

Step-by-Step

MAHD

Modified Agile for Hardware Development

The Smart Coffee Maker Project

Part 8 of a 9-part series to walk through an agile development project from concept to launch

Step 8:

Iteration 5 Complete: Launch Readiness



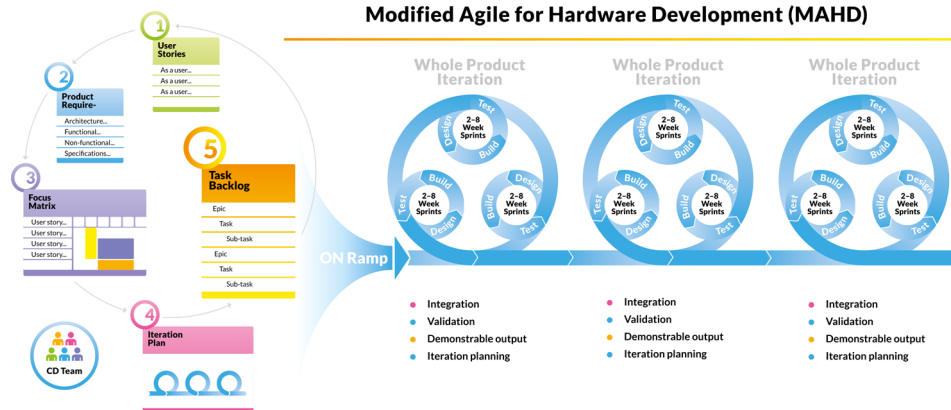
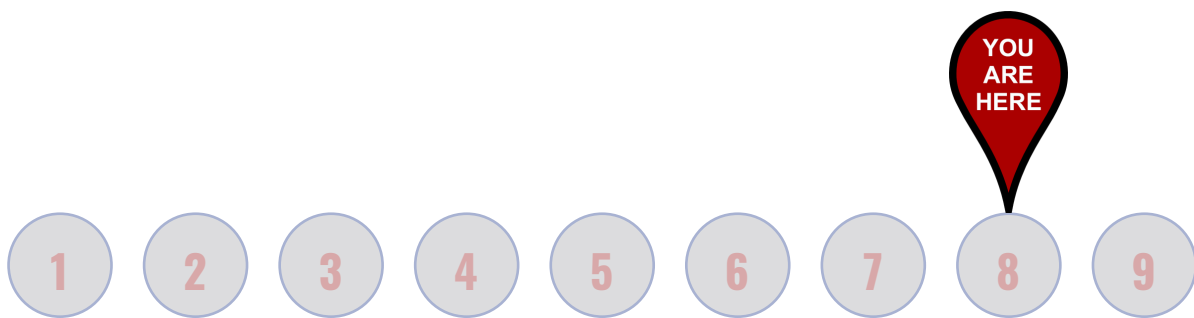
By Dorian Simpson and Gary Hinkle

A Quick Intro to MAHD

Agile methods have proven superior over traditional product development processes to quickly adapt to customer needs, reduce waste and accelerate development. However, the application of agile requires significant changes to support the needs of hardware products. This led to the development of the Modified Agile for Hardware Development (MAHD) Framework – an open-source initiative to embrace the principles of agile while recognizing hardware’s unique needs.

THE COFFEE MAKER PROJECT: STEP-BY-STEP AGILE IN NINE STEPS

To help practitioners visualize the MAHD Framework, we have developed a series of nine articles to explain how agile methods and tools can be used for physical products, who should be involved, the deliverables for each step and tips for how to overcome challenges. We hope you'll join us on this journey as JavaBrew uses the MAHD Framework to develop an innovative new coffee maker.



The MAHD Framework: Similar to Agile for Software, but with Important Differences

Learn More

To learn more about the MAHD Framework, download related ebooks and whitepapers, or sign up for e-learning opportunities, visit www.agileforhardware.org.

