

Demand Driven Technologies

Beyond MRP

Meeting the Current Materials
Synchronization Challenge

Case Study



Introduction

If you have read the White Paper, *Beyond MRP* or the new Orlicky's Material Requirements Planning, Third Edition (Ptak & Smith, McGraw-hill 2011) you probably have questions about how Demand Driven MRP (DDMRP) is put into practice and how it really compares to traditional MRP environments. This Case Study is designed to answer some of those questions.

LeTourneau Technologies™ is an American manufacturing icon rooted in a rich history of innovation and product leadership. Their vertically integrated structure brings challenges and opportunities. The complexity of their products makes materials and capacity synchronization across their enterprise a seemingly unsolvable puzzle.

Company Information

Headquartered in Longview, TX
Employees: 4000
Revenue: \$1.2+ Billion (US)



Three Major Manufacturing Locations: Longview, TX, Houston, TX & Vicksburg, MS
Website: www.letourneautechnologies.com

Primary Products:

- Offshore Drilling Platforms (jack-up rigs)
- Wheel Loaders and Dozers primarily for the mining industry
- Log Stackers
- Drilling Systems for offshore and land rigs
- Power Systems
- Steel

Representation worldwide

- ~20 Dealers w/ after-market support
- ~20 Representatives w/o after-market support

Prevailing Improvement Methodology:

- Heavy emphasis on Demand Driven MRP (DDMRP) backed up by constraints management philosophy on the shop floor (Drum-Buffer-Rope pull scheduling and execution) in the Longview and Vicksburg sites. Information on DDMRP can be found here: www.demanddrivenmrp.com

Technology:

- ERP System: Infor XA (formerly MAPICS)
- Production Scheduling and Control: A mix of DBR+™ and Infor XA. Information on DBR+™ can be found here: www.dbrplus.com
- Materials Planning: A mix of Replenishment+® and Infor XA. Replenishment+® controls 5,700 strategic parts. Information on Replenishment+® can be found here: www.demanddriventech.com
- Project scheduling and execution: Concerto™

LTI's History

The phrase "Built on Experience. Driven by Vision." is more than a marketing tagline. It describes the manifestation of a one-of-a-kind company built upon the dedication and personal achievements of an extraordinary man, [Mr. R.G. LeTourneau](#).

Also known to many as “Mr. Earthmover,” R.G. LeTourneau launched his career, and LeTourneau, Inc., in California when he combined two loves: contracting and the engineering and manufacturing of earthmoving equipment. His fast-growing business was incorporated in 1929 as R.G. LeTourneau, Inc.

By the mid-1940’s, R.G. LeTourneau, Inc. had completed many large earthmoving projects that spanned the globe from Nevada to Australia. It’s during this time that the name LeTourneau became synonymous with earthmoving, worldwide. LeTourneau himself became known as a genuine innovator and inventor, with a series of “firsts” to his credit. He was the first to build a two-wheeled tractor coupled with a scraper for high-speed earthmoving. And he was the first to develop all-wheel electric drive machines for a wide range of uses in heavy construction work.

Across eight decades and many challenging earthmoving projects, LeTourneau, Inc. has built a reputation for leadership, innovation, and reliability. This rare legacy lives on in LeTourneau Technologies™ today, across all operating units, ranging from offshore equipment manufacturing to oil and gas drilling technology.

