

Refining the Squeeze Machine

AME community uses lean skills and tools to advance the needs of the autism community.

By Tricia Sutton, Ed Minnock and Ken Rolfes

While working with Dr. Temple Grandin as a keynote speaker for the 2011 annual conference in Dallas, AME saw an opportunity to help both the lean and autism communities at the same time. In 1965, Grandin designed and developed the Squeeze Machine as a way to calm individuals with autism-spectrum disorders. The device has not been broadly adopted because it is intimidating in appearance and expensive to manufacture. Why not involve the AME community and use lean skills and tools to help redesign it?

After gaining support from Grandin and the manufacturer Therafin Corp., Frankfort, IL, AME's volunteer team defined two related workshops in which participants would redesign the actual Squeeze Machine while teaching powerful lean practices for product and process development:

1. A Voice of the Customer (VOC) Workshop — March 28-29, 2012.
2. Production Preparation Process (3P) Redesign Workshop — Jun 12-14, 2012.

Both workshops were hosted at Therafin's facilities and included first-hand input from autism experts. (See page 26.) Customers of the Squeeze Machine include individuals who use the device for themselves as well as therapy and care providers. They use it in a variety of settings such as clinics, schools and homes. The workshops could target any or all of these groups and use scenarios; however, AME chose to focus the initial workshops on clinical users and incrementally improving the existing design. This approach supports producing tangible improvement in just five days of workshops that Therafin can readily implement.

Start with Customer Value

Providing value as defined by the customer is a core principle of lean and is especially important to successful product design. Although product development teams often incorporate VOC into their efforts, they can get tripped up by several misconceptions.



Boyd Rice, S&C Electric Co., reviews his team's results after an exercise. Also shown (left to right): Coleen Shinn, Easter Seals; Ed Minnock, workshop facilitator; team members (left to right) Maurice Shell, Easter Seals; Targeted Convergence Corp.; Jete Cronin, Therafin; Dave Sullivan, Sur-Seal; and Jason Culp, S&C Electric map out customer interests.



Collaboration in action: Workgroups actively used the actual Squeeze Machine during exercises. Shown (clockwise from left): Jim Dyes, Therafin; Dave Sullivan, Sur-Seal; Dr. Margaret Creedon; Ken Rolfes, KDR Associates; Boyd Rice, S&C Electric Co. (in Squeeze Machine).

One misconception is that VOC is what customers say; that customers don't know what they want so asking them will not provide enough useful information. Many organizations also assume they understand what their customers want, seek to confirm and defend their preconceived notions about the customer, and/or emphasize the company's strengths and capabilities in their development efforts.

VOC and customer value, however, go much further than what customers say or articulate, including how they behave, why they do things, what you can observe, even what they are not doing. Taking this broader view to understand the customers' interests and to define customer value will drive greater success in product development.

Ed Minnock, vice president of business development at Targeted Convergence Corp. in Carrollton, TX, facilitated the two-day VOC workshop. Designed for senior professionals in product development, the workshop instructed attendees how to find out and understand what customers want and how to present those interests in a format that product and process designers can use to design superior products. After discussing the value of and techniques for incorporating the consumer's voice into product development, a dozen participants applied the lessons to customers of the Squeeze Machine.

Exercises throughout the workshop included determining target consumers; defining their voice in engineering terms, prioritizing customer interests, defining design factors for the top interests; and drafting a brief that included a description, analysis and action plan to focus the 3P redesign workshop. Between each exercise, the teams shared their results and added feedback from the rest of the group to validate as well as enhance the outcomes.

Target Customer

During the workshop, subject experts shared their perspectives and experiences on autism (and related disorders) and the Squeeze Machine. Each expert brought a unique perspective. The variety and depth of knowledge provided a more rich and direct personal understanding than was possible from simply reading the professional literature or conducting customer surveys.

