

Where Lean+ and



Al Hardy (left), factory floor machining manager; Martin Manning (center), manufacturing engineering manager; and John Woodward, layout specialist, check the status of jobs in work at the Emergent Operations Center at the Boeing Fabrication facility in Auburn, Wash. MARIAN LOCKHART/BOEING

Ray Robinson Jr. checks a parts kit's "pinwheel"—a sheet listing the kit's pertinent information such as its destination. Parts employees worked with M&PT engineers to develop a system that lets them deliver completed kits to their point of use within 20 minutes after receiving orders from mechanics. GAIL HANUSA/BOEING

Commercial Airplanes Material and Process Technology engineers use agile development methodology to drive out waste

By Dan Ivanis

Although spread among 34 machines and over 70,000 square feet (6,503 square meters) in Emergent Operations at the Boeing Fabrication facility in Auburn, Wash., machinists, team leaders and managers now can monitor all jobs in real time and see what's coming next in the group's ever-changing queue of critical work.

At the systems installation area on the 777 moving line in Boeing's huge factory in Everett, Wash., parts room employees now can deliver completed parts kits to their point of use in 20 minutes or less after receiving orders online from mechanics on the airplane.

Employees at Commercial Aviation Services' Material Management organization in SeaTac, Wash., can with a glance view large plasma screens and individual andon lights in their work area to see whether teammates need support or are available to help on urgent matters.

At all three of these points along the Commercial Airplanes value stream, engineers from Material and Process Technology (M&PT) used agile development methods to design and implement solutions to local challenges so Boeing employees can per-

form work faster and more efficiently than ever before.

Agile development is a methodology that promotes rapid turnaround, iterations, teamwork, collaboration and process adaptability throughout the life cycle of a project. It works especially well in rapidly changing environments or where requirements are not well-defined, said Larry Hazlehurst, an M&PT engineer and Associate Technical Fellow.

"The people who ask for our help generally know what they want, and the next question is how long it will take to get it done," said Sidney Ly, who often partners with Hazlehurst and also is an Associate Technical Fellow. "The idea is there, but they don't know whether it will work or not. They want to be able to try it out the next day. That's what agile is all about."

For example, the outcome of a Lean+ workshop sometimes is a collection of participants' ideas. However, those ideas often require a new tool or a technological advance to become a reality. That's where agile development comes into play.

"My main focus area has been on where Lean+ and technology meet," Hazlehurst said. "The agile development environment works really well with Lean. For instance, we worked with participants in a Lean workshop recently. Their workshop let out on Friday and we had the first pass at a solution for them on Monday."

technology meet



Sidney Ly (left), Bruce Howard (center) and Larry Hazlehurst, engineers in Commercial Airplanes' M&PT organization, discuss a potential modification to one of the many systems they developed using agile development techniques.

JIM ANDERSON/BOEING

DIFFERENT FROM 'WATERFALL'

The agile method—which M&PT employees have used to do everything from design a special hand tool to simulate twin-aisle airplane production in the factory—differs greatly from the traditional “waterfall” method. In that method, which often is used in software development, detailed specifications are determined up front and handed over to a development team, which is expected to come back at a specified date with a finished product.

“With agile, we get our first iteration done quickly and then keep improving it with the customer’s input,” Hazlehurst explained. “Agile doesn’t work for everything and in some cases the waterfall method is best. But in certain situations, agile development is the best answer.”

One cornerstone of agile development is the re-use of available systems or the adaptation of off-the-shelf systems to the specific needs of the customer. For Hazlehurst and Ly, this often includes the Universal Data Collection System and the Intelligent Information Dashboard, both invented by Ly. When these are used together, real-time data can be collected from a number of existing systems and displayed in ways that can be customized to maximize usefulness for the user.

“When the 777 was transitioning to the moving line, we knew our old method of delivering parts to the airplane would no longer work,” said Jesse Quigley, a manager who at the time was a team leader for the largest parts control area for the 777 pro-

gram. “I kind of knew what we needed, but didn’t know what was possible.”

Quigley investigated and discovered the Pacer system, which was in use in 777 final assembly and on the 737 moving line in Renton, Wash. Developed by M&PT, Pacer collects data from an expandable collection of existing systems and displays it according to the customer’s needs.

“We asked Larry to come talk with us and we started with a very rudimentary tool,” Quigley said. “Every time we hit a snag, we’d call back and ask if we could change this or add that. He would come back to me within the next day and say, ‘Try it now.’”

With the Pacer system, employees have dramatically improved Systems Installation parts-room processes. Workers can see precisely where kitted parts are stored once they have been put together. And mechanics on the airplane can order part kits for their jobs online and know that the correct kits will be delivered at the point of use within 20 minutes.

“It is a long way from where we were,” Quigley acknowledged. “It used to be that most of everyone’s time was spent looking for stuff. Now, the system does all that for us.”

