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*Lean management case studies series*

## **Using Plan-Do-Check-Act as a Strategy and Tactic for Helping Suppliers Improve**

Lean Thinkers are familiar with the scientific process of plan-do-check act (PDCA) as a method that guides problem solving on the shop floor or office. But Medtronic’s Neuromodulation business not only uses PDCA for shop-floor problem solving, it also uses the process to guide overall strategy for selecting and developing key suppliers.

As a maker of surgically implantable medical devices, such as electrical stimulators and drug pumps, that alleviate pain, Neuromodulation (Neuro) depends on suppliers, many of whom deliver critical components or finished goods. Continuously improving their performance is vital.

“Medtronic is on a lean journey and we’d like our strategic suppliers to be on that journey with us,” said William Hooper, Medtronic vice president of operations and supply chain. “We can’t be successful unless our strategic suppliers are successful.” For example, he noted that analyses of field reliability problems showed that “a quarter to a third” were attributable to supplier quality issues.

“Not only do we have to lift our capability in quality and field performance, but we need to lift our suppliers’ performances,” Hooper said.

Besides improving supplier performance, a strategic PDCA approach helps Neuro:

- Align supplier development activities with business requirements as defined by Neuro’s director of global supply chain.
- Create a standard approach to the selection, status, and tracking of supplier development activities.

### **Medtronic Neuromodulation at a Glance**

- Minneapolis HQ
- \$1.5 billion (FY2010) revenue
- 10% of Medtronic’s revenue
- 140 suppliers
- Developed from Medtronic’s expertise in heart electrical stimulation
- Key products:
  - implantable neurostimulators send mild electrical impulses to the spine, masking pain messages
  - implantable drug pumps deliver pain medication directly to the fluid around the spinal cord at a fraction of an oral dose.
- Implantable treatments are reversible; a doctor can turn off or remove the system. Patients can try therapies temporarily to test effectiveness before getting a permanent implant.

- Deliver real-time visual status of activities to Neuro stakeholders.

The approach is “modeled after the Toyota Production System strategy of treating suppliers as partners,” said Jeff Hans, director of Neuro’s global supply chain. Before adopting a strategic PDCA methodology two years ago, engineers developing suppliers worked in a “heads-down, fix-the-fire-of-the-day manner,” said Hans. “We just didn’t feel that was a very proactive approach.”

Hans said Neuro had to overcome some initial reluctance about advising suppliers to launch lean transformations. “We felt a little presumptuous going out to help our suppliers become lean when we realized that we have a long way to go internally. We had a lot of discussion around that and decided, okay, we’re not perfect but let’s not let that get in the way of progress.”

Progress has included Neuro as well as its suppliers. As change agents work on a variety of manufacturing applications at suppliers, they build skills. This unexpected benefit is helping them transform existing Neuro production systems and develop new “born lean” systems for product launches.

### Strategic PDCA

“PDCA is a strategic, methodical approach,” said David Errico, Neuro’s senior principal supplier development lean change agent.



Plan-do-check-act is often illustrated as a continuous cycle.

“It’s a whole operating system approach,” said Errico, who spent three years with Toyota’s Operations Management and Development Division, a special unit that helps implement the Toyota Production System (TPS) in the

automaker’s facilities. “We’re using PDCA with the emphasis on developing a strategy for improvement. The strategy is the Plan in the cycle where lean concepts become an actionable and measurable blueprint for improvement. We act on the plan, continually measure and evaluate the targeted metrics, make adjustments to achieve the target, or set the next level of improvement.” ([See a chart summarizing the supplier development process as a PDCA cycle.](#))

Errico noted that compared to other approaches to supplier development, the PDCA method requires an investment of time at the beginning of the process in order to thoroughly understand and define what has to be done. But execution goes very quickly. “Plan is where time is invested for deep thinking, strategizing, and assessment,” he said. “But Do is lightning fast.”

The approach is particularly effective for the medical device manufacturers because process changes have to be well-planned when seeking FDA approval, then implemented quickly and accurately when approval is received. “Failure is not an option,” said Errico.

### Plan

Strategic supplier development at Neuro begins at regular monthly meetings attended by a team that includes Hans plus the unit’s sourcing manager, quality manager, and a supplier

development lean change agent. The team selects suppliers, who are segmented into four groups, for development activities based on an analysis of their potential impact on quality and revenue.

The sourcing manager and quality manager identify a supplier's business problem. The trouble usually falls into one or two of several buckets, including delivery, capacity, quality, cost, lead time, product launch delays, or financial troubles. After getting the supplier's agreement for a lean project, Medtronic's sourcing manager, quality manager, and change agent visit the supplier to sharpen the project's focus and begin training a supplier manager who will lead the lean effort.