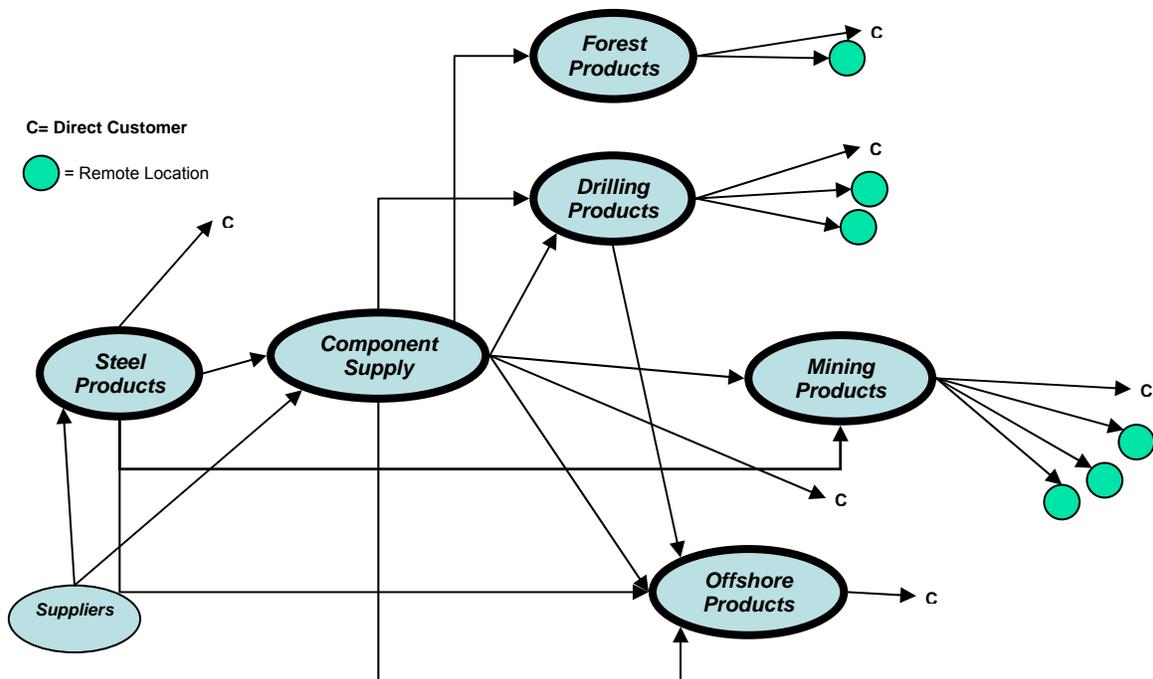
LeTourneau Technologies™ (LTI) Today

Today LTI is a complex and vertically integrated enterprise. Each major end item is comprised of steel plate, forgings, fabrication, machining, heat treat, gearing, electric motors & generators, digital control systems and final assembly that is done within LTI. On top of that there are also tens of thousands of purchased parts to coordinate and synchronize.

The Longview campus alone has:

■ BOM records	600,000+
■ Part numbers	165,000+
■ Manufacturing orders per year	60,000+
■ Operations per year	290,000+
■ Employees	1,300

Below is an overview of how the various product groups relate to each other.



A Look at LTI's Products

Steel Products – LTI specializes in high strength, thick plate (2-8 inches in thickness) steel.



Component Supply – with 930 employees in Longview, TX Component Supply manufactures components for four different market segments.



Mining Products – LTI makes the world's largest wheel loaders for various mining applications. They sell, distribute and service globally.



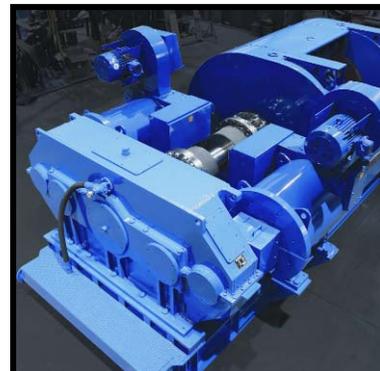
Offshore Products – LTI has a fifty year history in jack-up rig design, manufacturing and fabrication. Over 35% of all jack-up rigs in the world are LTI rigs.



Forestry Products – LTI builds Log-Stackers and Jib Cranes for the wood products industry

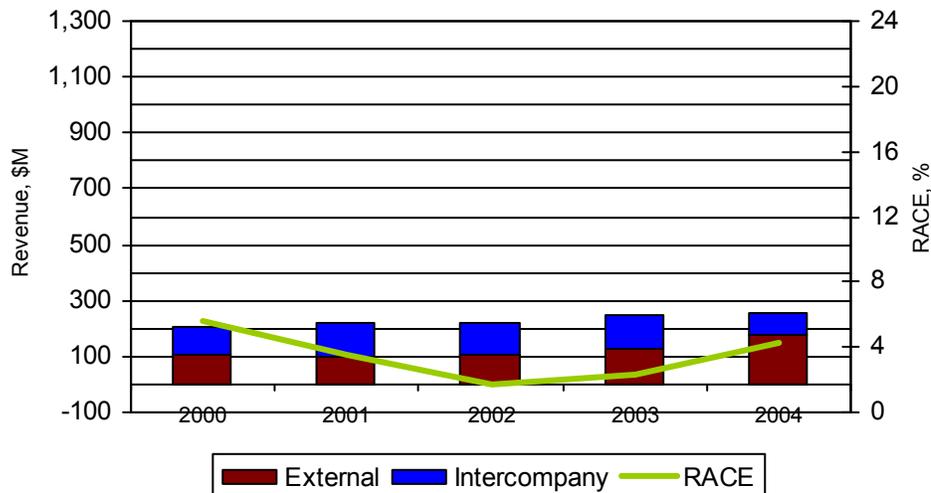


Drilling Products – LTI makes Drilling Packages (top drives, mud pumps, draw-works) for both offshore and land rigs.



