities and different expectations. Deregulation is paradoxically coupled with stricter safety and environmental rules. And the dramatic advance of technology presents both great opportunity and great challenge.

As Peter steps into his new role, he recognizes that he must help ProcIndustries adapt to these new realities. It is his mission to transform the company from a collection of silos to an enterprise with connected functions that empower everyone – from C-suite executives to frontline managers – to make data-driven decisions using real-time intelligence. Peter recognizes that data technology is the key to transformation.

However, for Peter to implement data-driven processes and deliver business intelligence and insight, he must overcome entrenched and outdated business practices. His journey begins with assessing the current state of ProcIndustries operations and building consensus among manager and executives that a data-centric infrastructure will lead to improvements. It quickly becomes clear that it will take more than information technology to deliver substantive business benefits. Business processes will have to fundamentally change. People will need to adapt their working styles and tasks. And it will take commitment, time, and investment to make sure that all the players are speaking the same language.

To navigate these challenges, Peter learns from the best practices and experience of early adopters, including major companies in the power generation industry (Empresa Nacional de Electricidad, S.A. ENDES A), mining and metals (AngloAmerican Platinum), aggregate and construction materials (CEMEX), life sciences (Novartis), oil (Shell), and raw materials (Suncoke Energy). Following these examples, Peter develops a plan to shift ProcIndustries from a traditional oil refining company with functional silos to an organization that uses a common language to conduct operations, manage risks, facilitate collaboration, and coordinate business plans for the future. His plan addresses the need for organizational expertise, company-wide training, an implementation plan, change management processes, and – most important – the cultural change necessary to empower personnel from frontline workers to management to use information in real time.
By the end of the story, ProcIndustries has become an example of operational excellence. Real-time, enterprise-wide visibility, data driven processes, and insightful analytic and visualization tools have put the company on a path to sustained profitability in an ever-changing world.

**Peter and ProcIndustries – A story for every industry**

In sharing Peter’s experiences, this *Journey towards a Digital Transformation in the Process Industries* takes the reader on a journey to understand what it means to pursue continuous process improvements, including status assessments, strategy design and the adoption of industrial digital data infrastructure best practices. Through Peter’s eyes, we see ProcIndustries’ strengths, areas for improvement, human assets, process units, and challenges as he undertakes the mission of remaking his company.

The strategies Peter describes and adopts at ProcIndustries are not exclusive to oil refining companies. While the story focuses on one industry, we designed this book to benefit executives and managers in every industry. After all, the story of Peter and ProcIndustries may be fictional, but their experiences reflect real-world challenges faced by leaders and managers across industries, including:

- Dealing with competition in a global economy that has seen dramatic changes in resource supplies and demand, regulatory protocols and labor demographics.
- Implementing the cultural and technological changes required to provide real-time information – and then empowering people to identify and execute next-best actions.
- Managing and analyzing oceans of data flowing into and through a company – and developing a common language for the organization to take advantage of it.
- Training people to do their jobs differently as new tools enable them to see business conditions in new ways and take appropriate actions as a result.

The ability to capture and translate data into meaningful information – making it possible to assign the right priority to any given event – is crucial in every industry. In retail, stores must train in-store employees to make decisions at the point of sale to ensure customer satisfaction and deepen brand loyalty. In aviation, the failure of an airliner turbine can lead to wasted fuel, scheduling delays and missed flight connections, emergency landings, or, at worst, catastrophic events. In mining, enterprises must monitor equipment fleets in real-time to diagnose maintenance needs and prevent equipment failures that lead to costly downtimes. Well-managed equipment fleets result in productivity gains, energy and water cost savings, and correlate with fewer safety incidents and stronger environmental compliance.

It is our hope that over the course of this story, Peter shows you as well as ProcIndustries how to simplify the semantics of process industries, how to empower front-line employees, how to detect and prevent potentially adverse events, and how to reduce costs with reliable business
intelligence. And we hope that by the story’s end, you, like ProcIndustries, will emerge empowered to provide the right data context for everyone in your organization, so that computer systems can inform human workflows for collaborative decision making and innovative technologies can catalyze a culture of continuous improvement.