If the Neuro sourcing manager wants shared cost savings as a project goal, it is discussed with the supplier before launching the transformation project. "We want to build and establish a partnership of candor, honesty, and trust through the change process," Errico explained. "The supplier becomes the Medtronic change agent's customer."

In the subsequent Do phase, the Medtronic change agent works on the shop floor with the supplier's improvement team to further investigate the problem's current condition, establish a goal, and provide training to the supplier's lean team as needed.

This phase can take several days to several weeks to thoroughly understand and "grasp the current condition," according to Errico. The Medtronic lean change agent and supplier team will develop a "scope A3" defining the problem, targets, strategy, implementation timeline, and needed resources. The scope A3 is supported by data the team acquires through observation and measurement as it works to understand current conditions. This document becomes the business case and instrument of accountability that Neuro and the supplier use to continue through the Do, Check, and Act/Adjust phases.

The Neuro change agent and supplier team implement the improvements, which are reviewed by the project stake holders, including quality engineers from Neuro and the supplier. The engineers coordinate the quality system requirements, regulatory requirements, and notifications regarding the improvement prior to implementation. "Quality and safety are top priorities and can't be compromised," Errico said.

The supplier and lean change agent must agree on a reporting method to Neuro along with follow-up actions that will be done in the Check and Act/Adjust phases. As part of the Act/Adjust phase, the supplier works with sourcing and quality managers from Neuro to monitor the continuing effectiveness of the improvements and determine if additional help is needed from the change agent. This review takes place during the periodic business review process.

Errico recently let LEI join him as he worked with two suppliers. One was moving from Plan to Do; the other was in the Check phase.

## **Do**

Located a short drive from Medtronic's headquarters in Minneapolis, STI Surgical Technologies, Inc. in St. Paul assembles surgical components into kits. Surgeons use the kits to implant Medtronic devices in patients suffering from chronic pain. The company makes six different varieties of kits, but three dominate the production schedule.

STI orders components from suppliers. Associates working in a clean room assemble parts into kits, built to Medtronic specifications. A typical kit includes instruction sheets, gloves, syringes,



A surgical kit containing 16 components.

needles, filters, gauze pads -- as many as 28 different components. Associates wearing hair nets and clean room suits place components into wells in a plastic molded kit tray, which is covered by a sealed lid. Kits are sterilized, then sent to an outside lab that verifies them as sterile.

Following a strategic supplier development meeting (Plan phase), Medtronic approached STI about quadrupling kit volume. Medtronic

wanted to shift assembly from another supplier to STI, which would become the primary source. The business problem for Errico and STI was how to handle the big jump in demand without expanding the expensive 1,800-square-foot clean room or adjacent warehouse, and without increasing the workforce of associates or managers. To become a strategic supplier, STI would have to launch -- with Medtronic's help -- a lean transformation.

### **Lots of Lots**

“Our production was completely a batch-and-queue process,” recalled Jesse Scanlan, STI manufacturing manager and project manager for the implementation team. Kits were built in batches to customer forecasts, based on how many units STI's sterilizer could handle. Thus, if the sterilizer could process 2,000 kits of a particular size every 10 days, the production batch size was 2,000 kits.

The old process required one-and-a-half weeks of preparation followed by a half-week of assembly. So, two weeks before a production run, associates picked components from a small on-site warehouse. That meant 2,000 filters, syringes, needles, etc. had to be kept on carts in warehouse staging areas and often in aisles. To prevent dust from entering the clean room with the parts, warehouse associates put the waiting components in plastic bags then bagged them again. The outer bag was removed just before employees brought the parts into the clean room.

Warehouse associates printed labels bearing kit lot numbers, contents, and use-by dates a week ahead of production then staged them in the warehouse too. “We had multiple processes batching up in preparation for our kit production,” said Scanlan.

Inside the clean room, employees broke down the 2,000-piece batches into lots of 50. They put the 50-piece lots into plastic bins then moved them to a line of tables for picking and placement into kits.

The 50-unit lots served as quality control. For a kit packager, the “number one” defect is to ship a kit missing a component, Scanlan explained. If, for instance, assemblers packed 50 plastic trays only to discover a package of gauze pads remaining in the bin where there had been 50 packages, then the lot of 50 kits -- instead of 2,000 -- would be inspected.



“We didn’t have any escapes to Medtronic for defects,” said Scanlan, “but our internal statistics showed that we were catching things on the line so our potential for an escape was there.”

### Overprocessing

Shawna Pearson, a Neuro supplier development lean change agent, noted that STI achieved “built-in-quality” in batches of 50 kits which resulted in significant handling waste and lost production when an abnormality was identified. A key challenge the team faced was how to transform quality verification from lots of 50 to lots of one in order to make kits in one-piece flow. The new production system would have to verify that the right part was placed in the right kit at the point of use.