Step 8: JavaBrew Prepares for the Product Launch

THE SITUATION

In our last step (Step 7), the JavaBrew team just completed their first iteration that focused on defining their new smart coffee maker, refining their value proposition and getting organized. During the team's MAHD On-ramp planning they originally planned for a total of six iterations (and many associated sprints) to complete the project. Overall, the team has been able to keep to this iteration plan but made a lot of adjustments along the way (as to be expected with agile). This step jumps forward ten months to the end of Iteration 5 where they will need to make several tough decisions concerning the product's readiness for production and market launch.

It's now time to review their situation as well as prepare for Iteration 6. This final project iteration will focus on executing their product launch. To recap what has happened up to this point:

1. After Iteration 1, the team knew they were on the right track with their smart coffee maker but had some big questions concerning the overall project schedule, management acceptance of the project and which features would drive customer demand.
2. Through each subsequent iteration the team developed incremental prototypes including a preliminary brochure, a 3D animation, rough product mockup and several functional prototypes at different levels of functionality (along with their mobile phone app) to gauge customer and retailer interest. They used a customer panel of 30 consumers and 4 targeted retailers to gain feedback from each prototype.
3. It is the customer feedback based on the last prototype that concerns the team now. Is the product really ready for launch or must they delay the launch in order to fix a big problem?

It's Friday afternoon and the team has gathered in the project room ready for their iteration review. Jordan, the Agile Project Manager will facilitate the review and lead the discussion.

AGILE ACTIVITIES

In this step, the team will plan two levels of reviews as is typical at the end of a MAHD Iteration. The first review will focus at the higher iteration level to review the status and results of the overall project and Iteration Plan, and the second review will define specific tasks for the next sprint. Since the looming question is, "Are we ready to begin executing a product launch?", let's focus on this challenge.

To begin the meeting Lynda (the Product Manager for their new coffee maker) shared the overall project goals along with the most important user stories. As with every iteration review, they discussed the status against these goals as shown in the following two tables.

Project Goals Vs. Status

Value Drivers	Status	Next Steps
Attractive Design: Pleasing, fit with decor, clean, modern.	On target.	Finalize packaging to match.
Quality of Coffee: Taste, consistency, flexibility.	* Bean option feature problem.	Fix and test.
Long Term Experience: Maintainable, functional, durable.	* Bean option feature problem.	Fix and test.
Smart: Easy, cool, intuitive, new use cases.	On target.	Refine and test.

(*) The gating issue preventing a successful launch

Top User Stories Vs. Status

User Stories		Status	Next Steps
As a consumer, I want... So that...	So that...		
... to automatically add coffee and water as needed	... I don't have to fuss with these when I want coffee	Met. Customers are OK with manually loading water.	Next generation add water source connection.
... set the maker from anywhere in my home	... I can make coffee while working, watching TV or anything else	Met. Customers love the app, but some work left to make it simpler.	Prioritize the use cases and update. Test on all phones.
... to control the timing	... I can have coffee exactly when I want	Met.	None
... to select the type of coffee based on the app user's profile *	... each person in the home can have their preference	App implemented. Fix bean contamination problem.	Redesign and test.
... the appliance to be reliable	... I don't spend time "debugging" my coffee maker	OK. But won't know until bean selection fixed.	Continue testing
... an attractive appliance	... it looks good on my counter and I can be proud of my investment	Met. Customers love the design.	None
... to enjoy hot, fresh coffee the way I like it *	... I can always enjoy coffee without compromise	This is a problem! Grinder not clearing out previous selection.	Redesign and test.

(*) These were added and prioritized after various prototype and customer feedback cycles. Note that some "high importance" user stories were also lowered in priority after feedback such as "... to avoid using filters."