The Beginning of Improvements at LTI

In 2000, LTI began to implement pull-based production control techniques in its Longview campus with very limited outside help. They purchased the finite capacity and planning module offered by MAPICS, their ERP system at that time. They achieved an increase in on-time delivery from $\approx 10\%$ to 75% but improvements soon stalled without achieving the full anticipated benefits. Below is a chart that tracks their financial performance from 2000-2004.



In 2004 LTI found themselves with a set of recurrent problems that was hampering their ability to capitalize on the predicted upswing in LTI's markets. Below is the set of symptoms that LTI was grappling with:

- Too long cycle times
- Too high WIP
- Too high obsolete inventory
- Too low inventory turns
- Too low on-time delivery
- Too high overtime and expediting
- Exiting markets due to pricing competition
- Poor cash flow
- Too low RACE (Return on Average Capital Employed - see above graph that shows that RACE was just above 4%)

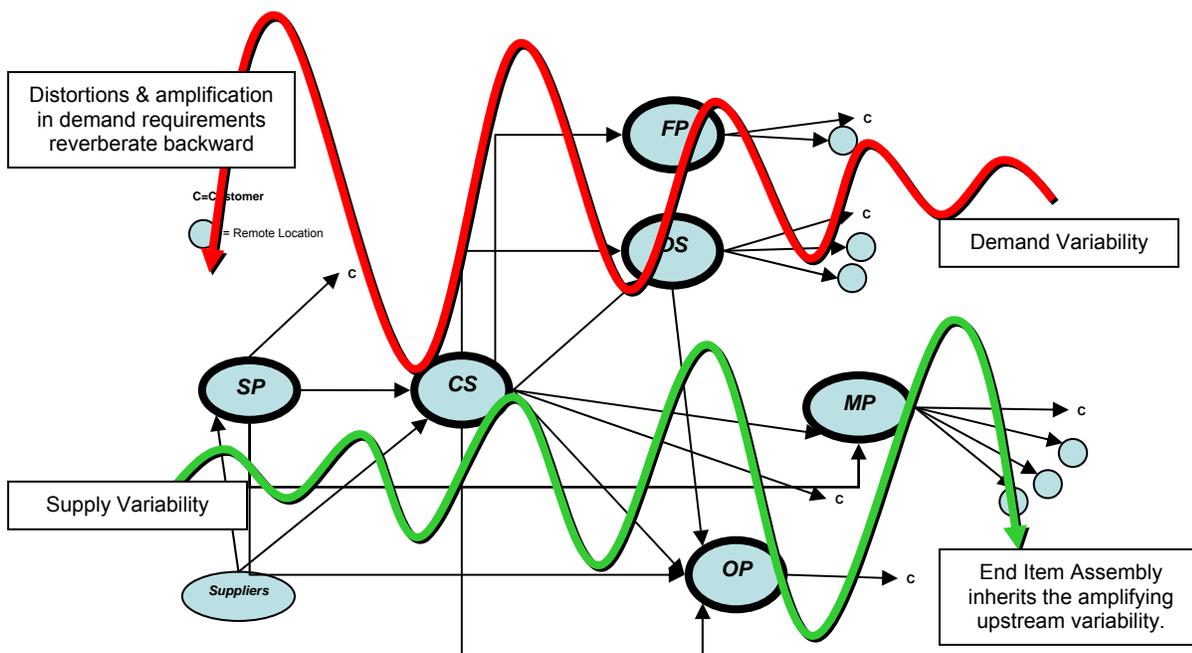
Additionally, there were some cultural issues that were contributing to and/or exacerbating some of these issues:

