



EBOOK

**EMPOWERING  
CONSUMER  
ELECTRONICS WITH  
AUGMENTED BATTERY  
MANAGEMENT SYSTEMS**

VOLTAIQ

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# I. The Ongoing Boom In Consumer Electronics

Half of the world's population now owns a smartphone, amounting to approximately **four billion individuals**. And **92% of internet users** access the internet via mobile devices. This tells us something that all consumer electronics (CE) companies already know: consumers are crazy about electronics.

Globally, revenue for the CE market **exceeds \$1 trillion annually**. A large number of businesses are attempting to capitalize on this demand. And because almost all CE products rely heavily on batteries, OEMs need to continually **improve battery performance** - longer runtime, faster charging time, and better reliability - to optimize the end-user experience.

However, **batteries are complicated**, and they require meticulous construction and monitoring to ensure safe use and long-term durability. Moreover, many Tier 1 battery makers are focused on the automotive market, leaving CE short.

**The Battery Management System (BMS) plays a key role in helping CE companies optimize their battery performance.**

BMS hardware is developing at a rapid pace. However, product OEMs are not fully optimizing how BMS algorithms manage the battery in order to assure optimum performance and, ultimately, create the best end-user experience for their products. To be competitive in the coming years, CE manufacturers need to get better, faster, and more agile at BMS algorithm development.

**Improving BMS algorithm development means onboarding a new approach to the BMS that takes advantage of the most cutting-edge battery tech: **Enterprise Battery Intelligence**.**

EBI speeds up the process of obtaining optimized control algorithms, enabling you to either complete the task faster, or obtain an even more optimal set of control algorithms in the same amount of time.



## II. The Importance of the BMS

The Battery Management System (BMS) is critical in ensuring that batteries are safe, durable, and high-performing. The BMS is a piece of hardware that controls the battery using algorithms. Its primary objectives are, in the following order:

1

Over the course of its life, the BMS makes sure the entire battery is never in a hazardous situation, like working when it is too hot, or any other event that could result in catastrophic failure leading to fire or explosion. For the same reason, the BMS also prevents the battery from becoming overcharged, via a cutoff voltage that prevents further charging.

2

In order to prevent a flood of warranty returns stemming from a battery going dead nine months into a twelve-month warranty, the BMS ensures that the battery lasts through the entire required product lifetime.

3

The BMS also ensures the battery meets application performance requirements. These requirements include device runtime on a charge, delivering power during pulse loads (e.g. a cell phone connecting to a remote tower, or a power drill being used), charging quickly, and retaining battery capacity over the product's life.

Without the BMS, a CE device battery would not be able to meet any of these safety, reliability, or performance requirements. As such, the BMS is crucial to a successful battery-powered consumer product.

# The Challenges of the Legacy Approach to BMS Development

**When designing a BMS for a CE product, the most technically challenging part of the process is writing the battery control algorithms that run on the BMS hardware components.**

It is necessary to test hundreds of battery cells under controlled settings before developing a BMS algorithm in order to completely define battery behavior and operation across the product's lifespan and over a wide range of application scenarios.

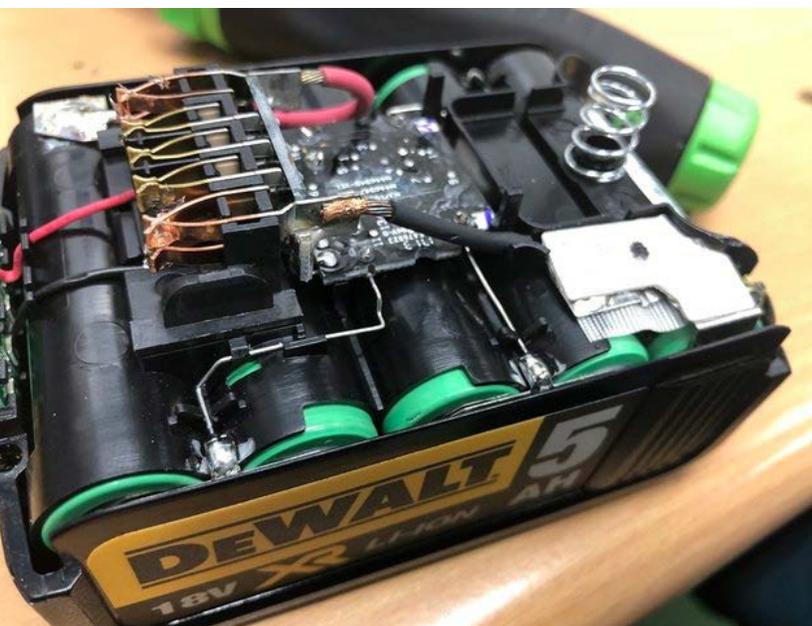
A large quantity of data is generated as a result of this extensive testing, which must be processed and evaluated to develop this deep understanding of the battery.