Before: Associates prepared kit components in batches, top, for batch assembly, bottom.

The implementation team identified other wastes during this phase, which is the strategic Do step for Neuro but a tactical Plan phase for STI. Much of the waste was caused by overprocessing. For example, the time needed to stage components in the warehouse, double bag them, prep labels and lids, remove outer bags before assembly, and other nonvalue-added activities added up. The current-state analysis on the team’s A3 showed that more than 75% of production time was spent in nonvalue-added activities. In addition, associates viewed this work as burdensome.

The team identified much of the overprocessing waste by observation after receiving training in lean basics from Errico and Todd Heeringa, also a Neuro supplier development lean change agent.



But the first lesson for the STI transformation team and senior management wasn't a "how-to" session on implementing lean concepts. It focused on the need for leaders and team members to create a culture of continuous improvement." This commitment is required to sustain the dramatic changes in manufacturing practices and behaviors that were about to occur.

The first lesson taught leaders and associates the TPS philosophy:

- The customer is our top priority
- Respect for humanity
- Continuous improvement and kaizen
- Shop-floor focus



The STI lean team tested single-piece flow in a basic simulation of a U-shaped cell, top. Later, team members checked walk paths in a more complex simulation, bottom.

The philosophy is the foundation of the TPS business model and management system that Errico had experienced. It's a key part of the training with all supplier improvement teams because it informs basic lean thinking elements that guide every project. Elements include "develop real-time problem solving" or "build in single-piece flow." In turn, the interlinked elements form an operating system.

Teams learn that the basic thinking is driven by what should be the goals of a

competitive company. These objectives collectively become the team's perpetual goals or True North:

- Highest quality
- Shortest lead time
- Lowest cost

The team received additional training as needed for analyzing current conditions and designing a leaner future-state. The objective of current-state analysis is to gain a deep understanding of the process and improvement opportunities so training included studying videos of team members working.



In a third simulation, many quick kaizens occurred as operators offered more suggestions.

“Many lean practitioners will look at every process and every work element in a process by first-hand observation 10 times to get such key data as lowest repeatable time and they’ll run with that,” said Errico. The video analysis takes observation a step deeper.

For example, say the lowest repeatable time on an operation is 60 seconds. But during shop-floor observations, one cycle takes 68 seconds. That difference is called fluctuation. “What happened?” Errico asked. “We can’t ignore the fluctuation regardless of the frequency.

“Statistically the reoccurrence may be minimal, however, these abnormalities are critical because they often create

opportunities for potential breaches in standardized work as operators work to recover time lost to fluctuation. This may result in safety or quality issues. We can’t bring those conditions into the new process.”

### Instant Replay

To keep them out, Errico and the STI team watched videos frame-by-frame of operators preparing and assembling kits. Studying the videos allowed the STI team to spot fluctuations not identified by observation alone. This current-condition analysis included appropriate training such as how to capture data and how to design standardized work. “I teach as we do it,” Errico said.

He noted that a lot of fluctuation is eliminated simply by going from batch to flow production because batching tends to cause variability. For instance, fluctuations in the time needed to break components into lots of 50 will go away when assembly shifts to one-piece flow. But the improvement team also focused closely on fluctuations in the time team members needed to pick a part and place it into the kit. The picking and placement will still be part of the new process so it must be understood in detail.

“That’s the fluctuation that we really want to home in on and eliminate,” said Errico.

After analyzing current conditions in assembly and the warehouse, the team decided the future-state process would have to follow this basic thinking:



A pick-to-light system uses a green light (top) to show operators what kit component to pick. A red light and alarm indicate if a wrong part is picked.

- Create and run an assembly cell to a level schedule and build every part every day. The cell would have to be capable of building all kits in single-piece flow to a leveled demand of an estimated 400 kits per day. Each of the three most popular kits would be built daily by leveling (averaging) demand by type and quantity over a fixed period of time to eliminate spikes. STI would hold the kits in inventory then sterilize and ship them as needed. Cell walk paths and operator balance charts were created at three different takt times for each kit the company assembles.
- Develop visual indicators of production performance using standard work in process, a heijunka system, hourly production status boards, real time Pareto charts of abnormalities, min-max inventory levels by component, and real-time sterilization order status.
- Develop real-time problem solving. The visual indicators would tell operators and managers where there were problems. But the team also called for installing a pick-to-light system as a pokayoke (error-proofing) device. The system, one of the few capital costs of the project, would signal operators what part to pick then confirm that the part was picked. This would eliminate the pre-assembly sorting and prevent shipment of a kit without a component. If the light system signals that an incorrect part was picked, an operator summons the team leader by hitting an andon buzzer. The kit is taken from the line, parts are reloaded into bins, and the leader investigates the error's cause. (In early runs, two components were picked incorrectly more than others. The problems were fixed by a change in component packaging.)
- Deliver components by tugger based on a kanban signal and a 60-minute delivery route to reduce the amount of parts needed line side and identify improvement opportunities.
- Create a first-in, first-out (FIFO) warehouse system by developing a Plan for Every Part (PFEP) and installing, FIFO flow racks, min-max levels, and an overflow area to visually indicate if there was too much inventory.

