

A BRIEF OVERVIEW OF THE MAHD™ FRAMEWORK



It's **Agile**,
but **Modified**
for **Hardware**
Development



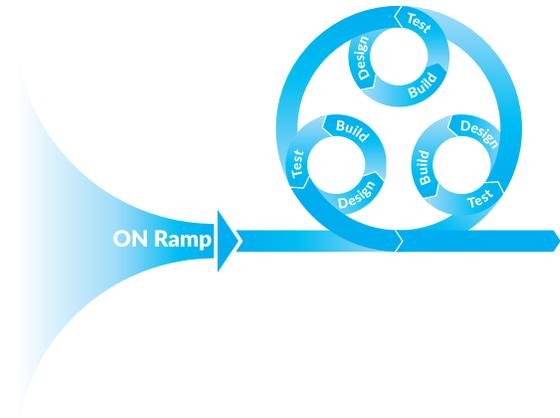
What Is MAHD?

Agile Principles. Methods Optimized for Hardware.

Software teams have discovered Agile is superior to traditional PD processes to enhance customer focus, accelerate development and increase project success rates. Hardware-based teams that need to integrate mechanical, electronic and firmware elements can also get these benefits. However, Agile methods were not designed for the needs of physical product development.

The Modified Agile for Hardware Development or MAHD (pronounced /mad/) Framework is built on Agile principles but optimizes the methods for hardware development to:

- Adapt to new insights, but allow designs to freeze
- Accommodate a range of disciplines (including SW)
- Incorporate all production considerations
- Integrate with Lean, Six-Sigma or other systems



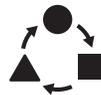
The Benefits of Agile for Hardware

Just small improvements in quality, value or time-to-market can provide huge increases in profit and ROI. Companies implementing the MAHD Framework see a range of benefits that lead to real business results:



Intense Focus

Autonomous cross-discipline teams prioritize work based on customer needs to drive fast decisions.



Adapt to Change

As learning occurs, attributes and tasks are re-prioritized each iteration with minimal schedule impact.



Faster Kickoffs

MAHD project kickoffs save months over traditional methods while enhancing strategic focus.



Proven Progress

With IPAC Iterations, internal and external stakeholders can see and touch real progress with each learning cycle.



Reduced Risk

Using learning cycles to focus on the most critical questions early in development naturally reduces project risk.



Engaged Customers

Every Iteration enables customer engagement opportunities to gain valuable insight for refining the product.

Key MAHD Elements

Agile Principles Optimized for Physical Products

Hardware is different than software — requirements must be frozen to ship, prototypes cost money, incremental features impact whole designs, etc. To address these unique needs of physical products, MAHD rethinks Agile tactics while maintaining the benefits of Agile principles.

Four Foundation Principles

Applying Agile Methods Without the Dogma

While the original Agile manifesto shares 12 Agile principles, the MAHD Framework focuses on 4 core principles that we have found to drive the right mindset and NPD activities for success.

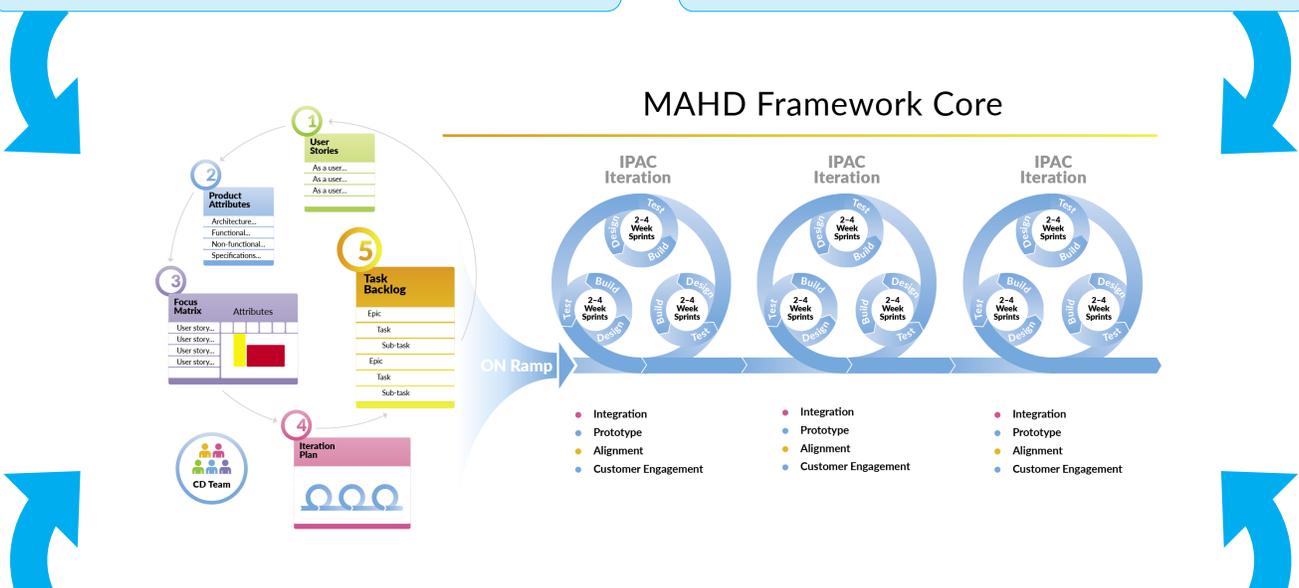
- 1 Short development cycles to drive learning and adapting to change
- 2 Accountable, autonomous and focused teams
- 3 Validating work at the end of each development cycle
- 4 Applying intelligent rapid prototyping strategies

