

Avoiding the *Dreaded* “Popcorn Kaizen” Effect

By

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Kaizen events are effective for making dramatic improvements within a carefully focused scope. However, they frequently result in random acts of improvement when used without a higher structure to orchestrate the individual events.

Boeing Canada achieved significant results, and avoided the “popcorn kaizen” effect, by using the Sandras Rapid Breakthrough Events[®] (RBE[®]). They used the:

1. **Strategy RBE** to develop a measurable action plan to achieve their vision of quickly becoming much more competitive,
2. **Value Stream RBE** to streamline and link processes, management, and support operations among sites, across product lines, and to quickly generate significant results that improved their competitive position and their bottom line.
3. **“One less at a time^ã”** process as a systemic process to drive continuous improvements by highlighting, prioritizing, and energizing specific improvement opportunities.
4. **Data RBE**, incorporating the core Total Quality Control and Problem Solving Storyboard techniques, to analyze and correct the root causes of process variations. And,
5. **Operation RBE** to streamline and balance process activities, parts flow, and people movements.

This is a case about Boeing Canada’s approach to rapid and successful Lean Implementation.

(Please read the inset that follows for information about the terms used in this article.)

Who can benefit from this case?

The lessons from Boeing Canada’s successful approach to continuous improvement and Lean implementation apply equally well to any organization – whether they are in the manufacturing, administration, or service sectors. Some organizations are large; others are small. Some are unionized; others are not. Some are high volume, low volume, high variety, or low variety. Some are closely regulated and others are not. Some process materials while others process transactions or people. While the organizations may differ greatly, all have one common thread -- all have processes that repeat.

Notes on Terminology

1. The Strategy RBE helps convert a vision into actionable and measurable steps.
2. The Value Stream RBE, for manufacturing, administrative, and service areas, is an example of what some people call a kai kaku. Kai kaku is a Japanese term that refers to major change across a broad area, such as an entire product line or service function. The Value Stream RBE makes broad-scope changes that affect management, systems, procedures, and behavior. These changes orchestrate and sustain the other RBE changes that follow.
3. The Operation RBE is an example of what some people call a kaizen. Kaizen is also Japanese. Kai means change, Zen means good. Kaizen is a good change. This term is traditionally used in the context of a small or focused area, such as an operation within a product line or within a service function. The RBE for an Operation is focused on a point within an operation to streamline and balance process activities, parts flow, and people movements.
4. “One less at a time©” is a process that was formalized by Bill Sandras for lowering the inventory or waste in the system to expose constraints to further improvements, and to energize people to take corrective action. It too orchestrates the more focused changes that follow.
5. The Data RBE is sometimes called Six Sigma. It is used for specific problems that require analysis to uncover and correct the root cause of process variation. The Problem Solving Storyboard guides teams through the Plan/Do/Check/Action process, and simultaneously helps them monitor and report on their methodology and progress towards their goal.
6. Incorporated into the RBE are concurrent analysis, design, and implementation techniques.
7. When kaizen events are performed without a clear over-arching strategy, the effect is known by the names “popcorn kaizens”, “drive by kaizens”, “kamikaze”, “kaizens”, or “shotgun kaizens”. All terms denote random acts of improvement, that is, local optimizations that do not improve the overall process or affect the bottom line of the company.

For more on the Sandras Rapid Breakthrough Events and the Problem Solving Storyboard, go to <http://pciconsulting.home.att.net>

What are the Boeing Canada Facts?

Boeing Canada has two divisions. One division is in Arnprior, Ontario and another is in Winnipeg, Manitoba. Both sites must adhere to US Federal Aviation and Transport Canada regulations. And, while they have the Boeing name, they must compete with outside businesses for Boeing’s cyclical business.

The Arnprior division supplies metal worked and assembled parts to Boeing in Wichita, Kansas and in Winnipeg, Manitoba, as well as to the Canadian government. They are unionized in the factory and in the office. Their 600 employees generate sales of approximately \$76 million CDN, 87% to Boeing, 13% to the Canadian government. Their products consist of 4,200 end items. How their use of the RBE affected key division metrics is shown in Figure 1.