GOODBYE, INDEX CARDS

Agile development methodology emphasizes the importance of leveraging the knowledge and unique talents of everyone involved in the process—the development team, customers, sup-

Dawn McDonald (left), a supply chain analyst, explains an issue to manager Jerry Davis at Commercial Aviation Services' Material Management offices in SeaTac, Wash. Plasma screens and andon lights (foreground) give Material Management employees highly visible, real-time information about the health of their production system. **MARIAN LOCKHART/BOEING**



Jesse Quigley (right), a manager who formerly served as team leader in the 777 systems installation parts control area, checks the status of a parts kit with Jodi Groves. **GAIL HANUSA/BOEING**



pliers and subject matter experts.

"The agile method allowed everyone on our team to get involved," said Martin Manning, a manufacturing engineering manager in Fabrication's Auburn Machining and Emergent Operations facility. "There was some skepticism to begin with, but once people saw their ideas were being taken seriously they started really getting involved."

Manning moved to Auburn in mid-2007 and discovered that group's operations revolved around a labor-intensive system where index cards were used to indicate work priorities. Because of the emergent nature of the work, the cards had to be rearranged constantly. "We had no way of seeing the big picture and no way of collecting meaningful data," Manning said.

Using agile development, M&PT designed a system that tracks and automatically updates the list of pending jobs, and at the same time, tracks work in progress on each of the 34 machines. The information is displayed on a large plasma screen in the work area, and individual operators can call up the data at their PCs so they can prepare for what's next in their queue.

"The old system was like writing everything out longhand," said Bill Taylor, a manufacturing team leader. "I spent most of my time moving index cards around. Now everyone has visibility of what is coming next, and I spend my time doing valuable work."

"The strategy was to make sure we had a good eye on the customer requirements for all the items that [they considered to be] critical," said Mike LeClair, a senior manager in Emergent Operations at the time. "This kind of factory floor visibility helps achieve a sense of urgency and involvement for the entire Emergent Operations team. It has been a great team effort."

Manning said the two factors in his success working with M&PT have been his close association with the developers and

the speed in which things are developed.

"They talked to me, they talked to the team leaders and the machinists and they helped us develop an understanding of what we needed, and not necessarily what we wanted ... Those were two different things," Manning said. "Then they delivered it in about a month."

In addition to the real-time data, the system also automatically compiles historical data, which managers can use to more efficiently run the department.

"Instead of basing decisions on anecdotal information from a collection of sources, we can use hard data collected from our entire operation," Manning said. "That has helped us engage the whole team. They give me ideas on how we can improve [the system] to help them do their jobs, and we work with M&PT to do that."

WATCH FOR THE RED LIGHT

When Commercial Aviation Services' Material Management organization established a Lean vision to dramatically reduce response times and improve customer service, Lean manager Gary Rucshner turned to M&PT to help develop the tools necessary to measure the health of the Lean system.

First, the organization implemented response cells and then process cells. Each cell was given specific responsibilities within the organization's overall mission, which is to receive orders and deliver airplane parts to customers and distribution centers throughout the world.

"We knew our customers were not totally satisfied with the service they were receiving," Rucshner recalled. "We established these groups of people—cells—to perform specific functions, and then we needed to figure out a way to measure the health of our



Glenn Richards (right), a supply chain analyst, explains an issue to manager Peter Kim at Commercial Aviation Services' Material Management offices in SeaTac, Wash. Real-time information about their production system comes from plasma screens and andon lights.

MARIAN LOCKHART/BOEING

processes and our productivity.”

After the teams developed processes for each cell and established points within the processes where time lapse should be measured, Rucshner contacted M&PT for help.

“We started out with a concept on paper and then we met with Sidney,” Rucshner said. “He created a working model very quickly and we refined it over the next several months.”

The finished product is a system that provides overall visibility of everything going on in a particular cell. Leadership team members also can use the system to get a higher level view of the organization’s productivity.

Employees within a cell can access the information from their computer screens or from large plasma screens situated within the cell. The screens display which cell members are signed on, the issues they are working and the status of each. Everything on the screens is color-coded—green, yellow or red—to indicate whether a task is on track to meet the time target.

In addition, each cell member has a three-color andon light plugged directly into the computer that lights up based on the same information.

“Managers can just glance around the room and see immediately the health of the production system,” Rucshner said. “They can come in here and say, ‘We’re not meeting our targets for today. What can we do? Shift resources?’ And so on.”

For Hazlehurst and Ly, who have been partnering for about three years, the agile development process has taken on a familiar rhythm. Hazlehurst, a Lean expert with extensive experience in assembly technology, is in charge of meeting with potential customers, investigating each problem and summarizing everything on a single sheet of paper that he hands off to Ly.

“Then Sidney puts his technology expertise to work and be-

fore you know it, we have a prototype,” Hazlehurst said.

“Larry’s role is extremely important because he has the experience with the processes out in the factory and can break down the issues and relay that information to me,” Ly said. “Without that input, we’d develop some great stuff that wouldn’t have any customers.”

“One of the greatest things about agile development is how it leverages knowledge,” Hazlehurst said. “We leverage it all—my knowledge, Sidney’s knowledge, the collective knowledge of our customers and the knowledge of the people doing the work. It’s a very powerful thing.” ■

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‘Material’ information

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