Besides the pick-to-light system, the only other capital spending was for FIFO storage racks in the warehouse, a right-sized sealing machine that could seal kits one at a time, and a pipe-and-joint system for building new assembly cells.

## Launch and Buy-In

“The Do phase is like launching a rocket,” said Errico. “Before the actual launch date many tests and simulations are conducted in stages to achieve a flawless launch.”

The improvement team built the first simulated assembly cell using cafeteria tables, lunch trays, and cardboard. But real parts were used to prove the concept. Then operators ran the simulated cell, offering improvement ideas.

“When we run these simulations, people are buying in,” said Scanlan. “They are having a say in the process with their ideas and suggestions.”

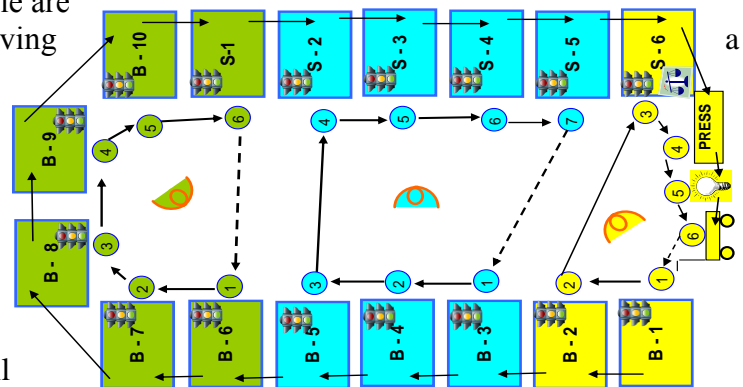
The first simulation used people and parts. The infrastructure of operator walking paths, bins, and fixtures wasn’t incorporated until the second simulation, which used a pipe-and-joint system to construct a working cell with actual workstations. “We build the cell with the intent of using the stations for production but we’re not production ready,” said Errico. “We build it and run another simulation.”

Once again, team members had the opportunity to run the cell, offer improvement ideas, or raise concerns. “Operators realized right away they were going to have to stand in the new cell to walk from station to station,” Errico recalled. “It was a major worry for them.” He said operators accepted the new way of working as they saw the ergonomic design of the cell. In fact, operators noted that time went faster when moving through the cell.

At this stage, operators made suggestions to improve station dimensions, part container flow, and scrap handling. “Because of team member suggestions, we eliminated three workstations in the cell,” Errico noted. “That reduced the cell footprint by 25% which is a huge cost savings due to the expense of clean room square footage.”

## A Plan for Every Part

Building every part every day in the clean room meant the warehouse would have to deliver every part every day to the clean room production cell. The first step was to create the PFEP



After: The Do phase at STI transformed clean room kit assembly from batch to a single piece flow cell with three walk paths.

(Plan for Every Part), a spreadsheet showing where every part came from, where it went, and how it was used ([See part of a PFEP from STI](#)). A typical PFEP database contains these categories:

Description	Length	Supplier City
Point of Use Location	Width	Supplier State
Standard Container	Weight	Delivery Frequency
Quantity	Daily Usage	Transit Time
Order Frequency	Storage Location	
Carrier	Supplier Name	
Container Type		

Using information in the PFEP, the team made changes to improve storage and retrieval, including:

- More frequent deliveries in smaller quantities from selected suppliers
- Minimum and maximum levels marked on shelves and racks
- Parts storage in three levels from low density (larger parts) on the lowest level to high density (such as needles) on the highest
- One side of shelves or roller racks designated for retrieval only
- Parts stored in FIFO sequence
- Tugger delivery every two hours to a clean room interlock

<b>STI Scorecard</b>		
Goal: Improve productivity, quality, and floor space utilization to handle 4x increase in demand		
	<b>Improvements</b>	<b>Comments</b>
Assembly Team Members	>50% reduction	Freed team members were redeployed at STI to help with demand growth.
Lead time from warehouse to clean room	Before: 2 weeks After: 2 hours	Components were double bagged and held for 2 weeks in the warehouse in lots of 1,500 to 2,000 per component. Now components are delivered when needed based on kanban and a 60-minute delivery frequency. Warehouse inventory is being reduced, by as much as 50% on some components.
Rejected components per month	50% reduction	Achieved by real-time notification of rejects to drive immediate problem solving.
Next Steps		Create additional cells to handle 4x increase in volume without increasing clean room or warehouse space.