Margaret Creedon, PhD, special projects director at the Autism Research Institute in San Diego, described a range of experience and research on the conditions for which the Squeeze Machine can provide benefit, from the autism spectrum to attention deficit disorders (ADD/ADHD) and sensory processing disorder (SPD). Creedon focused heavily on the fundamentals of the customers' needs during the exercises and served as a reality check for each exercise.

Sensory overload is a common factor with these disorders, where what might be considered normal levels of stimulus can overwhelm an individual and increase stress. Touch is a common trigger but other stimuli may be involved such as sound, level of noise or frequency and sight — light, brightness or specific colors. Even the hormonal changes of adolescence can elicit this type of overload.

The type and location of touch makes a difference too. Tactile or light touch, such as that on the surface of the skin can be problematic; whereas deep, steady touch, such as the type that engages the deep receptors in the joints, can be calming and relieve stress.

People experiencing sensory overload may have difficulty with self-regulation. They will try to cope with a variety of defensive responses, underreacting (e.g., inattention, gaze aversion, shutting down) or overreacting (e.g., outbursts, panic, hitting, fighting). Individuals with autism tend to need extra time for recovery from stimulus overload.

Valerie Creedon, Margaret Creedon's daughter and program manager for the Jesse Brown VA Medical Center in Chicago, related her personal experience with attention deficit in her youth. She had constant urges to do things with ideas by rushing in to a situation. She needed ways to calm down and maybe act on the ideas — or maybe not, if they distracted from accomplishing important goals. She found personal benefit from use of the Squeeze Machine.

The younger Creedon also related her experience in working with the military and veterans. Military combat raises alertness. High alertness is important for survival and saving lives, but causes overreactions in normal environments. Once triggered, individuals need ways to deal with the energy and adrenaline when outside of combat situations. They need to interrupt the cycle and adjust their internal “thermostats” to be able to handle normal situations appropriately. She helped broaden the perspective and see potential future opportunities beyond the initial redesign.

In any spectrum disorder, each person is different when considering how to relate to and treat them. Colleen Shinn, training specialist and manager of autism programs for Easter Seals Metropolitan Chicago, discussed how individuals can react to triggers. Some individuals can manage multiple triggers, but as they build up, they can reach an overwhelmed point. Having to be “on” for too long can affect the behaviors and reactions as well as the ability to self-regulate. Shinn brought a fervor for expanding access to the Squeeze Machine.

Maurice Snell, administrative assistant at Easter Seals Metropolitan Chicago, was able to relate direct personal experience with autism and how it affected his youth. He described how he worked through the experience and learned to self-regulate better. His personal and work experience, along with his passion and drive to support the project, provided a powerful connection to the workshop's customer throughout.

After hearing from each of the experts and asking questions to expand their understanding, the workshop participants teamed with the experts to describe the target customers. The group outlined specific attributes such as demographics, use scenarios, issues and skills. It also explored the differences between the purchasers and the end users.

Interest Categories

Based on this deeper understanding of the customer, the group discussed overarching

categories of interests, coming up with 15 different categories. Defining interest categories is an iterative process, and the categories were revisited and refined after the exercises to define specific interests.

Customer Interests

To identify specific interests for the categories, workshop participants formed teams that included at least one subject expert each. The teams picked different categories and worked through identifying specific interests for each category. Most categories featured multiple interests.

In the end, participants had defined 66 specific interests across the 15 categories. Not all interests are of equal importance nor can that many be addressed in detail so priorities become important.

Prioritize Interests and Define in Engineering Terms

The priorities are in the eye of the customer so only the subject experts rated the interests, each selecting their top three interests, going through two iterations — primary then secondary interests. Between each prioritization effort, the teams reformed and worked through the priority interests, creating tables of data for each one.

Teams defined the interests from the customer perspective, then considered how to measure them, possible targets, and the gaps between current and the ideal product. The teams went on to evaluate which of six subsystems would relate to the interest (positively delivering the interest or interfering/taking away from the ideal state) and the gaps between the current and ideal. Table 1 gives a sampling of example interests.

