Vertai's Final Product and Business Case

I. Introduction

Vertai is a new brand of footwear that will be capable of transforming between a sandal and a closed toe shoe. The original concept came from the frustration of bringing a change of shoes whenever one had to switch between business attire to casual attire for working individuals. The only changeable shoe the design team was able to find on the market is a heel to flat design and a zipper boot to sandal design. However, both of these designs have detachable parts which have the potential of being lost when not in use. Hence, Vertai will have all of its components attached or within the shoe to minimize this issue.

The name Vertai came from the Roman God of transformation and change, Vertumnus, and "Ai" which means love in Japanese. Hence, Vertai combines these two terms to mean, "love for change". Gender specific designs were fabricated in which the men's sandal could transform to an athletic shoe while the women's sandal switched to a flat design. Originally, the shoe designs were meant for college students but after conducting marketing research and consulting the Antrepeneur staff, the design team realized children may be a better market for this product. Hence, the team strove for making Vertai not just a shoe design that is convertible and easy to use. The design experience itself will be something for both the kids and parents to share together. By allowing the parents and kids to be involved with the concept development process, their shoe becomes a collaboration; a work of art for both parties to take pride in.

II. Final Product Design

A. Women's Design- 1st Functional Prototype

The woman's design presented during the first presentation will be the final basis of Vertai's first line of footwear. This design consists of a flat where the fabric pieces on the side unbutton and swivel to create a sandal strap around the ankles and toe strap. The fabric covering the toe is secured to the front of the shoe with a zipper-like mate. When the shoe switches to a sandal, the toe covering rolls over the sandal strip and clips to the underside, creating an open-toe sandal.

Image 1: Women's Prototype Design

III. Initial Prototype Designs

a. Men's Design

The men's design consisted of a toe cover which would be stored under the insole. The side fabric would be cinched into a z formation and Velcro along the ankle. However, no silicone mold or PU prototype was created due to material and budget constraints.

Image 2: Men's Design

b. Children's Design

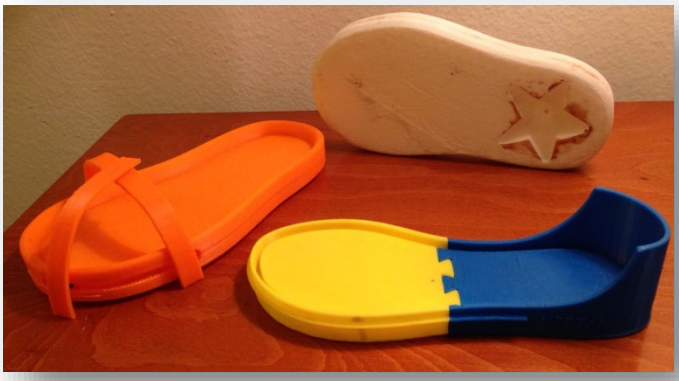


Image 3: Printed Children's Shoe Designs with the Final Model

Two designs were created for the children's shoe. Both have the same side attachments as final shoe but also feature an attachment for the toe cover fabric to slide across easily. As featured in Image 4, one design has the toe fabric slide across a rod along the outer sole, similar to a shower curtain. However, when retracting to the sandal design, the fabric was too thick for this to be a feasible sandal strap.