The next step calls for creating additional cells in the clean room, using the same PDCA

approach. “What I appreciated with the Medtronic partnership,” said Scanlan, “is that they didn’t come in and say, ‘Hey supplier this is what you need to do.’ A lot of companies will do that. Medtronic said this is what we’ve done; this is how it works. Then they teach us how to fish so it’s not just me leading the project. People on the shop floor have to be involved.”

### Check

A two-hour drive southeast of STI, is TSE where the process for making a kit component, a cable used by surgeons to program implanted devices, has entered the Check phase. Located in a small industrial park set among the farmland of Jackson, MN, TSE’s plant builds the cables, called screeners, along with other electrical components used in medical products.



TSE built the Medtronic cables, which come in two lengths, on a traditional production line, 33 feet long, five feet wide, and occupying 175 square feet. Raw cable arrived from suppliers in a big coil, was cut to length, then transported to the line where eight team members performed 12 operations, including trimming, soldering, and attaching contacts and pins, to create the screener cables.



The line layout and batch processing led to a number of wastes. For example, operators left stations to get materials and spent time untangling cables passed from station to station in batches. Work-in-process (WIP) between each station fluctuated between 20 to 80 cables. Work content at each station varied greatly. Operators often struggled to keep up and felt overwhelmed as batches of cables in WIP grew larger as the day went on.

“Everyone was always busy, but they were doing a lot of non-value added work and resources were often reallocated to address the moving bottleneck,” said Errico.

Screeners production went from a straight line with eight operators, top, to a one-piece flow cell with four.

The screener line was selected as the initial lean project because Medtronic’s demand for the two

cables was significant in volume and fairly level over time. After three months of analysis, simulations, and redesigns, Errico and a TSE team had converted the line into a U-shaped cell, following the same tactical PDCA process used at STI.

### **Leadership Involvement**

Errico checked performance in person weekly and in daily phone conversations with the team. Three weeks into cellular production, he was accompanied on the weekly visit by two Medtronic senior leaders: Bill Hooper, the operations and supply chain vice president, and Jeff Hans, the global supply chain director.

The morning started in a training room off the shop floor with short presentations by plant managers and cell team operators, who reviewed the cornerstones of TPS philosophy:

- The customer is our top priority
- Respect for humanity
- Continuous improvement and kaizen
- Shop-floor focus

Team members took turns presenting, based on the project's Scope A3. ([See a sample A3 template.](#)) First they described the problem: batch production was causing long lead times and higher than optimal labor, burden, and material costs. They reviewed their basic thinking and strategy:

- Run to a level schedule
- Develop real-time problem solving
- Develop visual status of production
- Build in single-piece flow.

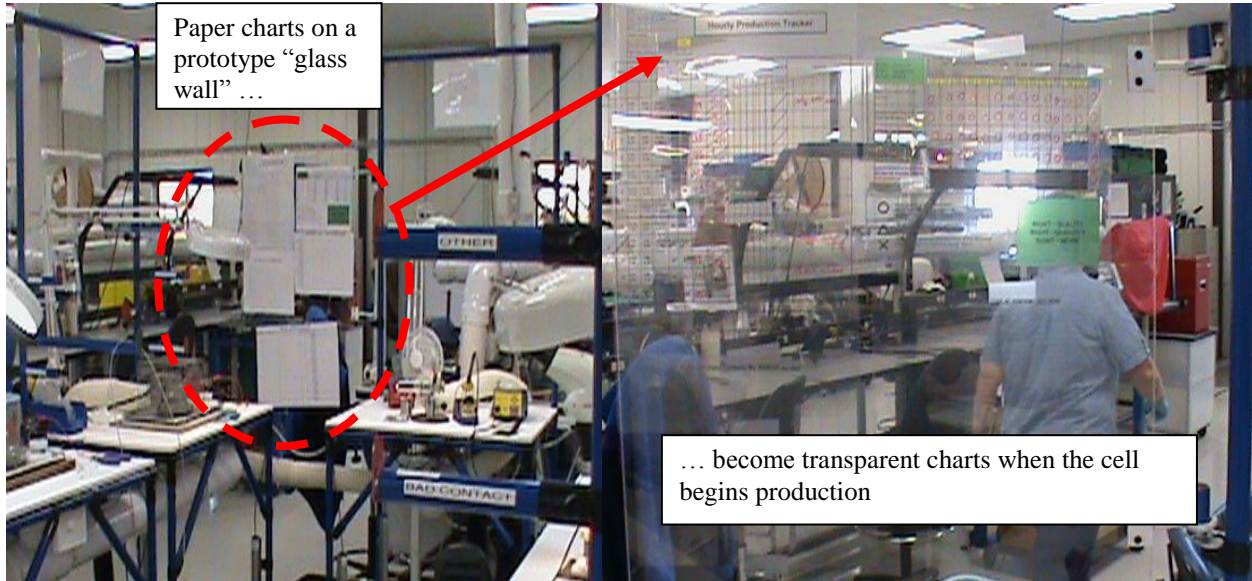
They reviewed targets, current conditions, improvement strategy, a diagram of the new cell, and the implementation timing schedule. Then the TSE team and Medtronic visitors headed to the shop floor to see the current shift of operators run production.

