# CALLAHAN AUTO PARTS' BOLD NEW VENTURE: ADVANCED BUSINESS INTELLIGENCE

*A White Paper from the ATC BI & Analytics Think Tank*

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## Introduction

While some might find it surprising, the practice of statistical data analysis can be traced back to at least the mid-17th century when it was used to help better understand the spread of bubonic plague across Europe.

Abraham Lincoln was an early proponent of statistical analytics in the U.S., describing its potential to "save us from doing, what we do, in the wrong places."

For professionals in the automotive aftermarket, data analytics and its more worldly cousin, business intelligence, became an area of intense interest in the late 1990s and early 2000s, as the promise of "big data" aligned with the needs of an industry dedicated to providing the right part – from a universe of millions of SKUs – to the right place at the right time.

In its 2021 AASA Technology Committee white paper, "Business Intelligence Technologies in the Automotive Aftermarket," the Data Analytics & BI Think Tank defined BI and its constituent parts – People, Process and Technology – and provided a roadmap for establishing a business intelligence function within any manufacturing/supplier enterprise. That paper also introduced the concept of a "Maturity Model for Business Intelligence," a broad set of waypoints for measuring progress in implementing and leveraging the power of BI technologies, from rudimentary spreadsheets and canned, ERP-generated reports to modern data science, including artificial intelligence/machine learning and more.

In this paper, the Think Tank advances the concept of an aftermarket-specific Maturity Model, underscoring the point that exploring the benefits of data science and other BI technologies is a multi-stage journey requiring an enterprise-wide commitment, significant process discipline and robust, continuing investments in resources.

It might be helpful to consider this journey in the context of high-profile achievements in science and exploration. Manned spaceflight, for example, evolved from early-stage innovations in spacecraft propulsion and life support systems to, years later, landing men on the moon, developing reusable spacecraft and, more recently, operating a space station. Each stage in this journey comprised countless smaller achievements that enabled progress.
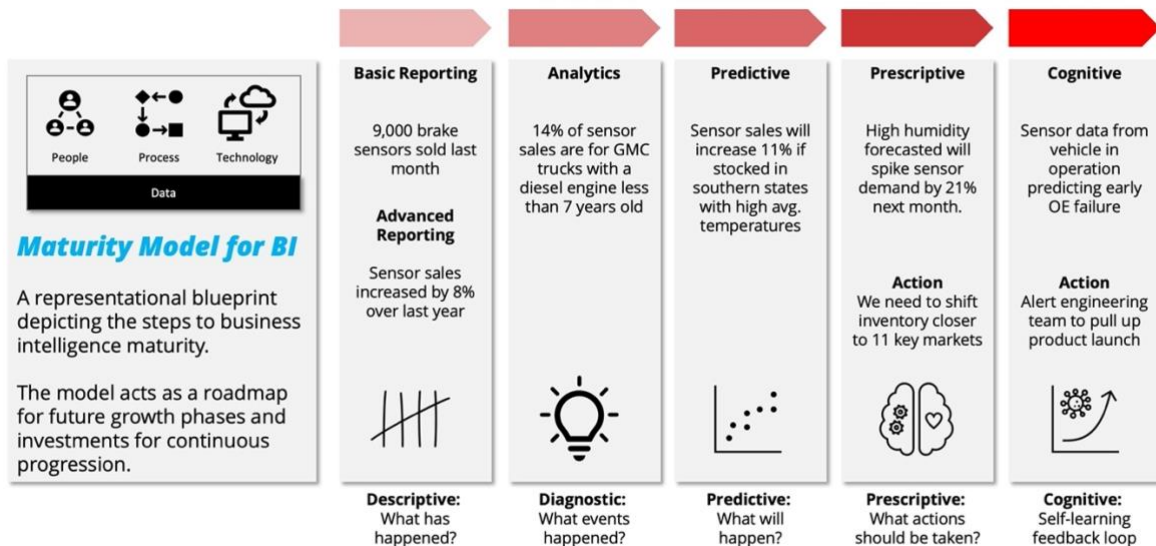
It is smart to consider BI in the same way – as incremental steps, each supporting an enterprise's longer-term vision and strategy while contributing results that justify the required investments in people, process and technology.

## BI Maturity Model in Action: Callahan Auto Parts

The five stages of BI Maturity are: **Basic Reporting**; **Analytics**; **Predictive**; **Prescriptive**; and **Cognitive**.