**ProcIndustries**

**Headquarters:** Houston, Texas

**South Texas Refinery:** Channelview, Texas

**Cast of Characters:**

**Headquarters**

Jeff Edgell, CEO

Bill Roberts, vice president of operations, champion of operational excellence program

Myron Pratts, CIO

Christine Van Soler, purchasing analyst

**South Texas refinery**

Peter Argus, newly hired continuous improvement manager

Tom Jordan, refinery manager

Alex Moretti, process engineer

Tim Olsen, operations manager

Monica Armstrong, economics and planning coordinator, and Peter’s main ally in this project

Paul Morgan, maintenance manager

Pat Verlaine, IT manager

Chuck Smith, instrumentation and process control engineer

Chen Wang, lab manager

Ron Erickson, energy and utilities manager

Raj Singh, process safety manager

Francois Dufeu, environmental manager
OUTLINE

Chapter 1. From a traditional strategy to an industrial digital data infrastructure
“In God we trust; all others must bring data.” W. Edwards Deming.

CHAPTER SUMMARY: Operating Intelligence Concept. This is chapter is inspired on the Creating “The Living Company. It presents IDEA Strategy (Infrastructure, Data, Engineering and Analysis). It shares that a digital transformation needs an alignment with the company mission and implemented as a program rather than a project over the long term. Operational and Safety issues are described as part of their Operational Excellence quest. Presents three steps deployment plan approved by management.

Chapter 2. On the path to a business process transformation: Establishing the operational excellence team
“Continuous measures are one those factors than be measured on an infinitely-divisible scale; weight, height, time, temperature, pressure, ohms, money, energy, flow. You can't manage what you don't measure.” Peter F. Drucker.

CHAPTER SUMMARY: Enterprise Process Continuous Improvement and Innovation becomes part of ProcIndustries DNA. Unifying themes: Process Unit Data Model, Collaborative Workflows, Big changes can be achieved by many strategic small improvements. It presents a new business workflow paradigm that start at the sensor level to generate operational and business improvements rather than just a transactional traditional system.

Chapter 3. Integration of Time and Data - Infrastructure Data Engineering and Analysis = IDEA Strategy
Everything should be made as simple as possible, but not simpler. Albert Einstein.

CHAPTER SUMMARY: Insights generated by asset data classification for immediate actions and further analysis. This chapter presents a strategy for an accelerated adoption using a standard Process Unit object data and time models. ProcIndustries description of the follow the money initiative. Events become the new transactions for further analysis and implementation of process and equipment improvement strategies. The Infrastructure Data Engineering and Analysis Concept (IDEA) is the strategy that ProcIndustries decides to move forward with. Many projects can be implemented with a real time data infrastructure. Moving towards a program rather than a traditional project implementation.

Chapter 4. The Human behind the Data: Visualization and Collaboration
Give a Man a Fish, and You Feed Him for a Day. Teach a Man To Fish, and You Feed Him for a Lifetime Anne Isabella Thackeray Ritchie’s (1837–1919)

CHAPTER SUMMARY: Human aspects for collaboration and capturing knowledge for adaptation and perpetual improvements. Implementation methodology. Once the Data is Classified Machine Learning for Predictive Analytics becomes the new fuel. Communication to Top Management.
Chapter 5. IDEA Strategies for Prevention of Abnormal Situations

*One event can be the cause of another only if they both can brought within the same point of space.*

Andre Breton

*The scarce resource never was technology, it was the set of managerial capabilities needed to create value with that technology,* Vijay Gurbaxani, Professor of Information Systems, UC Irvine

**CHAPTER SUMMARY:** This chapter provides seven examples using the data classification based on predetermined conditions for alerting of an abnormal situation for further assessment and action. It enables to compare families of assets based on their operating conditions for evaluation of their performance.