### **Changing Behaviors**

Despite the presence of all the visitors, cell operators performed without a hitch. While they worked, Medtronic managers focused on two clear plastic boards (“the glass walls”) attached to the cell's metal structure on either side of its “U” bend. Performance charts posted on the boards were “see-through” so they didn't block sight lines, an important consideration as the lean system is deployed to other areas of the plant.

The charts tracked not only production output, but incorporated lean management practices into the cell's daily operation, a key element of creating a lean culture, which is critical to sustaining the cell's new way of working.

Depending on type, charts were filled out hourly by team leaders, supervisors, engineers, or managers. They tracked hourly production, daily production, defects by type and station, problems and corrective actions. But one, called [a kamishibai board, showed how well management was supporting the cell team.](#)



The kamishibai board makes the lean management concept of genchi genbutsu or “go see what's really happening” part of management’s standardized work. It gives leaders from team leader to plant manager a schedule for when to visit the cell and what to check. The board shows whether or not the required audits occurred along with the results of the audit and, if necessary, notes about abnormalities and countermeasures.

“The goal is to act right now if there is an abnormality,” said Errico. “If the team can’t solve it, engineering is notified about the need for a countermeasure.”



Cell operators drape any defects on horizontal posts that are labeled by type.

The left side of the board listed five tasks to be checked every hour, beginning at 6:30 a.m:

- Real time defect Pareto review
- Hourly count and countermeasure tracker
- Line review (check standardized work at each station)
- Raw material and standard work in process status
- Review that all required support has performed required reviews

The top row listed who is responsible for performing the check. The cell team leader does every check, but at 7:30 a.m. and

1:30 p.m. the production manager accompanies her. A representative from manufacturing engineering and quality join her at 11:30 a.m. and 3:30 p.m. respectively.

A triangle in the box means an abnormality was observed and corrected. An X means that corrective action is needed to fix an observed abnormality, which is noted on the corrective action sheet hanging on the plastic board. A circle indicates that the right quality and right quantity was being produced and the right standardized work was being followed. An empty box means that team support didn't occur.

### Sounding the Andon

In its first week of operation, the cell hit 74% of targeted production, exceeding the 60% rate that was anticipated. In a few days, output was at 98.7% Then it plunged to 87% when spattering solder at one station contaminated cable contacts. "It wasn't happening all the time, just some of the time," Errico recalled.

The cell team summoned its leader, who also supervised a nearby line, by ringing a bell. She stopped production for a quick problem-solving discussion. Team members knew that spattering is usually caused by cold solder, so they replaced the existing solder. But soon, the team member at the station next to solder had rejected another cable for spatter. The team tried a different solder gun, but the problem soon reappeared. Then a team member noticed that a small fan at a



A heijunka post loaded by the team leader levels production through the cell. Each section is an hour's worth of work.

neighboring station was blowing towards the solder station. The air stream was cooling the solder, which spattered when it hit the hot iron used to join contacts. The fan was redirected; problem solved.

"It really is a paradigm shift from where we were," said Gary Roberts, TSE plant manager.

"You have a cell that can compete globally," Hooper told TSE managers and associates after the cell inspection. "If you can compete, we can compete."

### Adjust

In the Adjust phase, Medtronic's Purchasing group will review continuous improvement performance with TSE as an agenda item during periodic business reviews. The review will include a discussion on the effectiveness of the improvement

activity to determine if the supplier is sustaining and spreading the improvements or if it needs additional support.