Once BMS development is complete, additional testing must be performed to confirm that the entire system is functioning properly and safely, generating even more data to analyze.

This battery data analysis and processing is a key part of the CE product development, an endeavor that involves combing through huge data files to evaluate whether or not the battery is delivering the desired performance.

**Data processing and analysis are normally carried out by teams of engineers poring through spreadsheets – an extremely time-consuming and labor-intensive process.**

But by utilizing big data and relevant tools to their full potential, BMS development can be significantly improved and expedited. Battery analysis is such a workflow bottleneck that engineers are missing out on possibilities to obtain the maximum performance from the battery-BMS combo as a result of the time they are wasting on labor-intensive tasks. That is a critical drawback, because the primary goal for OEMs is safety, and they must ensure that they get it right the first time, every time.





### III. The Advantages Of The EBI-Powered BMS

EBI (Enterprise Battery Intelligence) enables CE manufacturers to optimize and speed up the development of their battery management systems. An EBI platform can **automate** the process of collecting and analyzing battery data automatically to derive critical insights. This creates a host of benefits:

#### **Faster BMS Development**

An EBI system automates the processing of data and the generation of key performance indicators (KPIs) that are used to power BMS control algorithms. Because an EBI system effectively computes thousands of extra variables that provide deeper insight into battery activity, insights that can go beyond the essentials,

BMS development can be completed more quickly and with greater efficiency than before.

**OEMs will be able to complete the design and engineering of the BMS and ship the product faster with the help of the EBI system.**

It is also more efficient because engineers no longer have to rely on the time-consuming spreadsheet-based technique that was previously utilized to evaluate the results. The elimination of manual data processing enables engineering teams to save time and devote their attention to developing and evaluating battery control algorithms for BMS development, rather than manual data processing.



## Better BMS = Better Overall Product

Engineering productivity increases as a result of engineers no longer having to sift through enormous amounts of data. CE manufacturers also gain valuable resources that can be used to produce a better overall product. The improvement in the BMS process will enable battery testing to be broadened to include a wider range of application scenarios, resulting in greater security for battery performance once the battery is on the market.

Engineers may execute tests with a higher resolution, to deliver a “supercharged” BMS, enabling them to generate a more precise SOH (State of Health) calculation for regulatory compliance and better consumer experience.

**EBI completes all of the data collection and analysis tasks, enabling engineers to focus on product development and improvement rather than data collection and analysis.**