To chronicle this journey in the context of an aftermarket parts supplier, we will turn to a well-recognized (though entirely fictitious) aftermarket business, "Callahan Auto Parts" of Sandusky, Ohio. Many will recognize Callahan as the filter and brake products manufacturer depicted in the popular Hollywood film "Tommy Boy."



# Maturity Model for Business Intelligence

**People** **Process** **Technology**

**Data**

**Maturity Model for BI**

A representational blueprint depicting the steps to business intelligence maturity.

The model acts as a roadmap for future growth phases and investments for continuous progression.

| Basic Reporting | Analytics | Predictive | Prescriptive | Cognitive |
|---|---|---|---|---|
| 9,000 brake sensors sold last month | 14% of sensor sales are for GMC trucks with a diesel engine less than 7 years old | Sensor sales will increase 11% if stocked in southern states with high avg. temperatures | High humidity forecasted will spike sensor demand by 21% next month. | Sensor data from vehicle in operation predicting early OE failure |
| **Advanced Reporting** Sensor sales increased by 8% over last year | | | **Action** We need to shift inventory closer to 11 key markets | **Action** Alert engineering team to pull up product launch |
| **Descriptive:** What has happened? | **Diagnostic:** What events happened? | **Predictive:** What will happen? | **Prescriptive:** What actions should be taken? | **Cognitive:** Self-learning feedback loop |

**ATC Think Tank**

## Business Profile

Callahan is, in some respects, typical of many small to mid-size aftermarket suppliers – privately held, dependent on legacy (often homegrown) business operating systems, insular, but successful through skilled, multi-generational leadership, solid products and strong customer relationships.

Nevertheless, Callahan is confronted with the realities of an increasingly dynamic business environment: more competition; rising operating costs, particularly due to the proliferation of part numbers required to service the North American car parc; increasingly sophisticated vehicle technologies; and ever-changing customer needs. Shops and other end users of Callahan's products are highly price sensitive, and many of the company's channel partners have added competing lines to address this threat.

The youngest member of Callahan's leadership team is Thomas R. "Tommy" Callahan III, fresh off seven years of undergraduate education at Marquette University. Tommy, while serving as an intern, had attended the 2018 ATC Conference as a guest of a committee member, returning from the event convinced of the need to establish a business intelligence function within his family's company.

Following his long-awaited college graduation, Tommy kicked off this BI journey with a board presentation summarizing the company's business/market intelligence capabilities:

- Callahan was largely dependent on spreadsheets generated by its 20-year-old ERP system;
- The de facto data "expert" within Callahan Auto Parts was an IT employee reporting to the Finance Director;
- Available reports were internal in nature: order, sales and shipment data, all of which were manually entered
- The company struggled to track point-of-sale movement by part number on a weekly basis, an activity that consumed significant administrative manpower. Data integrity was suspect;
- Callahan leadership conducted quarterly assessments of key business metrics, including sales, SG&A, returns, purchase volume, etc.;
- At end of year, family members conducted a "total business review," including P&L, detailed cost assessments, inventory turns, supplier contract reviews and more – with all reports consolidated withing an imposing, impossibly thick binder.

Supporting this BI activity was difficult given the company's comparatively outdated systems and processes as well as the lack of data engineers.

The company's greatest need, Tommy Callahan told family members, was to move beyond "gut-level" decision making. He believed the company, while still experiencing moderate growth, was falling behind its competitors, particularly in the availability and use of data to make strategic, fact-based decisions.

Although other members of the leadership team recognized these deficiencies, they were hesitant to invest in new technologies/capabilities that would not guarantee consistent, predictable, virtually immediate results.

Callahan Auto Parts was entrenched (some might say mired) in the **Basic Reporting** stage of business intelligence.

As noted in the Think Tank's previous white paper, moving beyond this stage requires, among other things, clear articulation of the problem to be solved:

*"…you cannot find a solution without knowing what you are trying to solve. The organization should understand the complexity of their data and define goals to reach an outcome. Setting clear expectations about outcomes and selecting projects that can meet ROI goals are vital to success."*

## 'Tommy Boy' Meets Data Analytics

Moving to the second stage of BI Maturity also requires executive buy-in. As previously noted, the Callahan Auto Parts leadership team is notoriously averse to investments in technology. Given their growing discomfort with the competitive landscape, however, as well as Callahan's recent launch of a line of premium brake pads, Tommy Callahan was able to secure funds to establish a modest business intelligence initiative and supporting team to set the stage for faster, more profitable growth.