- Belief in GAAP to Decide Product Pricing, Transfer Pricing, Sourcing, Capital Expenditures, Product Line Profitability, etc.
- Belief in overtime to ship on-time
- Belief that we are "different" and more "complex"
- Belief in "fire fighting" rather than "root causes" they became really good at expediting!
- Belief in themselves rather than outside advice

In August of 2004, LTI engaged Constraints Management Group (CMG) for a Strategic Planning Session with its executives. In that session a huge synchronization opportunity between the various market segments was identified. Some of the synchronization challenges included:

- Local profitability was sometimes a source of contention between market segments
- Material shortages caused cascading disruptions to schedules within market segments and across the company
- Many areas were being scheduled locally
- Generally, confidence in each others' ability to deliver on-time was low

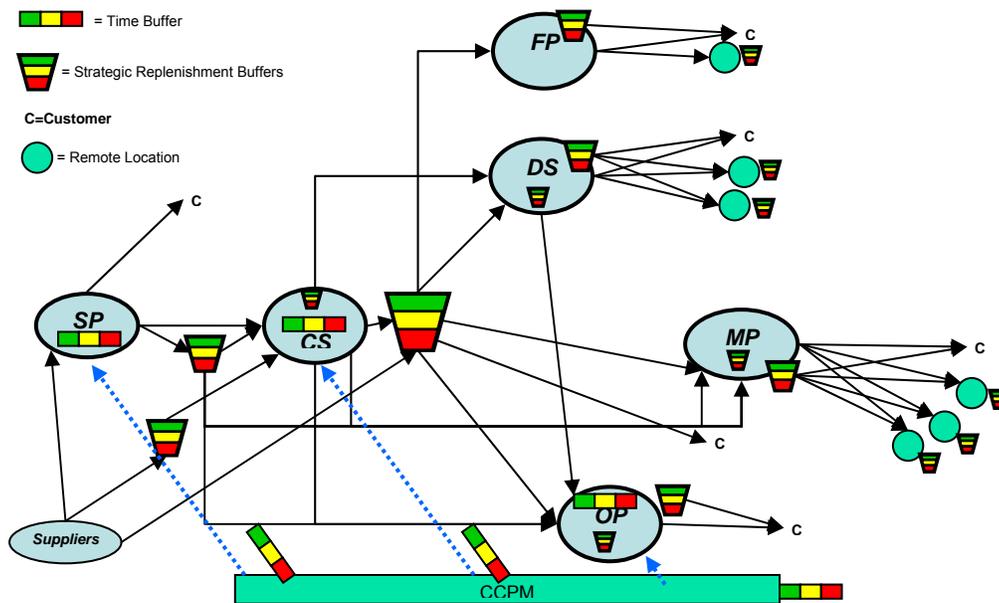
Below is a simplification of the cascading disruptions both up and down the vertically integrated chain created by lack of good synchronization.



In that strategy session the direction of the solution was identified and articulated. LTI needed simple and clear signals within and across market segments that increased visibility and velocity through their total system. To tackle the synchronization challenges and get these signals it required:

- Changes to the material synchronization strategy – Demand Driven MRP (DDMRP) would be implemented on strategic parts at the Longview campus to ensure that pull-based production and project systems would not suffer from shortages;
- A redefinition of their manufacturing scheduling and execution strategy – a pull-based production technique know as Drum-Buffer-Rope (DBR) would be implemented throughout the Longview campus;
- A redefinition of the project control and execution strategy – a pull-based project planning and execution system called Critical Chain Project Management (CCPM) would be put in place in Longview and Vicksburg to create the right materials signals based on actual demand pull;
- A new administrative function to integrate these strategies;
- A new set of rules and metrics to support the above implementation strategy.

A high-level solution model was constructed to depict the necessary changes. Below is that solution model.



The “buckets” represent DDMRP dynamic stock buffers that are designed to prevent the cascading effects of both demand and supply variability. While it may appear that there is inventory everywhere – these buckets only represent a fraction of the total number of parts. That fraction of parts, however, are strategic parts that tend to be the major source of disruption and major opportunity for lead time compression.

Additionally, you will note “time buffers,” represented by a 3 color bar. These are simply discrete windows of time designed to protect critical operational areas, pace setters or project milestones from disruption in the pull based manufacturing project control systems. It is important to note that without DDMRP in place and ensuring material availability, the pull-based manufacturing implementation would be compromised dramatically by a combination of the following factors:

- Time buffers would be inflated beyond acceptable lead time ranges;
- The scheduling horizon would be more complicated because more activities would have to be planned and synchronized at once;

- The likelihood of shortages and of work being released without all components available would be dramatically increased;
- A "False Echo" would call for more capacity.