Customer Interest Category	Customer Interests	How to Measure
Approachability	Position of user in machine	<ul style="list-style-type: none"> • Standing • Prone • Supine
	User field of view while in machine	Field of view in degrees
Sensory	Sound	<ul style="list-style-type: none"> • Decibels (dBs) • Frequency
User ease of use	Users with limited motor and communications skills can use (tactical controls)	<ul style="list-style-type: none"> • Visual • Force • Distance
Hygiene	Washability using common products	Cleaning product cost
Function	Pressure adjustability	PSI range
	Location of pressure	<ul style="list-style-type: none"> • Touchpoints • Length of area where pressure is applied

Table 1. Examples of customer interests.

Before finalizing the customer interest work, the group double-checked the top two sets of customer interests. Every participant listed three things that should be changed and three things that should not be lost from the current Squeeze Machine. After comparing

AME will help with lean design and development expertise to support Therafin with implementation plans where desired. The final results, as well as a prototype of the revamped Squeeze Machine, will be presented Oct. 15-19 at the AME 2012 International “Excellence Inside” Conference in Chicago. The VOC Workshop will be offered again at the conference.

Tricia Sutton is president of Sutton Enterprises Inc. in Bensenville, IL, where her team works with not-for-profits and small manufacturers to inspire better results through knowledge-based development and improvement programs grounded in lean principles. She has more than 28 years of diverse expertise in new product development, lean enterprise, program and project management, business process and program design, value stream management and visual knowledge, having led programs for corporations such as GATX, Outboard Marine Corp. and J.C. Whitney and worked as an external consultant. Sutton holds a BS from Beloit College, a MS in Science from the University of Waterloo (Ontario, Canada), an MBA from the Lake Forest Graduate School of Management, and a certificate in Business Process Design from DePaul University. She also holds certifications as a Project Management Professional (PMP) from the Project Management Institute (PMI) and the Lean Bronze Knowledge Certificate from SME. She has received several women in business awards.

Ed Minnock is vice president of business development at Targeted Convergence Corp. in Carrollton, TX. He is a recognized leader in product development and has helped companies throughout the Americas, Europe, Asia and the Middle East. A former executive at Hewlett Packard, he has more than 30 years of experience managing and improving product development in the technology industry. Minnock has a BS in Industrial Engineering/Operations Research from Cornell University and an MBA from Colorado State University. He co-authored Ready, Set, Dominate: Implement Toyota’s Set-Based Learning for Developing Products and Nobody Can Catch You.

Ken Rolfes, president of KDR Associates, Inc. in San Diego, works with his customers to develop business performance improvement programs on a focused or enterprise-wide basis for service and manufacturing companies. He helps businesses craft and execute winning value creation and growth agendas that maximize the value of the business to its customers, employees and shareholders. With more than 30 years in public and private companies that design, manufacture and market technically based products. Rolfes holds a BS in Industrial Engineering and a MBA in Finance. He has presented at various industry national conferences and at workshops, acted as contributing editor for Modern Woodworking magazine and served as an instructor for San Diego State University in the Lean Enterprise Program. He currently serves as director of the Association for Manufacturing Excellence (AME). He will facilitate the 3P Workshop in June.

Temple Grandin and the Squeeze Machine

Dr. Temple Grandin was the featured keynote speaker at the 2011 AME International Excellence Inside Conference in Dallas. Despite being diagnosed with autism as a young girl, she earned a PhD and is a professor at Colorado State University as well as a livestock equipment designer who has done extensive work on the design of cattle handling facilities. She has written many books and is the subject of an award-winning movie bearing her name.



Autism is a neurological developmental disorder typically diagnosed during early childhood. It affects the brain in four major areas: language/communication, social skills, sensory systems and behavior. The causes remain a mystery as experts believe it arises from a combination of genetics and environment. Autism now affects one in 100 births and is rising.

Autism is unlike most diseases because patients don't fit into clearly defined categories. Each person with autism is different, which is why it is called a spectrum disorder. Individuals on the spectrum range from those who are nonverbal and self-injurious to those who are high functioning, known as Asperger's Syndrome. These people are intelligent with good language skills but have impaired social skills.