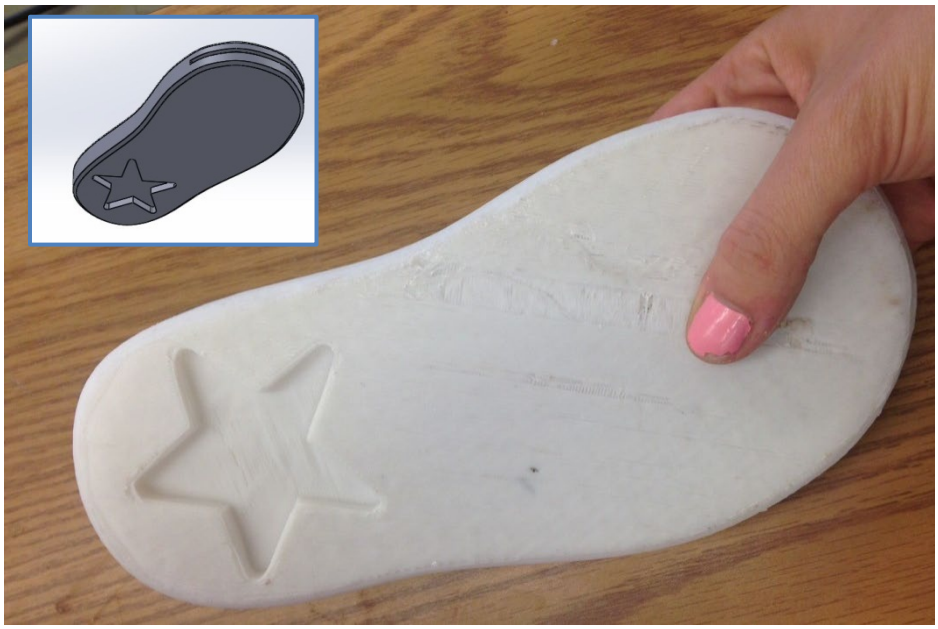


Image 4: Tread Example on Rod/Curtain Design with CAD Model Insert

The second design features a rotating arm attached to the center of the front sandal band. This rotating arm at the front of the shoe has fabric attached to one side and slides along a track embedded into the front of the sole. However, due to material and cost constraints, the silicone mold and PU version were not created.

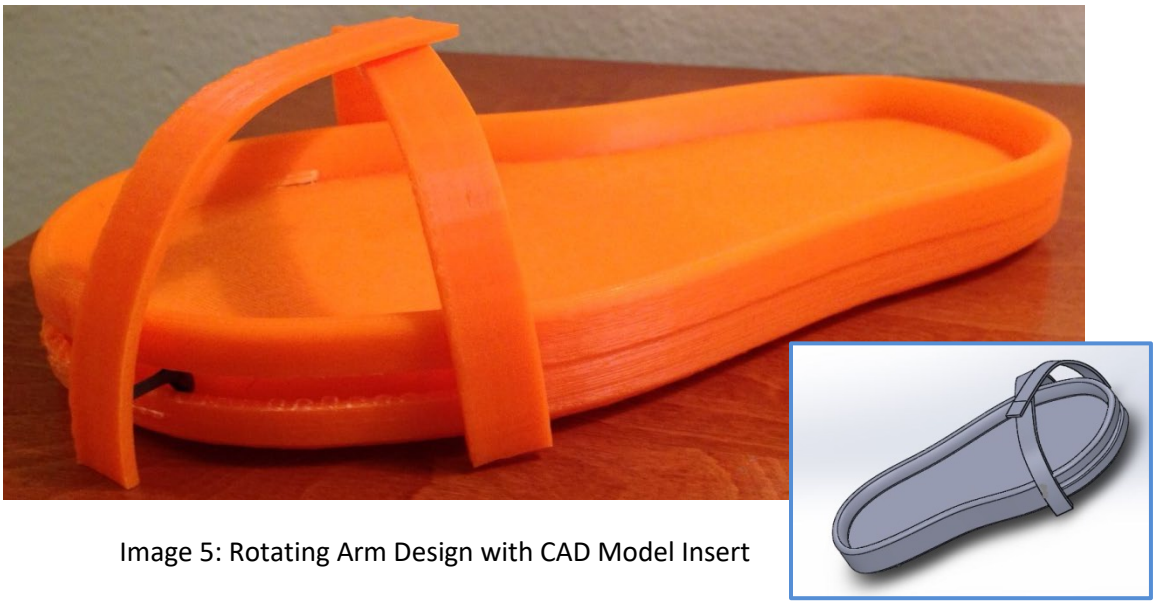


Image 5: Rotating Arm Design with CAD Model Insert

IV. Market Demand

The shoe market industry is huge, consisting of a variety of shoe types, styles, and brands. However, the market value for shoes is also expected to grow. According to Transparency Market Research's Footwear Market article, the global shoe industry is expected to be worth $211.5 billion by 2018 (http://www.prweb.com/releases/2013/8/prweb11074116.htm). Compare this to 2011's

footwear global value of $185.2 billion. Hence, Vertai will have about four years to launch during this peak in value.

Vertai's design is meant to be simple and convenient for its users. Being able to be a closed shoe and sandal allows it to be competitive in two different shoe styles. After the first presentation, a survey was conducted in terms of what were the most common used shoe types. The results yielded sandals (76.32%) and athletic shoes (52.63%) as the top two types of shoes people preferred to have with them. See Chart and Table 1 in the Appendix for the breakdown of responses.