The MAHD On-Ramp

The MAHD On-Ramp includes 5 collaborative activities to clarify customer needs, set goals, evaluate risks and identify important areas for innovation. After a few short sessions, the team is ready to execute.

IPAC Iterations

An essential difference of the MAHD Framework from Agile for SW is the use of IPAC Iterations. These milestones align disciplines while driving prototype and customer engagement strategies.



A Focus On Success Factors

The MAHD Focus Matrix is a powerful hardware development tool used to highlight areas of risk and innovation potential to form the basis of prioritization and Iteration Plans.

Production and Launch Readiness

Design and technical decisions are systematically nailed down through IPAC learning cycles. As the team nears product completion, IPAC Iterations focus more on production challenges and preparing for launch.

Picture Going MAHD

Plan. Execute. Learn. Repeat.

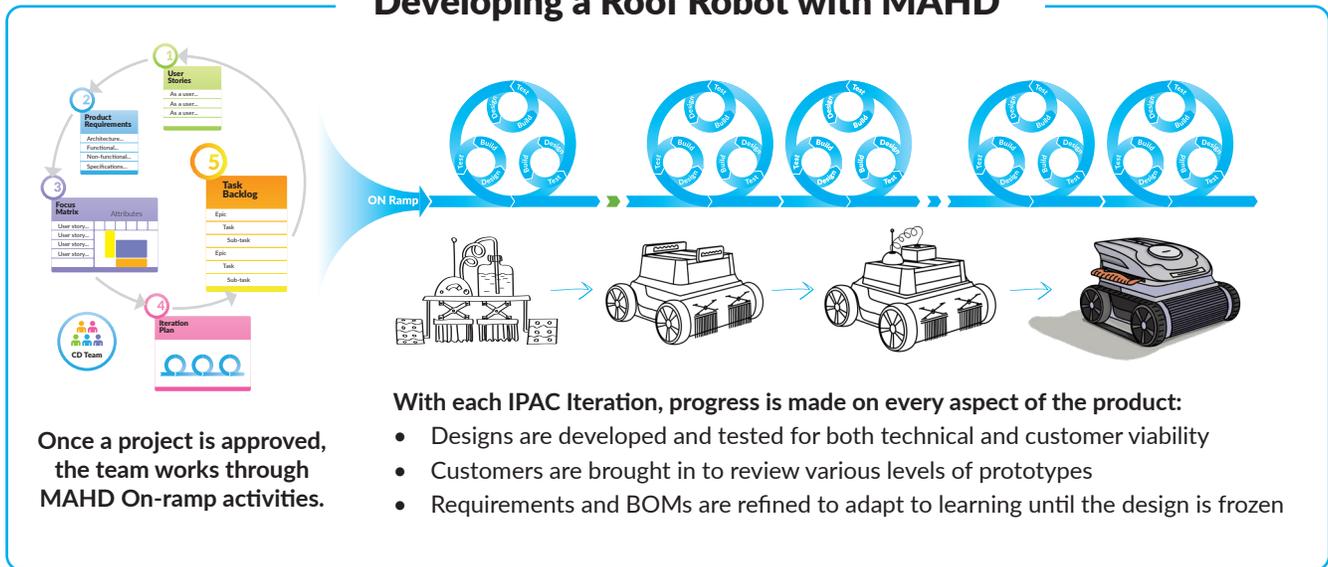
Consider a recent project where you may have used a traditional process. Did the project get initiated with a fast, focused start? Were you forced to make painful tradeoffs late in development? The MAHD Framework eliminates these common challenges.

To see how MAHD enhances NPD performance, it may help to visualize a new product being developed.