<b>TSE Scorecard</b>			
Goal: Improve productivity, quality, space utilization through flow and visual management			
	<b>Improvements</b>	<b>Comments</b>	
Screener Team Members	50% reduction	Freed members were redeployed to other jobs in the plant.	
Work-in-Process	Before: 320+ After: 6		
Floor space	Before: 175 sq. ft. After: 99 sq. ft.		
Defects	50% reduction		
Assembly lead time	Before: 3 to 5 hours. After: 6 min.	Time for 1 cable at start of line/cell to final assembly	
Next Steps	Improve 3 more product lines then improve setup time on the next process, which is molding, so the cell can be coupled to the molding, test, clean, and inspect processes. This will incorporate downstream operations in the single piece / small-lot production flow.		

## Links with Related Information

**Medtronic Neuromodulation** is the second-oldest and fourth-largest of Medtronic's business units. It products include neurostimulation systems and implantable drug delivery systems for chronic pain, common movement disorders, and urologic and gastrointestinal disorders. [Learn more.](#)

- Learn more about the PFEP, tigger routes, and lean material handling in the [LEI Lean Case Study, “Following Four Steps to a Lean Material-Handling System Leads to a Leap in Performance”](#)
- Read LEI’s Lean Leadership articles: a continuing series of [interviews with executives](#) on how they changed the ways they managed and led during lean transformations.
- The [Lean Enterprise Institute](#) (LEI) teaches many of the lean management concepts described above in [workshops](#), [Lean Summits](#), [books and workbooks](#), and on its [web site](#). Join LEI’s [Lean Community](#) for access to case studies, webinars, newsletters, lean management columns, e-letters, and many other resources for starting and sustaining a lean transformation.