The children's footwear market, particularly ages 4-7, was also chosen because children are not as conscientious about the types of shoes they wear at this age. In fact, it will usually be the parents who decide if the shoe's functionality is worth purchasing for their child. Vertai's two-in-one approach provides dual functionality. In terms of the child, shoes that tend to be remembered are the ones which are eye catching, flashy (sometimes literally), or have an interactive element to them, like the Reebok pumps. Vertai addresses this through its convertible motion aspect, in which kids can decide when to switch between designs. Perhaps in later designs, the shoe can have a button for automatic, retractable transformation.

On the other hand, the shoe industry is a tough market to create a shoe line that can stand out, especially with the large number of brands, distribution costs, and competitor's designs. For example, Converse, Nike, and Adidas already have websites where one can build their own shoes. The lowest base prices for these brand shoes can range from $75 (Converse's Chuck Taylor High Canvas) to $105 (Nike's Flex 2012 Run iD). In terms of printed shoes, Continuum Design has developed a 3D printed shoe with the price of $900/pair. When the design team conducted a survey for the ideal price for Vertai's concept, the results revealed about 25% would consider it reasonable in the $60-$79 range. Please refer to Chart 2 in the appendix. Hence, a cost analysis was conducted for when 365 shoes/ year are created at varying prices.

Though Vertai was striving to be within the $60-$80/pair range, the cost analysis revealed some set-backs with printing the model. For example, if only size 3 shoes were sold for $60, the net income for the first and second year would be $-1,854.20 and $5,455 respectively. However, if these were all shoe size 12.5 (4 year old size), then the net income would be $10,198 and $17,498 respectively. At a maximum of $140/pair, one could see a net income of $27,445 or $39,398 for sizes 3 (7 yr old) and 12.5 (4 yr old) respectively. The reason for these income dynamics is due to the shoe model's size affecting printing times, which can cause the model alone to be $24-$40/pair. For mass production (100,000+ pairs), each pair would costs $32.06 for the smallest size and $55.58 for the largest size. The calculated values of expected costs and revenue can be seen below.

	Price	Profits (365/yr)	Cost for 365 Pairs	Net Income
	$0.00	$0.00	-$1,299.00	-$1,299.00
	$20.00	$7,300.00	$15,158.45	-$7,858.45
	$40.00	$14,600.00	$15,158.45	-$558.45
	$60.00	$21,900.00	$15,158.45	$6,741.55
	$80.00	$29,200.00	$15,158.45	$14,041.55
	$100.00	$36,500.00	$15,158.45	$21,341.55
	$120.00	$43,800.00	$15,158.45	$28,641.55
	$140.00	$51,100.00	$15,158.45	$35,941.55

	Price	Profits	Cost for 365 Pairs	Net Income
	$0.00	$0.00	-$1,299.00	-$1,299.00
	$20.00	$7,300.00	$15,158.45	-$16,454.20
	$40.00	$14,600.00	$15,158.45	-$9,154.20
	$60.00	$21,900.00	$15,158.45	-$1,854.20
	$80.00	$29,200.00	$15,158.45	$5,445.80
	$100.00	$36,500.00	$15,158.45	$12,745.80
	$120.00	$43,800.00	$15,158.45	$20,045.80
	$140.00	$51,100.00	$15,158.45	$27,345.80

After 1 Yr			
	Profits (365/yr)		
$0.00	$0.00		
$20.00	$7,300.00		
$40.00	$14,600.00		
$60.00	$21,900.00		
$80.00	$29,200.00		
$100.00	$36,500.00		
$120.00	$43,800.00		
$140.00	$51,100.00		

After 1 Yr -Pair #				
	Total Cost	Price for 1 shoe/yr	Profits	Net Income
$0.00	$2,223.20	$0.00	$0.00	$0.00
-$7,858.45	$5,558.00	$20.00	$7,300.00	-$12,986.70
$2,898.10	$11,116.00	$40.00	$14,600.00	-$5,686.70
$10,198.10	$20,286.70	$60.00	$21,900.00	$1,613.30
$17,498.10		$80.00	$29,200.00	$8,913.30
$24,798.10		$100.00	$36,500.00	$16,213.30
$32,098.10		$120.00	$43,800.00	$23,513.30
$39,398.10		$140.00	$51,100.00	$30,813.30

The team also considered the cost of fatigue life for the silicone molds. However, using an arbitrary life cycle of 10 cycles for these molds, the production cost only increased by $.10. Perhaps the best route would be to either design a printable mold box itself, thereby skipping the silicone mold making process, or increase the price per pair. However, designing in CAD and 3D printing the model provides digital, reproducible files which will be beneficial when supporting multiple facilities.

