

Lean Product Development at Playworld Systems

How relentless focus on customer value can reduce time to market and increase R&D capacity.

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For commercial playground equipment manufacturer Playworld Systems, Inc., recession-fighting strategies range from intense customer focus to lean manufacturing and a revamped new product development process. It is cutting order-to-delivery cycle times, boosting order accuracy, and reducing costs. Now the company is using “lessons learned” about lean in development of a new, low-cost line of products. Playworld targets even more responsive customer service, making the best use of the organization’s capacity.

Playworld Systems, Inc. has always prided itself on its ability to understand the competing needs of the customers it serves. In the recent recession, the company's ability to maximize customer value enabled it to thrive when others struggled. Playworld makes commercial playground equipment for schools, new housing developments, and parks. Its sales were closely tied to credit markets, school board and local government budgets, and new home construction.

But this company had some secret defenses. In 2003, Playworld began to systematically upgrade its operations to eliminate waste and streamline processes using lean manufacturing. By 2005, it had cut the time to fulfill orders from 10 weeks to nine days, and improved order accuracy from 85 percent to 97 percent.

By 2005, the company began to reap the benefits of these

efforts: less cash tied up in inventory, lower costs overall, lower costs to correct mistakes in customer orders, and more rapid response to changes in customer demand. It began to move lean practices into other areas of the business.

By the fall of 2008, the company set aggressive targets to make similar improvements in product development:

- Shorten time to market from 18+ months to less than a year,
- Ensure that all products hit their cost targets and launch dates, and
- Reduce the hit on the factory from expedited prototypes to meet catalog deadlines.

As the impact of the recession hit, the company began to appreciate the most important benefits of its program to re-invent itself: the ability to deliver customer value with flexibility and speed. Playworld had the ability to do things that its competitors simply could not do.

Despite 20 percent across-the-board cuts that hit product development



Playworld Systems® Inc. is a family-owned, 230-employee company with headquarters in Lewisburg, PA. A leader in environmentally sensitive outdoor recreation and playground equipment for more than 30 years, Playworld Systems believes that "The World Needs Play." The company brings fitness through play to people of every age through product lines such as ENERGI®, LifeTrail®, Advanced, NEOS®, PlayDesigns®, Playworld®, Activo®, and Climbing Boulders™.

The T-Rex bones are made from fiber-reinforced concrete.



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how standard line additions would work, the process broke down whenever they tried to do something new.

Anything more than the simplest product line addition was plagued with design loopbacks and revisited decisions that delayed product launches from one year to the next. It was not unusual for products that appeared in the catalog to be unavailable until many months into the catalog year. Some new products were plagued with quality problems in the initial months after introduction due to inadequate time for field testing.

Playworld often found that new products were much more expensive to produce than forecast, and that customers were not willing to purchase new products at a price that was profitable for the company. With all of the investment in new tools already made, Playworld's sales and marketing department would have to find ways to justify a higher price.

Results from new product development efforts were disappointing. It took a lot of work to deliver a product that did not deliver the promise embedded in the "pretty pictures" they saw so many months before, and products took a long time to develop traction with customers.

Lean Product Development

Playworld decided to bring lean thinking into product development. It sought to replicate the gains achieved in manufacturing upstream in engineering and design. When Playworld made its first attempts in 2007, lean product development was still new and not well-understood. Like many others, Playworld first tried to use lean manufacturing tools such as value stream mapping in product development.

These methods did not work. For one thing, most product development waste is invisible; it sits in hard drives or inside the brains of overloaded engineers. The most important wastes in product development

Sheet plastic storefront with a rotomolded window box.

severely, the company was able to get more products — and the right products — to market in the fall of 2009.

"Ninety percent of our products were within 5 percent of their target cost, and we got 50 percent more products out to the market than we had in previous years," said Brett Barrick, director of product development. "We invested a 20-percent cut in R&D (research and development) expenses into more than 200 percent more tools to support new products. It was as if we got all the tools for free."

The Need to Re-invent Product Development

Playworld's revamped new product development process also contrib-

utes to the company's success. In 2005, Playworld Systems recognized that it had a problem turning ideas into products at a price customers would pay and within a timeframe that would allow it to meet competitive challenges. It took 18-24 months to develop a new piece for one of its existing playground systems. New playground systems took much longer.