Callahan Auto Parts was entering the **Analytics** stage.

While the new brake pad offering had been well received among channel partners and end users, Callahan sales and marketing team members and distribution partners were requesting deeper visibility into customer behavior. Not surprisingly, the announcement of the BI initiative triggered requests for more sophisticated data analytics projects, each with aggressive timelines. The floodgates have opened.

The company had built a small (3 person), talented BI team. It had also invested in the Microsoft Power BI solution to help automate standard reporting and meet the growing demand for custom reports. Other key enhancements/capabilities included:

- Dashboard interface covering KPIs on a daily (not yet real-time) basis;
- Access to third-party market data to more easily monitor sales by part and category and identify gaps in coverage;
- Weekly reporting of same-store sales, inventory turns and returns;
- Enhanced QBR: costs, sales, warranty, returns, purchase volume, coverage gaps, market share and white space;
- Enhanced EOY: turns, total business line review, adds/keeps analyses by line, assessment of buying power/supplier contract review, and more;
- Access to VIO data and part lifecycle analyses on national and select regional/local levels;
- Access to Motor data;
- OE part number and OE production forecast data;
- Access to part replacement rate data to begin to understand and manage product lifecycle;
- Market share and customer share-of-wallet;
- Customer behavior, channel share and more.

True, Callahan's BI team was still experimenting with many of these capabilities. But BI was firmly established as a core contributor to the company's long-term strategy. Moreover, early results have been promising. Among recent "wins" are the added ability to identify key portfolio enhancements; capture margin through strategic price adjustments; and establish processes aimed at achieving faster revenue growth, improved profitability and significantly better cash management. Though still growing into its new BI infrastructure, Callahan Auto Parts is quickly learning to trust – and act on – its data.

## Future State: Predictive

Although Tommy Callahan understood that his company's initial goal would simply be to advance to the Analytics stage, he is fascinated by the promise of predictive analytics. In fact, the achievements of elite organizations that have reached the **Predictive** stage were what first piqued his interest in business intelligence during that long-ago ATC Conference.

Success in the Predictive stage requires a rock-solid foundation in Basic Reporting and Analytics, with the time and effort to prepare, transform and ensure data integrity already having taken place.

The most appealing opportunities represented in this stage for Callahan and many other aftermarket suppliers are:

1.) Winning new customers and strengthening account loyalty through best-in-class **inventory optimization** capabilities; and
2.) **Influencing brand choice** through a deep understanding of brand performance at the ultimate point-of-sale. This, in turn, enables an organization to align its marketing and sales investments with the demonstrated preferences/emotional triggers of end customers.

Application of predictive analytics requires an additional investment in resources, particularly in data scientists to build, deploy and test predictive models and recommendation engines. They will work in concert with existing BI team members, including data engineers and analysts as well as BI steering committee members and the sponsoring organization's subject matter experts.

To achieve Callahan's BI objectives, this team might first set out to model demand by part number based on replacement rates and other merged data. Additionally, they might examine conversion rates and brand bias readings to model brand potential at various levels of the channel and/or by location.

## Future State: Prescriptive

To understand the differences between predictive and prescriptive analytics, Tommy Callahan resorted to a simple Google search. (He often lamented the fact that Google did not exist during his extended undergraduate career.) In any case, here's the explanation he found:

*"Predictive analytics forecasts potential future outcomes,*
*while prescriptive analytics helps you draw specific recommendations."*

In short, not simply actionable information but recommended actions based on previously defined objectives and operating realities, such as inventory constraints, supplier contracts, customer agreements, and more.

Callahan Auto Parts is years away from the **Prescriptive** stage, but its president could recognize the value of a solution that would assist employees in more quickly and consistently contribute to the company's goals. Tommy pointed to the current labor shortage facing many aftermarket suppliers, not to mention the extended time needed to train buyers, category managers and other employees to analyze and fine-tune the company's go-to-market strategies. Callahan could use prescriptive analytics to fill many of these gaps in manpower by automating add/remove inventory recommendations by trading area (inventory optimization) and identify updates to pricing, promotion and good-better-best value proposition (influence brand choice).