Jordan also shared Iteration 5 goals and status as shown here:

Prototype	Key Questions	Milestones
Product Ready Prototype	<ul style="list-style-type: none"> • Is it ready for production? • Is the quality “good enough?” • Are cost targets met? 	<ul style="list-style-type: none"> • BOM complete • Launch plan complete • Final tooling • Compliance testing plan • Certifications submitted

A Brief History of Decisions

To clarify the current problem, Lynda walked through a bit of history. Based on their prototypes and customer feedback, including a 3D animation based on the graphic of the coffee-maker as shown in Exhibit 1, they made several important decisions throughout the preceding iterations:

1. They confirmed that customers were fine with the absence of a physical interface so the decision was made to remove it. This feature was seriously debated inside JavaBrew, but both customers and retailers loved the sleek design that included only an on/off switch. The team and executives were convinced there was no need for an expensive LED display or complex array of controls.
2. While customers thought the *idea* of voice control was cool, they did not think it was important and would even add unnecessary complexity. The decision was made to kill it.
3. Customers loved the “smart” features and app. However, the coffee machine needed to do more than just make coffee, provide status, set timing, etc. At the top of their list was the desire to choose from a variety of beans. For example, one might want a dark roast in the morning and a Mexican coffee after lunch. And often the consumer’s spouse preferred a different flavor or type of bean.

To satisfy this last customer need, the team decided to include the feature to support multiple types of beans. As discussed in earlier steps, JavaBrew hoped they could defer this feature to a new, higher-end model, but the feedback was clear — this new feature added significant value both to the smart functionality as well as the overall device and customers were OK with a higher price.

However! Now the team faced a huge problem. JavaBrew had not built a machine like this before and were having mechanical problems. As their new maker switched beans, it would leave a residue of the previous bean selection and disrupt the flavor of the new coffee. This was especially a problem if the user only wanted to make a small quantity since the newly made coffee would consist of up to 20% of the old bean. If they released the product with this known problem, it would likely lead to low customer ratings, high product returns and a failed product. But if they take the time to fix it, they will assuredly miss the holiday selling season! *So now what?*

Taking a short aside on how agile methods can deliver better results, the good news is the team was very confident that they had the right product for their market. Early in the development process they were able to strip features that weren’t important, such as the water connection and permanent coffee filter, and add the features most important for success. This provided necessary focus that was often lacking in their previous projects. Also, in the previous iteration,

Frank, their head of mechanical design also identified the new multiple-bean design as a major risk. In anticipation of the problem, he had already lined up an external design firm that had the resources and know-how to help. They could work fast, but it wouldn't be cheap.

To move ahead, the team agreed to develop a quick cost/benefit analysis for the available options so management could make a quick financial decision. The first option was to get design and test from outside. If all went well, this would allow the team to meet their schedule and hit the holiday selling season. A second option would be to fix the problem internally. The mechanical and design group estimated this would add at least a full iteration (about 6 weeks) to the schedule. The team believed the best decision would be to add resources, but of course, their CEO needed to approve the funds.

In addition to preparing for this important decision, the team continued planning for Iteration 6 and the next sprint.

Iteration 6 Planning:

After reviewing the backlog and iteration plan again the team dove into planning for their final iteration as shown in the following table. They knew that if their CEO did not approve funds to get help with the mechanical design, this plan would need to be modified. They would do this in the next sprint planning session.

To refresh the team, Jordan shared Iteration 6 goals:

Prototype	Key Questions	Milestones
Production Units – continue beta testing	<ul style="list-style-type: none">• Are retailers ready to take orders?• Can we hit the forecast?• Is the sales team ready and engaged?	<ul style="list-style-type: none">• Pricing/forecast established• Production ready• Marketing calendar• Sales and channel ready

Iteration 6 is planned to take six sprints. If they can resolve the mechanical issue, finalize the design and order parts by the end of the 2nd sprint, they can hit this schedule. This is a big risk, but with renewed focus, the team is confident this can be achieved.

STEP 8: CONFLICT AND RESOLUTION

During this iteration, with the exception of the multiple-bean contamination problem discussed earlier, there was actually minimal conflict since all the major decisions had been made throughout the agile process. While Jim, JavaBrew's VP of Engineering, is still skeptical that customers will be happy without a physical interface ("What will customers do if they don't have their phone available or WiFi is not working?", he often stated), he is willing to accept the consumer and retailer feedback.

The added multiple bean feature may have easily created serious upheaval in the team. Many people in the company believed this was an unnecessary extravagance and would put the schedule and target cost at serious risk. Some of them even feel their concerns have been validated with the contamination problem that was found so late in development. But they made this decision early in Iteration 3 based on clear customer feedback and executives felt it was the right decision. Luckily, the risk was also assessed early and Frank was instrumental in identifying a solution to the mechanical design problem.