The Results

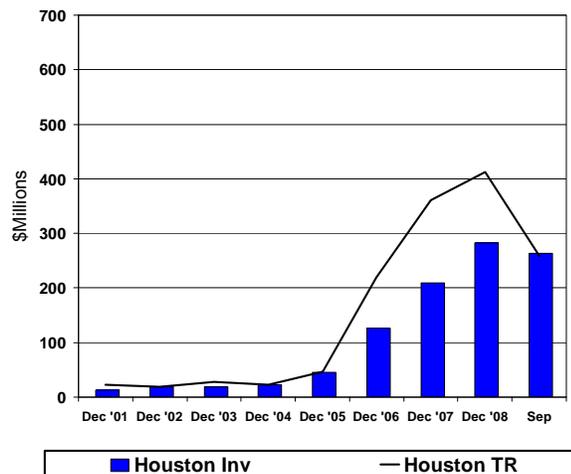
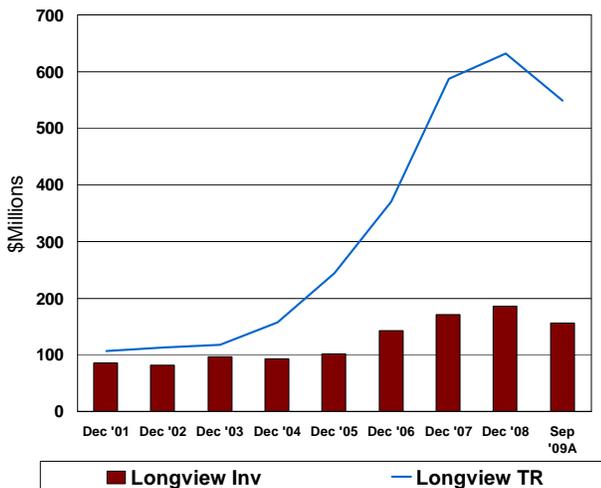
The improvement model and strategy defined above was implemented primarily in LTI's Longview and Vicksburg campuses. The Houston facility stayed with a more traditional MRP driven system. These graphs clearly demonstrate the differences between operating a complex manufacturing operation according to DDMRP principles backed up by good pull-based manufacturing practices and a traditional MRP driven environment that creates chronic shortage issues, inflated inventories and makes the implementation of effective pull-based systems extremely difficult.

Below you will see the dramatic differences between the two comparable campuses of Longview and Houston. To be very clear – the type of manufacturing is very similar both in terms of complexity and scale.

Beginning in 2005 the market began to take off for all LTI business segments. What is really important to understand is that LTI has been through these boom cycles before. All previous times, however, LTI's inventory and expenses have dramatically risen at a similar rate as revenue along with deteriorating service levels. What is unique about this particular case, is that the Longview facility was able to dramatically control inventory and expenses while maintaining excellent service levels.

Additionally, what should be noted is that all boom markets eventually end. You can see in the graphs below that in 2008 the markets began to cool off. When those boom times are over DDMRP minimizes your exposure to inventory liabilities. The bottom line is that no matter what kind of economic times your company finds itself in, good inventory practices that minimize inventory exposure while maintaining service levels is always the right strategy.

This first graph shows Total Revenue versus Inventory from 2001-2009 from the Longview campus only. Note that beginning in 2005 there was rampant growth. Revenue grew by a factor of greater than 3X (over \$400 Million). Over that same period inventory rose only by about \$80 Million.