With these costs in mind, Vertai will implement a lean marketing model in which an online game and/or app will serve as both marketing research as well as advertising for the company. The app itself is still under development but it will allow users to design their own shoes in a game environment. Details will follow in the Business Model section.

V. Product's Manufacturing Architecture

The Vertai shoes are fully customizable and are determined by the client's preferences. Similar to other shoe brands' customizing options, the client will be able to choose the outer fabric pattern, tread design, and accessories. The client will receive the 3D printed model in addition to their shoe. Once the shoe design is finalized, the order is sent to the design team, where they will reconfigure the base model or retrieve a previous model for modification. The final model is saved as a .STL extension file and sent to an FDM (Fused Deposition Modeling) 3D Printer. After the printer finishes printing the ABS material, the rendition of the shoe is then placed inside a watertight mold box, where the 3D printed master is covered in silicone. Once cured, this yields a silicone mold that captures the negative of the model, including fine details. Then, liquid polyurethane (PU) is poured into the mold cavity and left to cure inside a 60-psi pressure chamber. This minimizes the number of air bubbles in the sole. After curing, the sole is removed from the shoe, fabric is fastened, and the final shoe is ready to be sent to the client.

VI. Business Plan

The first phase will last for a year, consisting of finalizing the shoe design and creating a new game featuring the Vertai product. Instead of a usual cut-and-dry ordering website, Vertai's ordering form will be through a design studio computer/ipad game for kids and adults to start designing their own shoe. The child may even ask for the parent's help to navigate through the website. Keep in mind, the shoe itself is not available for purchase during this phase. This game is similar to Word Bump, in which users pass designs between friends. For instance, when the user has finished his or her shoe design, the user sends the design to other friends for judging. Since children will be participating in this, phrases will be available as options for constructive feedback to the original designer, such as "I like the pattern" or "The sole color is ok". After the friend has chosen his/her phrase, the friend can redesign the user's shoe and send it back as a commentary to the premade phrases. Then, the friend may send his/her own shoe design to the previous user or send the redesigned shoe to another friend for judging. This game will not only allow users to interact with friends and family through Vertai but it will also provide market research for the design team. Once the first line of shoes and their optional features have been finalized, the design team will pitch this concept to another shoe company for further development of the insole design. To help bring in revenue during this waiting time, there will be an option to print out one's shoe as a keychain. Key

chains usually take less than an hour to print (approximately $4-$5 on an FDM machine). See next image for reference.

Image 6: Keychain Size

When Vertai's team and/or the partner company are ready to launch this shoe, printing the life size version will become an option in the game. Note that having a business partner is an option during this transition from phase I to II.

For Phase II, Vertai 's shoe will launch on the game, in addition to purchasable themed packages for the digital studio and a corresponding iOS app. These packages will include not only an environment, but also special decorations on the shoe designs themselves. Also, a new pet feature called Maibuddies will launch. Maibuddies are unique pets users can have in their design studio. The design team is hoping to use these Maibuddies as a way to encourage kids to be play outside and be active. The Maibuddy grows happier as the owner walks around or reports recreational activities to it. This reporting system will be on the game itself first but is a precursor to an app feature being developed during this phase. In terms of the shoe design, the team will use the user's preferences to further develop the next line of convertible shoes, whether there is a particular age group Vertai attracts or if the overall concept design needs to be altered. Phase II will last for 2-3 years.