A wide range of solutions is available to assist Callahan Auto Parts and other aftermarket businesses in applying predictive and prescriptive analytics. Many of these solutions are detailed in **Appendix A**.

## Future State: Cognitive

Callahan Auto Parts' BI journey has already impressed many of the company's peers, including other manufacturers of aftermarket brake and filtration products. While an entrenched player with 8% to 9% market share, the company had not been considered a likely survivor in an industry undergoing significant change. Many friends and competitors alike believed Callahan's best days were behind it – especially when the company's reins were turned over to Tommy Boy.

But Tommy Callahan is full of surprises. His field sales force is now armed with BI support offering tangible value to longtime channel partners. Out-the-door sales are up and the new brake line is taking business away from larger, better capitalized competitors.

It is no longer inconceivable that this comparatively small company, with the right leadership and an unrelenting focus on the people, processes and technology of advanced BI, could become an industry thought leader. Ultimately, Callahan Auto Parts might even advance to the **Cognitive** stage, where it would combine multiple intelligent technologies, such as AI, machine learning algorithms, deep learning models, etc., to draw valuable inferences from existing data and patterns. In this stage, the company's BI infrastructure would be designed to mimic the logic and processes of the human brain, leading to faster decisions and continually improved outcomes. (The heck with Google, if Tommy had access to these solutions back at Marquette, he might even have graduated in four years.)

As one example, Callahan could replicate the knowledge and decisions of a store manager/inventory manager with respect to stocking recommendations, based on location, competition, customers and financial objectives. Also possible would be making dynamic/situational changes to product price positioning and personalization.

Advancing to the Cognitive stage is neither easy nor inexpensive. The company would need additional data scientists to manage machine learning and statistical model development. Perhaps Callahan will someday reach this level of BI maturity – in fact, it might eventually become mandatory in an increasingly data-driven world. But an organization that could reach this stage today would have a powerful competitive advantage in the aftermarket, regardless of product category.

In advancing to the Cognitive stage, aftermarket companies would be well advised to explore the technology stack detailed in **Appendix B**.

## The Journey Toward Maturity

Tommy Boy, of course, is a work of fiction. Nevertheless, every industry – including the automotive aftermarket – is replete with firmly entrenched, though perhaps competitively challenged, manufacturers like Callahan Auto Parts.

For those who know Callahan's story, any references to Tommy Boy and "maturity" in the same sentence might seem incongruous. After all, Tommy needed seven years to complete an undergraduate degree in General Studies.

In truth, however, his story and the company's (for some) surprising adventure into business analytics are valuable reminders that discovery breeds innovation, even at the most basic levels. As articulated so well in the BI and Analytics Think Tank's 2021 paper, "…the worst thing to do is not even try…Take the marathon mentality with easy wins and show the value at lower maturity levels."

Tommy Callahan III might still be at a comparatively low maturity level. But he is moving in the right direction. If only every other aftermarket supplier could say the same.

## Appendix A

**PREDICTIVE/PRESCRIPTIVE Analytics Solutions**

1. **Microsoft Azure Machine Learning**
   - This is a cloud service for accelerating and managing the machine learning project lifecycle.
   - Machine learning professionals, data scientists, and engineers can use it in their day-to-day workflows.
   - One can use it to create a model in or use a model built from an open-source platform, such as Pytorch, TensorFlow, or scikit-learn.
   - MLOps tools help you monitor, retrain, and redeploy models.

2. **AWS SageMaker**
   - Full integration with many parts of the AWS ecosystem makes this a great option for AWS-based operations
   - Serverless options for deployment allow costs to scale with usage
   - A marketplace facilitates buying and selling models and algorithms with other SageMaker users
   - Integration with various AWS databases, data lakes, and other data storage options make working with big datasets simple.

3. **Alteryx**
   - Specializes in no-code and low-code analytics building blocks to design repeatable workflows.
   - The platform is designed for companies that want to provide self-service analytics and data science for all departments.

4. **IBM Watson Studio**
   - IBM continued to innovate SPSSs core capabilities and integrated them into its more modern Watson Studio on IBM Cloud Pak for Data platform.
   - This consolidated offering combines a broad range of descriptive, diagnostic, predictive and prescriptive analytics functions.
   - The platform simplifies predictive analytics for expert data scientists and improves collaborative data science for business users.