The process for deciding which products would be built was based upon "pretty pictures" — concept sketches the industrial designers created to describe their ideas for new products. Although the designers knew enough about engineering and manufacturing to get a sense of

are the inability to deliver products at a cost that reflects true customer value, ineffective decision-making that leads to confusion, and the lack of systems to understand and capture the knowledge created in the product development process.

That type of waste does not show up on a value stream map until the consequences are severe, with uncontrolled rework loops. Although a value stream map can identify rework loops that slow product development, the root causes of those rework loops are not shown by anything captured within the map itself. What is needed: Address the reasons why rework loops are needed in the first place.

Doing a value stream map on a product development process that is too slow and costs too much is like mapping a manufacturing process flow when a machine is leaking oil and creating a hazard. Most lean manufacturing experts would agree that the priority should be the leaky, hazardous machine. The team should use lean problem-solving methods to fix the leak permanently and remove the hazard before trying to redesign the entire process.

The typical product development group has “leaky machines” all over the place. Every unproductive meeting steals time away from value-creating development work. Every revisited decision makes it harder for people to focus. Every time an engineer has to make a decision under pressure to make it work, without the time to make it work well, customer value suffers.

When it’s easier to re-invent something than it is to reuse something that works, the organization misses an opportunity to make things easier for downstream partners, including the end user: a parent pushing a child on a swing. The remedies for all of this waste are counterintuitive: Pursue more alternatives than you can ultimately deliver, spend more time learning earlier to save time later, get

The Spider Web Climber.

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the technical staff engaged with the customers even if it seems like they don't have time for that, and wait to make decisions until the last responsible moment. How do we know that these countermeasures work?

The Current State

The lean product development community recognizes that product development has key differences from manufacturing that require us to use a different tool set, even though the principles of lean thinking still apply. Unlike most of the organization, product developers have four different value streams to optimize:

- **The customer's value stream:** how a customer expects to use a product to realize its expected benefits. Waste in this value stream includes things such as extra setup time, poor user interface design that makes the product hard to use, maintenance, and repairs. Playworld's customer value stream is complex, with different people responsible for recommending the product, configuring a system, paying for it, installing it, and using it. These customers have competing needs, and the end user — the child who goes up a climber and down a slide — has almost no role in the key decisions that lead to the design and purchase of a new playground structure.
- **The production value stream:** the value stream most familiar to lean organizations. At Playworld, the main factory is in the same building as everything else. After five years of experience with lean manufacturing, this value stream is easy to see.
- **The product design and test value stream:** the processes used to turn an idea into a product that someone can buy. This is the process that early lean product development work tried to optimize. Waste here includes things such as excess requirements, overloaded resources, unproductive meetings, excess documentation, and project status reporting.
- **The knowledge creation value stream:** Invisible inside most organizations, it

turns out to be the key that unlocks a deeper understanding of the root causes for late products, defects, and excessive cost. The knowledge creation value stream is the flow that develops raw ideas into mature product knowledge used by product developers to guide the details of product design. In most organizations, this flow happens through cross-fertilization between teams; product developers build experience that they take from one project to the next. The knowledge they build often comes from their experiences of living through painful design loop-backs of build-test-fix.

In a lean product development organization, the knowledge creation value stream is a set of interlocking learning cycles that look a lot like the Plan/Do/Check/Act (PDCA) cycles an operator uses to permanently fix a leaky machine. Rather than build knowledge to improve a process, these learning cycles build knowledge the team needs to deliver good products. Instead of relying on individuals to bring their knowledge from team to team, the lean product development organization captures and shares the knowledge created.

When Playworld looked at these four value streams, it learned that their industrial designers already had a good understanding of customer needs but the other three value streams suffered. As a result, designers were not able to turn their understanding of customer needs into products that met those needs at a reasonable cost. They did not have a good way to understand how much it would cost to produce a product until too late in the process. They needed a deeper understanding of costs related to the production value stream.

The product design and test value stream contained many rework loops. Industrial designers moved off of products once they were sent to engineering. There were some opportunities to make later changes, without addressing root causes of the major

The Bouncing Drawbridge allows princes and princesses to leave the castle as they wish.





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problems. Like many organizations, Playworld's knowledge creation value stream entirely depended on individuals. Associates needed to spend more time understanding what they did not know and putting it into a framework.