The Winnipeg division supplies composite parts and assemblies to Boeing in Wichita and Seattle. It is unionized in the factory. Their 1,400 employees produce over 1,000 end items in seven product lines that generate sales of \$391 million CDN. How their use of the RBE affected key division metrics is shown in Figure 2.

What was the situation?

In 1997, Boeing Canada was facing a rapidly doubling sales forecast (part of the cyclical aerospace business). At the same time they were experiencing increasing competition, and becoming painfully aware that their product and overhead costs were too high. They needed to improve their competitive position, improve their ability to respond to customers, and reduce costs. In short, they needed to dramatically improve quality, delivery, and cost – and do it quickly. Otherwise, the Boeing Commercial Airplane Group would award the business to someone else. In today's competitive aircraft business, the parent company could not afford to subsidize Boeing Canada.

Boeing Canada's objectives were to achieve rapid bottom line results and to establish a culture for continuous improvement. Both Arnprior and Winnipeg successfully achieved this objective. This would not have been possible had they fallen victim to “popcorn kaizens”.

Twelve-Steps to Success

Boeing Canada in Winnipeg successfully executed a 12-Step Success Program that incorporated the Sandras Rapid Breakthrough Events[®] (RBE[®]). The balance of this article will outline those steps.

Step 1: What are we going to do?

To regain and sustain their competitive position, and to meet the challenge of rapidly increasing sales, Boeing Canada President and Winnipeg General Manager Jim Sawyer and his staff engaged Bill Sandras to facilitate his Strategy RBE.

The Strategy RBE methodically synthesized the wisdom and knowledge of the management into a 12-Step Success Program. The result was commitment to a series of twelve major steps to achieve the vision, and to the many detailed, actionable, and measurable activities. One important activity was to establish JIT¹ as a key element of the management policy. As a result, implementation of JIT was placed on performance objectives of the senior managers.

Step 2: What about the existing systems and organization?

Management decided to utilize the synergy among JIT¹, MRP², and CQI³. They wanted to capitalize on the fact that JIT, MRP, and CQI have different, but complimentary purposes. And, they wanted to have the people associated with

¹ Just-in-Time (JIT) was the term Boeing Canada used initially. When the term Lean later became popular, they used both terms interchangeably.

² MRP refers to Manufacturing Resource Planning. Today many prefer the term Enterprise Resource Planning or ERP.

³ Boeing uses the term CQI, or Continuous Quality Improvement. Others use the term TQM or TQC (Total Quality Management or Control), or Six Sigma. The authors trust the reader can make the bridge from the terms used in this article to the ones you prefer.

the existing MRP system support the Lean/CQI (or Lean/Six Sigma) efforts, not feel threatened by it. They also decided to begin with the existing product line organization, each of which shares key common resources.

Step 3: Where are the experts?

The Lean/CQI office contracted an experienced expert (i.e., sensei, master teacher) for education and implementation assistance. Winnipeg selected Bill Sandras of Productivity Centers International since they had earlier success with his JIT/Lean guidance in Arnprior, and they valued the way he would help them become self-sufficient in the Sandras Rapid Breakthrough Events as quickly as possible.

Step 4: What is the macro plan?

Blair Seale and others from the Lean/CQI office and the factory, with Bill's help, gathered data and mapped the major process flows. Then they established JIT conversion schedules, product line by product line. Figure 3 shows seven product lines, each sharing seven major processes in the middle of the ten-step flow.

Step 5: Who will make the changes?

A cross-functional team was chartered for each Value Stream RBE, initially one team per product line. Team members consisted of managers and workers from the product line, as well as people from support functions such as CQI/Lean, Quality, Maintenance, Engineering, Planning, Purchasing, Accounting, and Human Resources. Most teams assigned a full-time leader for the few weeks of the project phase (Step 8 describes how much time Value Stream RBE requires). The other team members retained their existing jobs but prioritized their work to enable them to complete their assigned actions items on time.