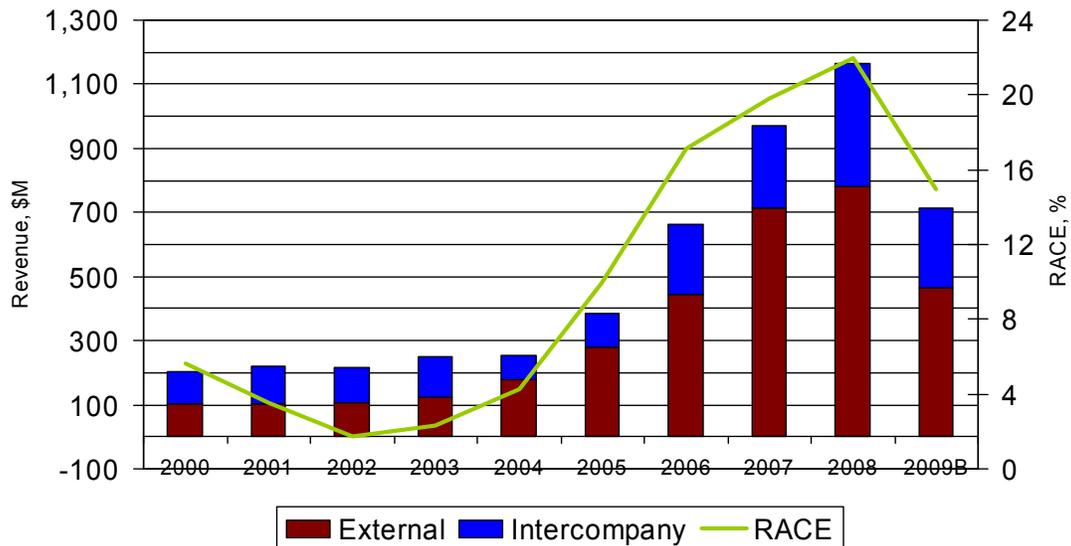
Additionally, it should be noted that service levels in Longview are high, WIP is very low and expenses are relatively under control.

This second graph shows Total Revenue versus Inventory from 2001-2009 from the Houston campus only. Note that at the beginning of 2005 there was the same rampant growth curve as observed in Longview. In this case, however, inventory ended up growing at nearly the same rate as revenue. There is about a 6-9 month lag but it is pacing at the same rate. Why is there a lag? As typical with most MRP implementations, they are building to forecast.

Now, when the market begins to turn as can be seen in both graphs at the beginning of 2008, LTI is exposed with a huge amount of inventory liability. In fact, due to the nature of forecasting there is a risk that the inventory will actually grow beyond revenue in the short run without massive course correction in the form of PO and MO cancellation and/or delay. This is a classic effect of traditional MRP driven environments.

It is very important to note that the people in the Houston facility are smart, professional manufacturing personnel. They simply did not have the tools and new approaches at their disposal to replicate what happened at Longview. The above graph is not an indictment of those people; it is the proof that traditional MRP represents a huge liability in the volatile and variable manufacturing environments that tend to be today's rule rather than exception.

Overall the company's RACE shows dramatic improvement from 2005 through 2008. This is demonstrated in the graph below. RACE grew from just over 4% to over 22% in 4 years. RACE, however, took a solid hit during 2009 as revenue fell in proportion to inventory levels, the majority of which was located at the Houston site.



Your Next Step

If your company has felt the impact of material, parts, component or finished goods availability problems - **you need to learn more about Demand Driven MRP (DDMRP).**

The gains in customer service and productivity, with reduced inventories and lead times, are simply too large to ignore. If shortages have been blocking efforts to implement a Lean or TOC Pull-based system, DDMRP could be the key to successful implementation.

Go to www.demanddrivenmrp.com to learn more about DDMRP. Watch the videos and listen to the podcasts about this revolution in materials and inventory planning and execution

About Demand Driven Technologies

Demand Driven Technologies is the provider of the world's only fully compliant DDMRP application called Replenishment+®.

www.demanddriventech.com



About Replenishment+®

REPLENISHMENT+® (R+®) is a multi-echelon materials and inventory management software designed to facilitate a demand pull inventory system consistent with the methodology of Demand Driven MRP (DDMRP) and Actively Synchronized Replenishment, an application of the Theory of Constraints. It is the only fully compliant DDMRP software in the world.



Companies that implement Replenishment+® typically see huge jumps in Return on Average Capital Employed through three avenues:

1. Service level increases
2. Sales Increases
3. Reduced total inventory

The above three effects typically happen SIMULTANEOUSLY. Case Studies and examples are available in Orlicky's Material Requirements Planning, Third Revised Edition.

Watch an informative overview video about Replenishment+® at here:

<http://demanddriventech.com/intro.php#about>

Watch an online demonstration of the product here:

<http://demanddriventech.com/intro.php#quick>

Explore the Demand Driven Technologies website and see how your company can see the power of Replenishment+® with you data for NO RISK.