Chapter 6. IDEA has been around and successfully implemented

*“The Mission of the Plant is to fulfill the strategy of the corporation, but to do it in such a way that increase the chances of the plant surviving when the next storms hits.”* Arie de Geus,

**CHAPTER SUMMARY:** ProcIndustries summarizes the EIDI (Enterprise Industrial Data Infrastructure) implementations by early adaptors using the principles of continuous improvement in a standard way to simplify the implementation, maintenance and enterprise wide analysis of process units and assets in general. These companies using Enterprise Data and Time Context are: Endesa, Cemex, Anglo-American Platinum, MOL, BR Group, Alcoa and Suncoke.

Chapter 7. External Connectivity via the Cloud for Equipment and Processes Remote Support

*“We cannot solve problems with the same thinking we used when we created them”, Albert Einstein.*

**CHAPTER SUMMARY:** This chapter provides the next step for ProcIndustries to get external process and equipment services as proposed by Paul. This is based on the work and paper written together with Anglo-American. It presents the example of Anglo-American sharing the data with Outotec in Finland to provide external support to reduce water content and the energy ramifications business improvements as described by our customers in details.

Chapter 8. IDEA integrated to Business Systems

*“Henceforth space by itself, and time by itself, are doomed to fade away into mere shadows, and only a kind of union of the two will preserve an independent reality”, Hermann Minkowski, 1907.*

**CHAPTER SUMMARY:** This chapter describes what ProcIndustries is planning to accomplish in their work pipeline to achieve their goal of implementing their Operational Excellence Program. ProcIndustries realized in Chapter 4 the opportunity to use space and time for the logistics pilot that they did to demonstrate to management to capabilities of their industrial data infrastructure.

ProcIndustries take the ESRI PI Integrator to expand on their initiative early initiative to monitor their logistics.

ProcIndustries takes a look into exploring deeper the integration of their refineries with their ERP System for improving their initiative described in Chapter 5 to extend the capabilities of predicting equipment failures based on the current conditions and historical assessment of their compressors,
pumps and other rotating equipment. They will also look at improving their Production Planning and Execution initiatives developed in Chapter 3 for one refinery. This last initiative was their proof of concept that got their management approval for moving forward with an enterprise program.

Chapter 9. ProIndustries Digital Infrastructure Roll out

*It is by nature strategic: it creates possibilities that did not exist before, but without innovative processes all you have accomplished is the automation of current bad processes and procedures and sometimes this only does bad things faster and more accurately.* Dr. Pat Kennedy, RtPM for the Nuclear Industry paper.

**CHAPTER SUMMARY:** This Chapter provides some the insights on how ProIndustries has to provide the right business case to their management for transforming their enterprise towards achieving their operational excellence goals. They will find that due to changes in their safety and environmental issues they must have a standard way to reduce emissions and increase the health of their employees. This business strategy for survival of their company and to empower their people toward a knowledge based decision making will be an excellent strategy based on their current business and economic factors.

Chapter 10. Future Directions. Integration with the communities

*The “interdependence” of organizations is different than anything we ever meant before by this term.* Peter F. Drucker

**CHAPTER SUMMARY:** This chapter will review the challenges going from the Industry 3.0 to the next Industry 4.0 (Digital Age). It will look at the importance of the enterprise roll out and a look to involving communities for a successful program.

It will expand on the capabilities for machine learning and predictive analytics touch briefly in the chapter 4 as the transformation of their engineering force become more proactive and with additional time to think and to improve overall business performance rather than spending 50% of their time extracting data from silos and cleaning data.

Expanding and integrating real time operational intelligence in an embedded CIIP strategy. Early detection, early avoidance, Modeling, Predictions, Optimization, Collaboration, Coordination.

**Glossary**

**References**

Appendix I Data Treatment (by Pat) and Data Hierarchy
Appendix II What is real time? Definition of a New Enterprise Data Infrastructure
Appendix III Six Sigma and Process Analytics Tools
Appendix IV A digital Plant transformation example. Getting started with an Object Oriented Data model and Time Context

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