Step 6: What is the micro plan?

At this step, responsibility shifts from Management to the Value Stream RBE Team. Now activity shifts into high gear. This step typically takes 4-5 days.

On Monday, Tuesday, and Wednesday, the team participates in classroom education and shop floor exercises. On Thursday they discuss and commit to breakthrough objectives. Then, using a project planning process developed by Bill Sandras, they conduct a modified brainstorming session and organize all of the actions that need to take place to accomplish the objectives. Each action has an owner, a duration, and a specific deliverable. On Friday, most of the team is on call while a few people polish the plan and shorten the critical path (the longest chain of actions). Then the entire team reviews the plan with management. On the next Monday, action items start coming due!

Each team, for each product line, was challenged to deliver breakthrough quality, delivery, cost, and speed results across the entire product line. The following list describes actual examples of the breakthrough objectives that different teams set

and achieved. (Note: the production rate for each product line varied with the actual aircraft sales rate):

1. Arnprior's Tray and Shelf line makes 100 different part numbers, at a combined rate of 100 trays per day. Using the Value Stream RBE, the team established a mixed model cell and reduced lead times to 2 days, down from 27, counting from the first shearing operation, through various metal working operations, to completion of the end item. Then using Operation RBE's, they further reduced the lead-time to 1.2 days.
2. Winnipeg's 737NG Engine Aft Strut Faring cell makes left and right wing farings a rate of 1.5 ship sets (3 fairings) per day. Using the Value Stream RBE, initial improvements shortened the lead-time to 7 days, down from 21. Then using the Data RBE's and the Operation RBE's they improved quality, made design improvements, established a moving line, and further reduced the lead-time to 5 days.
3. Winnipeg's shared process centers produce 481 different composite panels at a combined rate of 209 per day (varies by airplane sales). Using the Value Stream RBE, the team established a mixed model flow through a semi-functional layout (economics precluded moving some of the equipment). Lead times collapsed from 21 days to less than 3, 80% of the time. A few panels still required more than three days, but they were reduced proportionately. Then using Data RBE's and Operation RBE's they made significant reductions in scrap and rework, and reduced other wastes in the flow.
4. Other areas had similar improvements using the Rapid Breakthrough Events. One new product line, Thrust Reverser Blocker Doors, was born using the JIT principles, and was actually the first to begin to use JIT/Lean practices in Winnipeg.

Figure 4 shows some of the typical elements of a Value Stream RBE project plan, however, it only shows the main categories. An actual project plan would have several to many action items under each category, with perhaps 150-300 in total, with durations of 1 hour to a maximum 5 days each.

Figure 5 shows some JIT/Lean elements that the teams considered implementing to meet their objectives. The focus of the teams, however, was not to implement every aspect of JIT/Lean before moving on to the next product line. Nor was the focus to try to implement one element of JIT/Lean across all product lines before moving trying to implement another element site wide. Their focus was not on implementing JITT/Lean; their focus was on meeting the business objectives – JIT/Lean was just a way to accomplish that challenge. Therefore, each team implemented whatever aspects of JIT/Lean that they needed to meet the objectives.

Step 7: What will be the ongoing involvement of the expert?

Once the project plan was complete, a follow-up consulting schedule was established with Bill Sandras. For the first product line using the Rapid

Breakthrough Events, Winnipeg budget for 15-20 days of consulting spread over the course of a year. Subsequent product lines took fewer and fewer consulting days as Boeing's people became proficient in the RBE. Typically, follow-up schedules begin with more frequent visits during the project phase, and taper down to a day or so once a quarter to ensure that the changes are sustained. Because Winnipeg had several product lines in various stages of the RBE's all at the same time, follow-up consulting was scheduled for one week a month the first year, then every other month for the second year. Today, an annual health checkup is all that is necessary.