5. **SAP Predictive Analytics**
   - The tool supports advanced users and business users through various features that simplify data aggregating, predictive modeling and model analysis across separate user interfaces.
   - Automated analytics helps business users with data preparation, modeling, social graph analysis, recommendation and predictions.
   - Expert analytics helps experts explore various statistical techniques, visualizations and code applications using the R programming language.

6. **SAS**
   - Core offerings for predictive analytics include SAS Visual Data Science, SAS Data Science Programming, SAS Visual Data Decisioning and SAS Visual Machine Learning.

### 7. H2O Driverless AI
- Newer offering
- Simplifies AI development and predictive analytics for both experts and citizen data scientists through open source and custom recipes.
- Has capabilities for feature engineering, model selection and parameter tuning, natural language process and semantic analysis.

### 8. RapidMiner
- Simplifies extracting data from a diverse set of sources, cleaning it and incorporating it into various predictive modeling workflows.
- The company offers both commercial and free versions of its core products that allow anyone to get started and learn the basics.
- RapidMiner Notebooks simplify the development of predictive analytics models for both novices and experts alike.
- The company also provides various augmented capabilities for data prep (Turbo Prep), model generation (Auto Model) and model deployment (Model Ops).
- A new feature-sharing catalog simplifies the sharing of predictive models across the organization.

### 9. TIBCO Statistica
- A lot of collaboration and workflow features are built into the tool to make business intelligence possible across an organization.
- It also integrates with a wide range of other analytics tools, making it easy to extend its capabilities.
- This is also the only tool on the list that emphasizes its IoT/embedded capabilities.

### 10. Q Research
- This is the predictive analytics solution for market research and marketing analytics.

### 11. Logility
- Designed specifically for supply chain management,
- Logility is a data analytics and predictive tool built inside of a business intelligence platform.
- Logility's predictive features use comparative analysis of existing data to build "what-if" modeling for smarter supply chain optimization.

## Appendix B

**COGNITIVE Analytics Solutions**

**1. SCIKIT LEARN**
- One of the most well-known ML libraries. It underpins many administered and unsupervised learning calculations.
- It expands on two essential libraries of Python, NumPy and SciPy.
- It has functionalities for the following algorithms: Classification, Regression, Clustering, Preprocessing, Model Selection and Dimensionality reduction.

**2. TENSORFLOW**
- This is an end-to-end open source platform for machine learning
- It utilizes an arrangement of multi-layered hubs that enables you to rapidly set up, train, and send counterfeit neural systems with huge datasets.

**3. KERAS**
- This is a high-level open-source neural network library that has a Python interface.
- This is a very user-friendly tool and is built on top of TensorFlow
- It is used for fast prototyping that facilitates the completion of state-of-the-art experiments from start to end with little or no delay.
- Keras run seamlessly on CPU and GPU.

**4. CAFFE**
- This has been developed at the University of California and has a Python interface.
- It has its best application in academic research projects and industrial disposition.
- It has a processing power that exceeds 60 million images per day.

**5. PyTORCH**
- This is an AI system created by Facebook.
- It has a Python-based interface for AI development. It also has a C++ interface.
- Pytorch has a specific USP. It's supported by all major public clouds for flexible developments.
- Use cases include computer vision, natural language processing (NLP), and language translation.

**6. CNTK**
- This is a Microsoft Cognitive Toolkit, that is also built on similar lines as TensorFlow, but not as easy to deploy.
- It has a broader range of APIs such as Python, Java, C, C++ and focuses on creating deep learning neural networks.

**7. AUTOML**
- This his is one of the top Artificial Intelligence tools.
- It automates the processes involved in articulating a real-world problem using machine learning techniques.
- This helps a data scientist to shift his focus from mundane repetitive tasks like modeling to handling problems at hand.

- This tool can also be extremely useful for someone who doesn't have a lot of experience in the field of machine learning.

**8. GOOGLE ML Kit**
- Google ML Kit, Google's machine learning beta SDK for mobile developers, is designed to enable developers to build personalized features on Android and IOS phones.

**Technology Council**

**About the AASA Technology Council**

The AASA Technology Council (ATC) is the aftermarket's leading business technology forum where attendees network and exchange best practices related to current and emerging technologies that support members' efforts to reduce costs, improve efficiencies and pursue new business opportunities.

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