Cutting Time-To-Market in Half — Twice

Playworld Systems leadership decided to focus on weaknesses in its understanding of the production value stream as well as its ability to make effective product decisions for driving maximum customer value — impacting both the knowledge creation value stream and the product design and test value stream.

First, leadership put in place an A3-driven product definition process that helped define each new product idea at increasing levels of refinement, capturing the history of key decisions. A3s are reports sized to fit an 11" x 17" piece of paper. The size forces the report's author to focus on only the most essential information; all of the information in the report is visible at one time.

Alongside the "pretty pictures" of a new product, the industrial design team now had places to document customer needs, revenue forecasts, potential manufacturing issues, and unproven

technology. That documentation keeps customer needs and target costs visible.

The resulting product definition A3 reports drove good decision-making through the boxes on the form and the approvals required. Playworld's template for the product definition A3 report created space for early input from the key functional areas that would be required to develop the product. This helped ensure that manufacturing experts, engineering, marketing, finance, and industrial design all delivered the information needed to make a good decision.

Second, Playworld developed better ways to forecast product cost and then ran every potential product through the cost forecast model. That process helped the team get a sense



NEOS 360 features eight games for fitness.

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of return on investment (ROI) for the product, and gave the leadership team better information for making product concept decisions.

Playworld defined more products than it needed. In a knowledge creation value stream, pursuing multiple alternatives stimulates learning, before committing with confidence to a design. The knowledge created through this process is not lost, and product concepts that don't make it into development can be revisited at a later time. The products that make it through this process have been more thoroughly vetted and are much more likely to be developed without expensive design loopbacks.

The team used visual management techniques to help it view the company's entire portfolio of products. They turned one large wall into the Product Planning Wall, with each product represented on an A3 report. A limited amount of space on the wall corresponds to the organization's development capacity, helping to prevent overload and confusion about which products the group has selected. With industrial designers on staff, visual models were already an important part of communication at Playworld; its lean efforts made them ubiquitous. In addition to the portfolio, visual planning walls track engineering tasks, schedules, and other commitments.

Results

Playworld Systems no longer wastes design resources on products it will have to abandon. Good ideas get a fair amount of investigation when it's cheap and easy to explore them, only going forward when their contribution to customer value becomes clear.

The implications of Playworld's customer-focused lean product development process for the organization are significant. In the midst of the recession, with 20 percent fewer resources, the company's associates delivered more new products, 90 percent within target cost goals. It delivered those products in time to prevent much of the expediting that plagued prior years' catalog development.

Customers who see these products at the industry's major trade shows can order the new products with confidence. The products have all of the innovative design, quality, and safety features that Playworld has always delivered, at a price more in line with their expectations.

It is a little too early to say what effect this has had on sales revenue and Playworld Systems' bottom line. There are some promising early signs. Its products stack up remarkably well against its competitors' products at trade shows.

Playworld saw a 29-percent increase in new products for its 2011 catalog over its 2010 catalog. At the same time, the company reduced the number of late projects by 29 percent, and only 1 percent of its new products were delayed more than 60 days from the scheduled introduction date. Playworld's 2011 new product introductions were 138 percent higher than those of 2008, which was the last year prior to its implementation of lean product development techniques.

What's Next?

Housing construction and municipal budgets are still under serious pressure. To help these customers and to open up new markets, Playworld decided to put everything it learned about lean into a low-cost line of products. This past fall, it launched a focused program to develop a new playground system from the ground up that is 40 percent less expensive than its standard lines with equivalent play value.

This goal drove Playworld associates to challenge traditional as-

sumptions about manufacturing and construction methods for playground systems. It used all of the skills it had built over the past two years to:

- Pursue multiple alternatives to solve challenges in optimizing speed and cost.
- Build a simple visual planning wall

in a corner of a conference area to keep track of major tasks, issues, investigations, and alternatives.

- Leverage new knowledge and analytical methods to lower costs in their standard product lines and found ways to save cost on the value line.

- Involve everyone early in the product development cycle — design, manufacturing, engineering, finance, and marketing — so

they could make robust decisions quickly.

The project team's experiences during the past two years gave them unshakable confidence that it could meet this challenge. It delivered the entire new system — from idea to first commercial product sale — in less than six months.

"Our next challenge is to learn from this experience to break free of the annual cycle," said Steve Malriat, CEO. "That will help us make the most of our organization's capacity and be even more responsive to customer needs." •

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