Beneath autism behavior is a brain that often inflicts pain and fear into patients. Sensory stimuli considered normal to most people (e.g., school alarms, light touch, certain types of clothing) are often extremely painful to patients with autism.

To deal with the anxiety people with autism often struggle with, Temple Grandin built a Squeeze Machine while she was in school to help calm her. Fifteen years ago, she designed a commercial Squeeze Machine that Therafin Corp. builds and markets to the autism community. The current purchase cost is \$4,525 (plus shipping).

The Squeeze Machine appears to help people with other conditions such as attention deficit disorders (ADD/ADHD), post-traumatic stress disorder (PTSD), and sensory processing disorder (SPD).

Learn more about autism and Grandin at www.templegrandin.com/templehome.html. For details on her Squeeze Machine design, see www.grandin.com/inc/intro-squeeze.html. Learn more about the Squeeze Machine from Therafin's website (the manufacturer) at www.therafin.com/squeezemachine.htm.

Autism Experts for the Project Margaret P. Creedon, PhD, ABPP,

is a licensed clinical psychologist, currently special projects director at the Autism Research Institute in San Diego, and adjunct faculty at DePaul University School of Education. She also serves on the panel of professional advisers for the Autism Society of America, and is chair of the Autism Network for Hearing & Visually Impaired. Previously, she was the director of a therapeutic day school and research at the Developmental Institute, Michael Reese Hospital. She developed Project SMART, Sensory

Modulation-Assessment, Research and Treatment, including the Squeeze Machine for students with Autism Spectrum Disorders. This work continued with the Easter Seals program described in Temple Grandin's book, *Thinking in Pictures*. Her depth of understanding and research background both grounded and challenged the workshop participants.

Valerie M. Creedon, LCSW, is a licensed clinical social worker (George Williams College of Social Work, Aurora University, 2004). In 2007, she was appointed as Operation Iraqi Freedom/Operation Enduring Freedom/Operation New Dawn program manager for Jesse Brown VA Medical Center in Chicago. Previously, she served as supervisor in the Aftercare Case Management Program at Mercy Home for Boys and Girls and was responsible for teaching independent living skills in the residential program and assisting with re-integration into the community. Prior to that, she was a youth care worker in the Juvenile Sexual Offenders Program at Hillcrest Family Services; she initiated and coordinated the residential Family Empowerment Program. She brought an appreciation of the needs and potential uses of the Squeeze Machine to a broader user base, including ADD/ADHD and PTSD.

Colleen Shinn is the training specialist and manager of the Autism Program (TAP) Service Centers for Chicago and Rockford. She has been employed by Easter Seals Metropolitan Chicago for 14 years and has been involved in many roles during her association. She is fluent in sign language and is a board-certified and licensed occupational therapy assistant. Prior to working with Easter Seals, she was a sign language interpreter for LADSE (LaGrange Area Department of Special Education) and a program coordinator for West Suburban Special Recreation. Shinn has worked in a variety of environments with children and adults with disabilities for more than 20 years. She is formerly trained in PECS, Lovaas, Structured Teaching and is faculty for the EDOPC (Enhancing Developmentally Oriented Primary Care) Project through the Illinois Chapter of the American Academy of Pediatrics. Shinn has presented at both the local



Representing the autism community: Dr. Margaret Creedon, Valerie Creedon and Maurice Snell. (Not shown – Colleen Shinn.)

and national levels on many topics related to Autism Spectrum Disorders (ASD). Her primary area of focus has been in the field of Inclusion, Special Education and Early Intervention with an emphasis on children who have ASD.

Maurice Snell works with Shinn as an administrative assistant for Easter Seals Metropolitan Chicago. As a youth, he entered the day school at Michael Reese Hospital run by Dr. Creedon to help manage his own ASD. Snell brought a dual background as an end user and a professional working in the ASD community.