# NEUROMODULATION - SUPPLIER DEVELOPMENT (SD) PROJECT; SELECTION, STATUS & TRACKING PROCESS

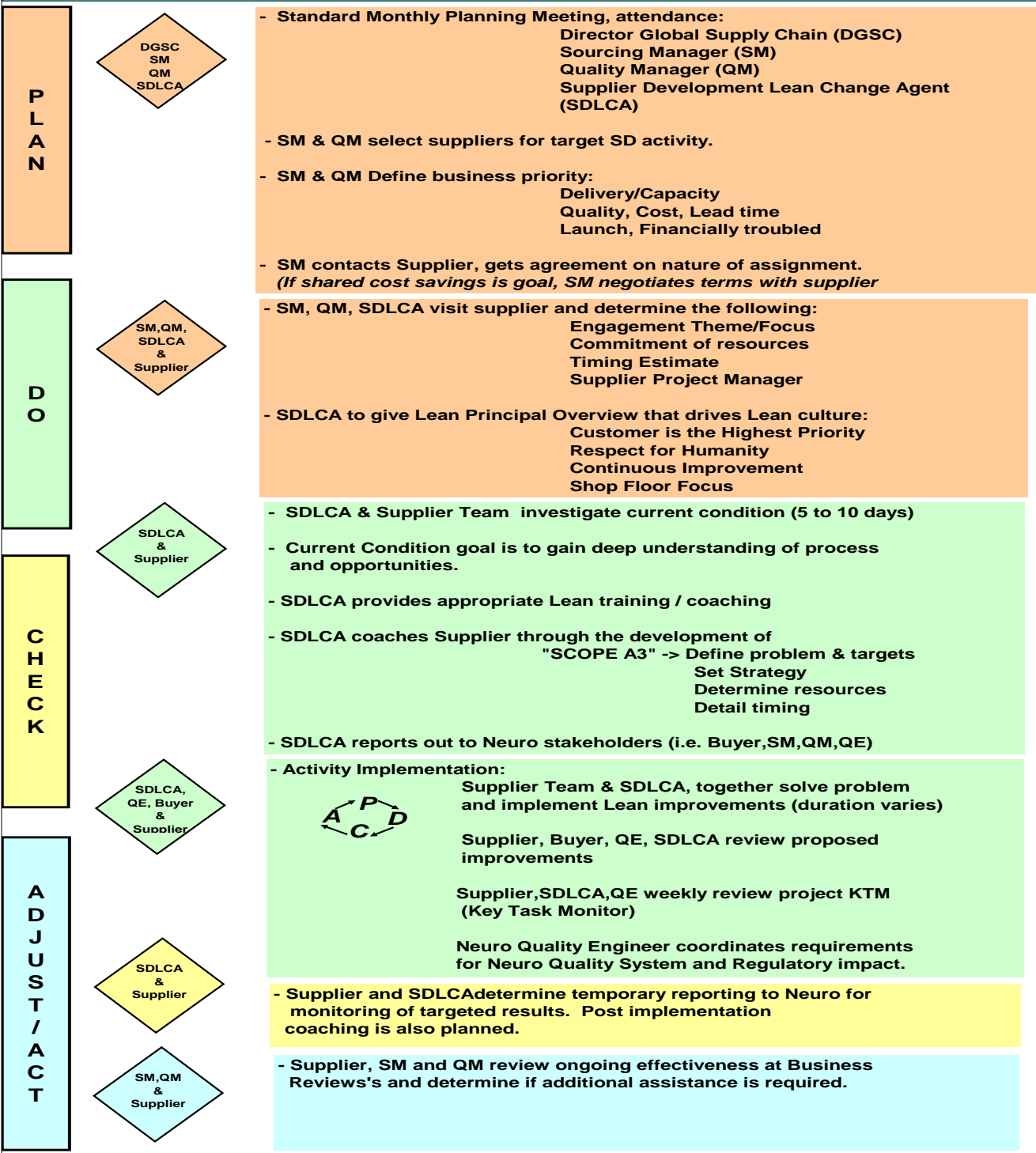
**Objective:**

- Align SD activities with business requirements defined by Director of Global Supply Chain
- Standard approach to the selection, status and tracking of SD activities
- Provide real-time visual status of activities to Neuromodulation stakeholders.

Standardized Work

Visual Control

Standard Management







Revision 9	Note: The master version of this excerpted PFFP has 52 columns and 64 rows of data. Color coding corresponds to warehouse storage locations.																
	ITEM	DESCRIPTION	Inspection Method V=Variable , A = Attribute (pass/fail)	On Site Use	(K) Quantity Required Per Kit	UNIT COST	Cost per Kit	Inventory Date (physical count)	# of Containers on HAND	(B) Units Per Container	Supplier	Supplier Location	Container Height "	Container Length "	Container Width "	(A) Supplier Required Minimum Order Quantity (units)	(A / B) Supplier Required Minimum Order Quantity (Containers )
0.01	MED009	Extension Set (Assembly-STI)	V1 / A1	CEA	1			24-May-10		403	STI						
0.02	STI 015	Alcohol Prep Pad (STI)	A1	CEA	2					403	STI						
1	MED018 S	DRAPE,PRE-STERILIZED,18X2	V3	CEA	1	0.189	0.189	24-May-10	18	500	Viscot Industries	East Hanover, NJ	17	24	21	8,500	17
2	MED040	(6034612)FILTER,22 MICRON	V1 / A7	CEA	1	0.8196	0.8196		4	5,000	Pall	Anarbor, MI	12	24	15	10,000	2
3	MED077	{301031}SYRINGE,20CC,LATE	A6	CEA	2	0.259	0.518		30	325	Becton-Dickenson	Franklin Laks, NJ	12	17	13	5,850	18
4	MED100	PINCH CLAMP(14019)ABS	A4	CEA	1	0.054	0.054		2	5,000	Quosina	Edgewood, NY	10	24	16	16,500	3
5	MED106	(7011C2-02) PVC TUBE,,032	A1	CEA	1	0.053	0.053		5	5,000	Filtrona		8	15	12	85,000	17
6	MED200	(350279-001-A)TRAY,,03 WH	A1	CEA	1	0.4	0.4		60	348	Perfecsea I	Makato, Mn	13	20	15	2,784	8
7	MED210	(S4001200N)FILTER STRAW,5	V1 / A4	CEA	1	0.29	0.29		2	5,000	B Braun	Bethlem PA	11	13	12	5,000	1
8	MED213	(51513BK/56513)GLOVES,EX A	A4	CEA	2	0.0609	0.1218		5	1,000	Smart Practice	Phoenix AZ	12	12	11	20,000	20

**RIGHT - QUALITY  
RIGHT - QUANTITY  
RIGHT - WORK**

**SCREENER PRODUCTION - TEAM SUPPORT - KAMISHIBI**

1st Shift	Date :												
Jeanne 8:30	Jeanne 7:30	Shella 7:30	Jeanne 8:30	Jeanne 9:30	Jeanne 10:30	Greg & J 11:30	Jeanne 11:30	Jeanne 12:30	Jeanne 1:30	Shella 1:30	Jeanne 2:30	Jeanne 3:30	Gary 3:30
Real Time Defect Pareto Review													
Hourly Count Board & Counter Measure Tracker													
Line Review (Standardized Work being Performed at appropriate station)													
Raw Material & "Standard Work In Process" Status													
Review all required support has performed corresponding review													

-  - Right Quality is being produced  
- Right Quantity is being produced  
- Right Standardized Work is performed
-  - Abnormality observed and addressed at present (no further corrective action required)
-  - Abnormality observed and Corrective Action Required (note occurrence on Corrective Action Sheet)
-  - A white square indicates Team support did not happen.

**RIGHT - QUALITY  
RIGHT - QUANTITY  
RIGHT - WORK**