If the education and project planning is done properly, there is no need for the expert to remain on site. The Value Stream RBE project plan shows the team what they need to do. The primary purposes for the follow-up visits of the expert, are to help the team:

- Stretch their expectations,
- Broaden their thinking,
- Learn from the experiences of the expert,
- Become aware of potential opportunities, problems, and solutions that they may have overlooked,
- Maintain confidence,
- Move past areas of indecision or differences,
- Better manage the project or workshop,
- Have a spokesperson to "tell it like it is" without fear of job repercussions,
- See the broader perspective of their efforts, and
- Provide management with an independent assessment of progress, concerns, and results.

Step 8: What is our progress to the micro plan?

On the Monday following the education and project planning week, action items on the project plan start coming due! Depending on the scope of the changes, a Value Stream RBE can last from 4 to a maximum of 12 weeks. Small product lines require less time than product lines with many process steps spread over large areas and multiple organizations. This time frame includes everything. All that is required to begin Step 6 is an understanding of which product line to improve and a chartered team to make it happen.

The project plan includes all analysis, design, and implementation activity. And using the Value Stream RBE, the analysis, design, and implementation functions occur concurrently, not sequentially. This enables what one learns to be quickly designed into the changes that are immediately implemented, and it permits the implementation time to be greatly compressed for broad scope changes.

Step 9: What are the tangible changes?

During the latter weeks of the Project RBE, typically there are one or more Operation RBE events that occur. These focused events, which are part of the overall project plan, might include relayout of the area, putting materials and tools

at the point of use, attaching kanban cards to items in process, establishing visual controls, performing the initial 5S functions, etc. Figure 6 shows the Operation RBE events that occurred near the end of the Winnipeg's Value Stream RBE to convert all of the shared process centers in one implementation.

Support started immediately after the Operation RBE's ended. Value Stream RBE team members supported all shifts for 2 to 3 weeks to ensure the desired new behaviors became a habit, and to ensure that the changes would be sustained.

Step 10: How will we drive a culture of continuous improvement?

After the action items on the Value Stream RBE project plan are complete, the next step is to drive continuous improvement using the "one less at a time[®]" process⁴. By systematically lowering the inventory, as shown in Figure 7, additional constraints to higher velocities through the manufacturing pipeline become clear, and prioritized. The "one less at a time[®]" process serves as a systemic driver of continuous improvement and further orchestrates the specific improvements that follow in Steps 11 and 12.

(Note: Depending on the nature of the requirements, Step 11 or 12 can be switched, or even done in parallel. Winnipeg's prioritized needs called for Step 11 next.)

Step 11: How will we address quantifiable problems?

As the "one less at a time[®]" process began to expose additional opportunities, Winnipeg began to correct the root causes of quantifiable problems using the Date RBE. These teams used the Problem Solving Storyboard⁵ to guide them through the Plan/Do/Check/Act problem solving methodology (see Figure 8).

Winnipeg's savings from the Data RBE teams equaled the significant savings they realized from the more traditional JIT/Lean activities. For example:

- One product line cut scrap dollars by 61%, another by 36%, and another by 77%,
- A purchasing team cut part shortages by 85% during a critical ramp up period,
- A difficult part from a supplier arrived with a 20% defect rate for a decade; it was reduced to zero defects,
- Out of certification tools were reduced to zero, from a level that could bring regulatory action if not corrected, and
- Waste and scrap from an expensive raw material was reduced by nearly \$1 million a year.

⁴ For more information read: Sandras, William A., Jr., Just-In-Time: Making It Happen (Unleashing the Power of Continuous Improvement), 1989, John Wiley & Sons, Inc., ISBN 0-471-13266-7, (versions also available Spanish and French).

⁵ For more information on the Problem Solving Storyboard go to <http://pciconsulting.home.att.net> and click on "Publications and Other Info" and then on "Articles" and then on "TQC and the Problem Solving Storyboard".

Immediately after receiving education in the Data RBE, and in the accompanying Problem Solving Storyboard method, each team begins to work on their problem. They developed various measures of the magnitude of their problem, determine how to measure their problem, they set objectives, and then develop a data collection process to identify the root cause of the problem(s). Then, as the data brings the cause of the problem into focus, they develop and implement countermeasures.