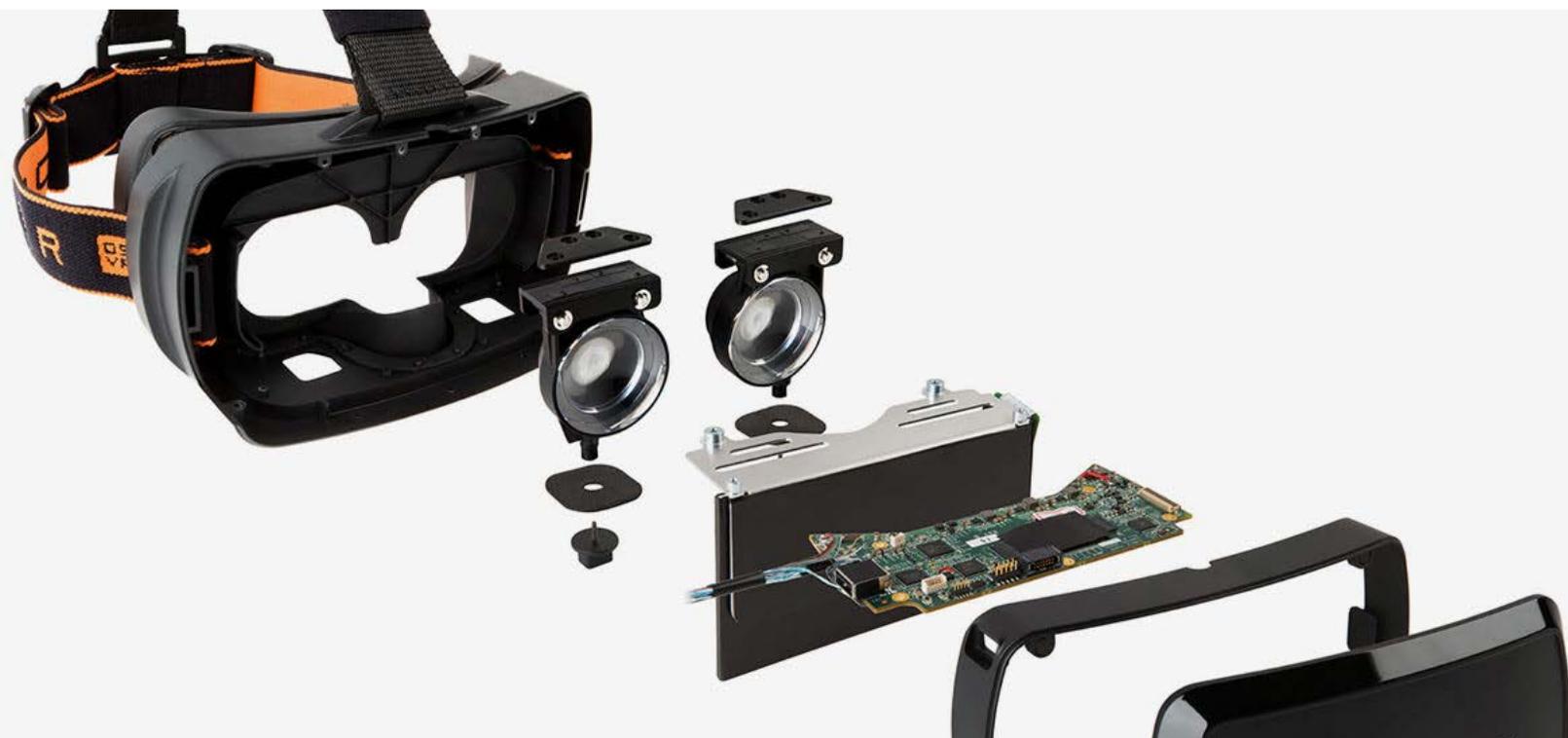


## Added After-Sale Value

In addition to providing a key link to powerful remote computing resources that provide additional value to consumers, an EBI-charged BMS can also deliver additional post-sale value. Given that the industry is already moving toward cloud-connected BMS, an EBI platform becomes a requirement to getting the most out of a cloud-connected BMS.

**It is also possible for an improved BMS to anticipate maintenance requirements and to issue alerts if any safety issues are identified.**

A BMS driven by EBI enables CE manufacturers to gain a better understanding of their products and consumers' behavior, enabling them to make future product enhancements and modifications.





## IV. An Upgraded BMS: Why Buying EBI Is Better Than Building

An EBI platform will benefit any company that uses batteries while developing their battery management system. This is due to the fact that using manual data analysis methodologies and home-built battery analytics can ultimately result in engineers facing development delays and unsatisfactory performance.

Overall, BMS development involves a large-scale data analysis effort. Depending on home-built tools or no tools at all other than spreadsheets is a recipe for a failed product. Because of this, engineers need an EBI solution in order to do battery analysis in a more efficient and effective manner. However, in the case of EBI, the prospect of building is substantially more onerous than using a leading commercial EBI product.

# Why? Because an out-the-box EBI solution is:

## ✔ Built by professionals

Created by battery industry veterans, PhD battery scientists, and experts in enterprise-scale analytics software.

## ✔ Continuously improving

The platform is updated and upgraded on a regular basis with benchmarks from industry leaders in every battery sector and application.

## ✔ Ready to use

No need to assemble a team of experts to start using the platform. Get it up and running in as little as 5 days (30 on average).

## ✔ Good value for money

A ready-made EBI platform offers fixed annual costs, clear subscription pricing, and a cheaper overall cost of ownership.

## ✔ Capable of full product lifecycle coverage

The development of a BMS is only one aspect of the battery-powered product lifecycle. However, EBI adds value and benefits throughout the rest of that lifecycle, enabling companies to:

- Bring products to market faster.
- Ensure a high-quality battery supply.
- Accelerate manufacturing ramp-up.
- Minimize battery product risk.
- Optimize systems in the field.
- Maximize financial performance.

**Contact us and experience the Voltaiq difference today.**

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## About Voltaiq

Voltaiq has built the industry's first Enterprise Battery Intelligence (EBI) software platform, helping its customers optimize battery performance, reliability and financing, while avoiding costly recalls and catastrophic battery fires. Voltaiq's EBI platform is the only purpose-built, fully automated software solution that marshals vast quantities of battery data from across the full product lifecycle, providing a window into real-time battery function and a detailed view into future performance and behavior. Founded in 2012 by veteran battery and software entrepreneurs, Voltaiq's global customer base includes industry leaders in transportation, consumer electronics, energy storage, and the full battery supply chain. For more information, please visit [www.voltaiq.com](http://www.voltaiq.com).