However, the big question still loomed, "Can we fix the bean contamination problem and still keep to the schedule?"

STEP 8: OUTCOMES

The iteration planning results from step 8 were similar to the outcomes of every iteration – the backlog was updated, the Iteration Plan was revised and decisions were made. We will not share all the details since by now you can likely imagine how tasks were selected from the backlog to plan their next sprint and other agile artifacts were updated.

We will, however, share the result of the management discussion for how the team would resolve the contamination problem.

The Schedule/Feature/Cost Tradeoff Decision

Lynda and Jordon took the action to prepare the cost/benefit analysis for each option and present them to their senior team. Several other key players, including Jim and Frank, joined them for discussion. They first prepared for the meeting by asking JavaBrew's CFO and CEO what was most important to them when making this decision based on the company's strategy and situation. The response was "we need to hit the holiday selling season with something exciting that will sell." This seemed obvious enough, but good to hear first-hand.

Working with the CFO's financial analyst, Lynda prepared three pro forma P&L estimates based on fully burdened expected product costs, expected price points and estimated sales forecasts. One scenario included the cost of outsourcing the refinement and test of the bean selection design. This would allow them to launch earlier with lower risk. The second scenario extended the schedule by two months to fix the problems internally. The last scenario was based on removing the multiple bean option. This would lower costs and schedule risk, but also would likely lower the sales price, margin and unit sales.

The numbers were compelling, but inconclusive. The first decision was to eliminate option 3 (removing the bean options feature) since it was clear the feature was a significant value driver

needed to drive excitement and sales. Now it was down to either hiring outsourced resources or delaying the launch. As Lynda explained, the option for outsourcing the mechanical re-design would allow them to hit the holiday season with the added benefit of getting customer feedback faster for next generation products. However, the upfront development expenses would be significant and there would still be risk of having a design issue. The other option of fixing the design in-house would save expenses, but would slow the team down (missing the holiday season). However, this option would also provide valuable technical experience for new designs. Since each option had similar net present values (NPV), the financial expectations did not provide a clear direction. So how should they decide?

As Lynda shared the pros and cons of each option, she closed with the one criterion the CEO and CFO had already furnished Lynda and Jordan – to hit the schedule with an exciting product. This key factor could not be ignored and swayed all to immediately approve the funds necessary to work with an outside vendor and help the team achieve their target.

NEXT STEP

In the final step of this series, Step 9, we'll take a post-project review of JavaBrew's first effort with using agile and the MAHD Framework for developing a new coffee maker. While this project is fictional, the challenges, conflicts and required decisions are based on a blend of many successful and failed real-world projects the authors have experienced. In the next step, we'll take a look at what went well in JavaBrew's first agile project, where it went badly and what might have been improved.

Once the product has launched, the team will continue to use agile methods to manage marketing, sales and customer service tactics.

Exhibit 1: Early Concept

A prototype used for customer feedback in Iteration 3

Customers loved the classic design with many stating something similar to, "I love that it looks cool and simple. Especially that the smart features built in but it doesn't look techy." Of course, many ideas flew on the choice of colors and other details!



To Be Continued...

GET THE SERIES

To see the previous steps and receive each new step of this project as it is published, visit www.AgileForHardware.org. Each step will be available for download and sent directly to your email.

ABOUT THE AUTHORS

The MAHD framework is an open-source process, available for all to use, build on and improve. We look forward to hearing from you and your experiences with agile, waterfall and other processes. The MAHD framework was developed by Gary Hinkle and Dorian Simpson to address the needs of hardware development.

To learn more, get involved, or just join our community for discussion, visit:

www.AgileforHardware.org

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Electronics, mechanical and software engineering are all part of Gary Hinkle's background, working in design, management and executive leadership of communication, industrial, telemetry, audio, avionics, computers, test & measurement, among other industries. Today, he's principal consultant at Auxilium, a company he founded to help engineering-oriented businesses increase productivity.

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