How long each Data RBE team remains in existence depends on how quickly they can understand the problem and implement effective countermeasures. Typically, teams of 4-7 cross-functional people meet once or twice a week for a couple of hours to work on their problem. Many significant problems can be resolved in a few weeks or months.

Step 12: How will we address flow issues?

As the “one less at a time[®]” process began to expose additional opportunities in Winnipeg and Arnprior, flow issues also begin to surface. Unlike the quantifiable problems that require careful analysis, flow issues require mostly action.

These flow issues are tackled by cross-functional Operation RBE teams. They address carefully focused flow issues in 2-5 days. Typically, a couple of weeks advanced preparation is required before the event, followed by another couple of weeks of post-event activity. One form that is often used to study the flow of work, typically in advance of the Operation RBE event itself, is the Standard Work Combination Sheet (see [Figure 9](#)).

During the event itself, the cross-functional team receives education tailored to the task at hand. Then after a few hours of study and planning, they begin to make changes. Progress reports occur every day for management. By the end of the week, changes should be in place delivering significant results.

Next Step: What do we do next?

At this stage, a company will have completed at least one Value Stream RBE. They have also been exposing and prioritizing opportunities for continuous improvement using the “one less at a time[®]” process. They will have completed those improvements using Operation RBE's and/or Data RBE's. Eventually, however, the rate of improvement seems to plateau. At that point make certain you are not getting complacent with the “one less at a time[®]” process. If you are not, then it is time to go back to Step 1 and start all over again.

As one person lamented, “That’s the trouble with continuous improvement, it never stops!”

When you return to Step 1, make certain you ask the right question. The question should *not* be “What do we need to do to take JIT/Lean to the next level?” The question should be “What do we need to do to help our customers

become more successful?” If JIT/Lean is part of the solution, fine, but if not, that is OK too. You are not in business for JIT/Lean; you are in business to serve your customers. And, the Rapid Breakthrough Events will help you make a wide variety of necessary changes.

Summary

Figure 10 shows the relationship among the four elements of the Sandras Rapid Breakthrough Events, and the “one less at a time[®]” process.

The Value Stream RBE addresses macro and infrastructure issues for a manufacturing, administrative, or service process. Value Stream RBE's are broad in scope. They involve management in the initial broad changes that pave the way for the more focused or point improvements that follow. They also establish a culture of continuous improvement that is necessary to sustain the changes.

The “*one less at a time[®]*” process lowers inventory and waste in the system to highlight and prioritize opportunities for continuous improvement.

Operation RBE's address activities, parts flow, and people movements within a carefully focused area. They make important changes within a narrow scope.

Data RBE's address process variation and complexity for quantifiable problems requiring root cause analysis. They too make important changes within a narrow scope.

Perhaps an analogy will serve to put these methods in perspective. Recall if you have ever seen a bear carved out of a log. When working at this scale, some sculptors use a chain saw to rough out the figure. Have you ever seen a duck carved out of a block of wood? The best ones are so detailed you can even see detail with the individual feathers. In this case the sculptor uses fine carving tools. It is not very expedient to use fine carving tools when you are beginning with a log. But once the image is roughed out, the more precise tools are necessary to refine the object.

The Strategy RBE and Value Stream RBE are more like the chain saw. They quickly put the situation into perspective and help you remove the major sources of waste to bring the new system, and new behaviors, into a more tangible view. These major gains are significant enough to positively affect the bottom line -- fast. But much more improvement remains to be done.

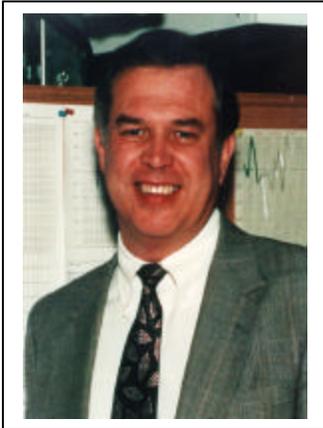
The “one less at a time[®]” process helps to orchestrate the more detailed steps that follow.