MAHD Differs from Waterfall

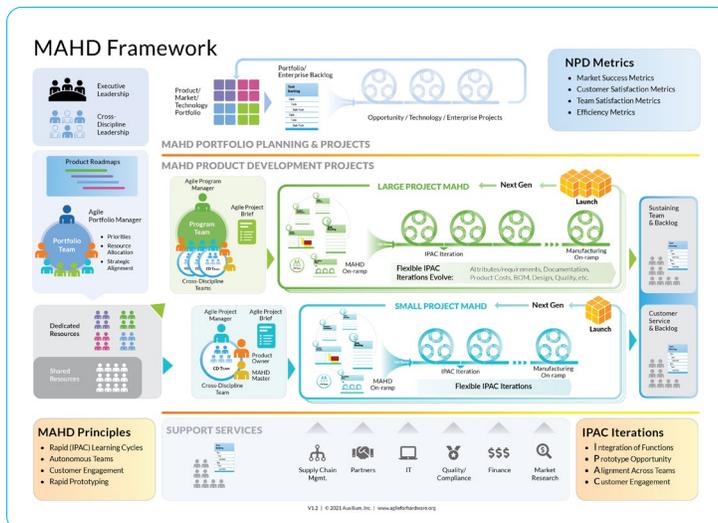
- 1 Teams start with intelligent uncertainty
- 2 Requirements evolve through learning
- 3 Real insight drives fast, sticky decisions
- 4 Walls between disciplines are removed

Developing a Roof Robot with MAHD



Scaling MAHD for Any Complexity

While every MAHD project uses a core set of methods, the MAHD Framework can be scaled to manage projects ranging from simple cost reductions to whole product portfolios. Visit agileforhardware.org to walk through an interactive model of the Complete MAHD Framework.



Scaled MAHD utilizes:

- **A MAHD team-of-teams approach**
Major projects use coordinated sub-system or functional agile teams.
- **New responsibilities**
Additional skills and responsibilities are needed to manage larger projects and whole portfolios.
- **Multi-level Iteration Plans**
For large systems, multiple levels of Iteration Plans manage each major workstream.

How Is MAHD Different?

There are many ways you can approach adding agility to your current NPD process. We often see the following three methods compared to the MAHD Framework. All of these can work given enough time and tinkering. However, the MAHD Framework was developed with HW development needs at its core. Teams can quickly learn and trial the methods to determine if MAHD is a better way.

Scrum for HW



Scrum for HW applies basic agile methods to HW development.

Hybrid Stage-Gate®



Applying iterative development cycles between NPD gates.

SAFe®



The Scaled Agile Framework for Enterprise scales SW efforts.

How the MAHD Framework Compares with Other Methods

ATTRIBUTE	MAHD	Scrum for HW	Hybrid Stage-Gate	SAFe
Project Kickoffs	Fast	Fast	Very Slow	Medium
Learning Curve	Fast	Fast	Medium	Slow
Designed for HW	Yes	No	Yes	No
Production Considerations	Yes	Limited	Yes	Limited
Discrete Products Focus	Yes	No	Yes	No

Who's Going MAHD

Agile is quickly being adopted for hardware-based product development efforts by companies in a wide range of industries. Contact us for more detailed case studies and success stories.



CATERPILLAR®

Thermo
SCIENTIFIC

Whirlpool
CORPORATION

Tektronix®

SIEMENS
Healthineers



Getting Started

The Best Way to Implement Agile Methods Is to Use Agile Methods

An advantage of Agile methods is that it's easy to get started quickly and expand as you learn. Regardless of your situation, one great way to start with the MAHD Framework is by initiating a pilot program. The following table outlines three ways to get started.

1

SELF-LEARN AND TRY

The simplest approach to experiment with the MAHD Framework

- Join the MAHD Community
- Identify a semi-complex project
- Work through MAHD Framework
- Learn, improve and repeat

2

TRAIN AND PILOT

The fastest way to start is to train a focused team and pilot a project

- Identify a pilot team and project
- Get hands-on MAHD training
- Execute MAHD w/facilitation
- Learn, improve and repeat

3

ASSESS AND PLAN

This is a great option if you already know that Agile is right for you

- Establish clear NPD goals
- Identify areas for improvement
- Develop a roadmap w/milestones
- Pilot, learn, expand

Contact: info@agileforhardware.org to get started

A Brief History of MAHD

Agile Manifesto
17 "independent-minded"
SW leaders develop 12
Agile principles



2001

Scrum Alliance Founded
Leads to rapid adoption in
SW communities



2006

MAHD Initiated
With industry input Team
Auxilium modifies Agile
methods for HW



2014

MAHD Website Launched
Tools, methods and
principles shared broadly



2017

Complete MAHD
Scalable Framework
published based on
community feedback



2020



Contact Us

The MAHD Community:
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