



“Integrated Design – Changing the Way We Think”

The Los Angeles Chapter April 2015 Meeting

Presentation by

**Arthur (Art) Weiss, Executive Director, Advanced Concepts
Rocket Shop, Aerojet Rocketdyne**

Article by

Lee Schwartz - Principal
Schwartz Profitability Group

Listening to Art Weiss explain how he has endeavored to change the way one thinks about product design and production reminded me of the 9 Dot Puzzle. Are you aware familiar with this brain teaser? Start with nine dots three-by-three. The goal is to connect all nine following these specific rules – only four straight lines, no retracing and the writing utensil cannot leave the paper.

For those unaware of the puzzle . . . or unable to solve it . . . the answer is consistent with Art’s approach to what he has coined InThinking™. We need to stretch traditional thinking. While most will remain within the boundaries of the nine dots to solve the problem, one must venture “outside the box” to crack the puzzle.

“Outside the box” thinking is the underpinning of Art’s approach to product design. Classically speaking, product design normally starts with a concept. From that initial idea, brainstorming begins. How will this product solve a consumer’s need? How will it be used? What will be required to produce it? With answers to these and other questions, the design is completed, and it is time to begin production. Vendors/ suppliers are identified or parts are produced in house. Units are ultimately sold after production. And that is typically the end of the process.

As a disciple of the thought leaders in this area . . . Doctors Deming and Taguchi, Russell Ackoff and others . . . Art views this process very differently. Instead of an open loop value-stream (series of processes) of independent parts, or steps, Art and his team see production as a closed loop value-stream of **interdependent** parts.

The open loop template stops with the consumers. The closed loop model sees the consumer as but another, and invaluable, step in the process. Consumer feedback . . . what they like, what they want to see different/ improved . . . becomes the springboard for enhancements in design. Once redesigned, the production process begins anew to build a better “mouse trap.”

The changing design methods and procedures resulting from these InThinking™ thought processes, combined with other techniques, leads to a new integrated design capability that promises to substantially impact business through simplified, more rapidly developed, affordable products.

At the heart of this design approach is an understanding of the difference between Macro System Models and Micro System Models, otherwise known as Mixed Model Management (MMM). While traditional design begins with a macro view of a proposed system and its functional requirements broken down to sequential individual parts, micro system thinking focuses on the interdependencies between the system elements, combining function into integrated elements and balancing variation between the processes that will fabricate and assemble those elements.

Here's a look at some of the differences between the Macro and Micro Models . . .

Quality Focus – Conformance to requirements versus relationship between actions, referred to as “Minding the Gaps.”

Goals – Defect-free parts versus profits beyond measure

Mindset – Reactive/ being the victim versus proactive, being the leader

Impact – No improvement in quality after zero defects versus continuous investment for long-lasting solutions

Attributes – Separation and blame versus no blame and collaboration

Art shared with the group an eye-popping example of the results that can be achieved from buying into and applying Mixed Model Management to process design. The story began in the 1990s. The RS-68, developed by Rocketdyne, is the largest hydrogen-fueled rocket engine in existence. It was developed with the goal of producing a simpler, less costly, heavy-lift engine for the Delta IV launch system.

Part of the injection system assembly requires 600 tubes to be inserted into 600 holes drilled in a metal plate. Each joint needs to be perfect **every** time . . . for obvious reasons. Two decades ago Art and his team looked at, through the prism of MMM, the variables in production to “mind the gaps” and ensure a successful assembly. They achieved complete success the first time these parts were put together and haven't looked back since. It has been 20 years of 100% success. No rework.

This notion of “minding the gaps.” What does that really mean? In the best of layperson's terms, it is the ability to manage gaps, i.e. tolerances, so that “things” will go together the right way, every time. No scrap. No waste. No lost dollars. Conversely, managing these gaps to reduce variation will increase quality and affordability . . . two key objectives in today's environment.

Art and his team at Aerojet Rocketdyne have demonstrated that InThinking™ yields better designs. They are pushing the envelope further by infusing InThinking™ into Advanced

Manufacturing, or 3D Printing, and by introducing and training their suppliers on its use. With a focus on designing for affordability, InThinking™ advances how people work, learn and think together.



Lee Schwartz, former CEO and President of manufacturing and distribution companies, is principal of the Schwartz Profitability Group (SPG) that, for 14 years, has uncorked the operational bottlenecks of manufacturing and distribution companies, boosting their bottom line results. Lee's clients range from smaller family run companies to Fortune 500 firms, including those in aerospace and defense. His work helps his clients find solutions related to process improvement, supply chain management, inventory control, workflow design, and operational performance. Results consistently include cost reduction, improved efficiencies and increased profitability.

Lee can be reached at lee@schwartzpro.com or at 310-450-2628. More info can be found at www.schwartzpro.com or his [LinkedIn profile](#).