The Operation RBE and the Data RBE are the fine carving tools. They improve the flow and variation at various points in the system. Each has its own purpose, just as each of the woodcarver's tools has its own purpose.

Anyone reading this article has lived long enough to know that if we only have a hammer, all problems look like a nail. We need broad-scope and point-focused techniques for change, and we need to use each at the appropriate time. The RBE's provide the balance of we need when we are making major changes across broad areas and when we are fine tuning specific points in the process. And because they prioritize and orchestrate each subsequent change, they help us avoid the dreaded "popcorn kaizen" effect.

By using the Sandras Rapid Breakthrough Process[©] and by following a 12-step success program, Boeing Canada in Arnprior and in Winnipeg, each went from being a marginal performer to one of the best in class in two years -- and they continue to improve today.

About the Authors



Bill Sandras founded Productivity Centers International in 1985, and provides his expertise to manufacturing, administrative, and service organizations throughout the world. The Sandras Rapid Breakthrough Events[®] (RBE) are based on over 30 years of experience helping manufacturing, administrative, and service organizations successfully convert their visions for change into reality. Bill also developed the “one less at a time[©]” process to serve as a systemic driver of continuous improvement. Bill personally provides education, facilitation, implementation, and support in the use of his Rapid Breakthrough Events. He frequently uses the:

1. Value Stream RBE to implement the full concepts of Lean (i.e., Just-in-Time) to make broad changes that deliver quick customer satisfaction and bottom line gains, and that orchestrate the more specific changes that follow,
2. Operation RBE to make specific changes to that streamline process activities, parts and transaction flows, and people movements,
3. Data RBE, incorporating the original Total Quality Control tools and his Problem Solving Storyboards to, reduce defects and other process variations,
4. *Strategy RBE, incorporating the new thought-based Management and Planning tools, to tap the intuition of experts to discover solutions to complex but non-quantifiable management problems, and*
5. A blend of these RBE's to develop measurable project plans to enhance the management of complex changes.

Bill began his career with Continental Oil Co. as a computer systems/programmer analyst. He then worked for Hewlett-Packard (HP) for 16 years in various management positions. While at HP, Bill worked at two mature divisions and helped to start three new divisions. These divisions manufactured high-volume/low-variety products, and complex low-volume/high variety products.

As a manager, Bill led HP's first successful Manufacturing Resource Planning (MRPII) and JIT/TQM implementations. Later he championed three more MRP and two more JIT/TQM implementations. He and his team were the first to link JIT and MRP together. He also led product design, and then product marketing and support efforts for an MRP software package

At HP, Bill managed production, manufacturing engineering, purchasing, planning, order entry, warehousing, shipping, transportation, software development, product marketing, product support, and information systems. Bill also began the JIT/TQM worldwide education and consulting services for the Oliver Wight Consulting Companies.

Bill holds a Bachelor of Science degree with dual majors in production management and statistics, and a Master of Business Administration degree in management science from the University of Colorado. He passed the American Production and Inventory Control Society's certification exams at the highest level and was on their JIT certification test committee. He wrote the popular "how-to" book titled Just-in-Time: Making it Happen, booklets titled About Face to JIT (100 Changes), Competition Killers (Competitive Technologies for 2000), and TQC2: The New Management and Planning Tools, plus many articles including "High Velocity Manufacturing" selected for the Best of Chief Executive Magazine. He is on the Association for Manufacturing Excellence editorial board for their Target magazine.



During his 36-year career with Boeing, Jim Sawyer has held positions as machinist, Union President, Arnprior Division General Manager, and President of Boeing Canada. In 1991, McLean's magazine recognized Sawyer on the honour roll as one of the top 25 business executives in Canada. Sawyer currently serves as President of the Manitoba Aerospace Association.

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Blair holds a B.Sc. degree in Aerospace Engineering from the University of Michigan and diplomas of technology in both Mechanical Engineering Technology and Aeronautical Engineering Technology. He is also a Boeing certified kaizen leader.

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