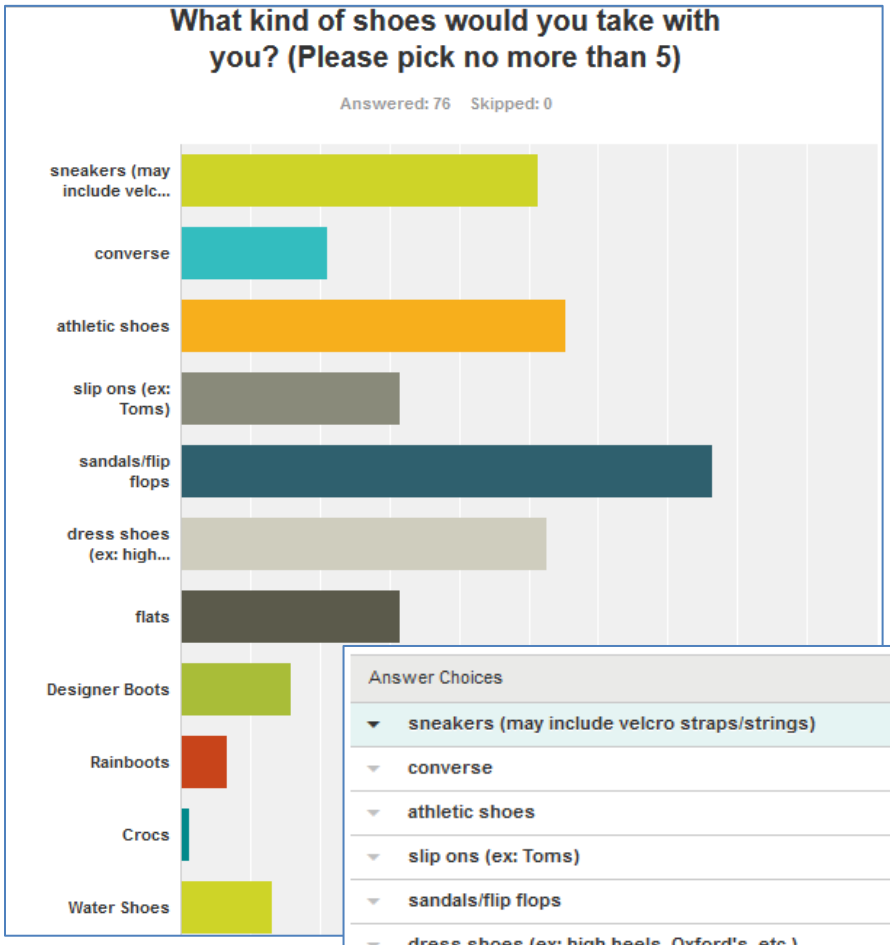
In Phase 3, Vertai can either seek a partnership with another company if needed or be fully sustainable, which will allow the company to launch another shoe line. Cheaper or more efficient 3D printers may be available at this time, which will help Vertai in production costs. As stated before, Maibuddies will be used to encourage athletic activities. Hence, the app feature that was being developed during phase II will allow one's Maibuddy to travel in the app or in an electronic device developed by Vertai. The user can use either an iphone to act as a pedometer or use a new electronic attachment Vertai will develop. This electronic device will clip onto one's shoe laces and count one's steps for convenience. Either device will show the status of the Maibuddy and how walking more will make them happier.

In conjunction with encouraging families to create something together, Vertai hopes to contribute 10% to art educational programs once fully sustainable. One such program the design team would like to initiate donations for is Inner City Arts (ICA), a non-profit organization dedicated to providing art programs for some of the poorest communities in Los Angeles. To publicize this, Vertai's website and app studio will have a "Hero's Section" to inform kids about these kinds of organizations and how they can help, whether through volunteerism or donation.

VII. Closing Remarks

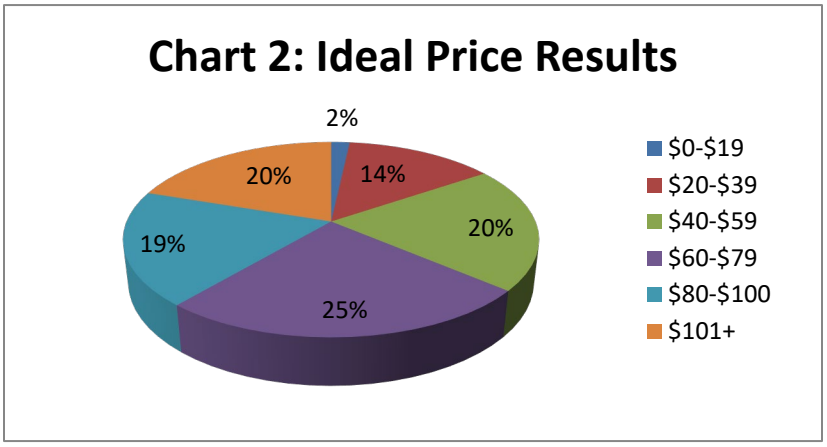
The design team knows much development is still required for Vertai to be fully functional and funded. However, the design team is enthusiastic to try new avenues with this flexible business model. On behalf of Team Vertai, thank you very much for this opportunity in applying the arts, business, and engineering process through this competition.

Additional Comments/Appendix



Answer Choices	Responses	
sneakers (may include velcro straps/strings)	51.32%	39
converse	21.05%	16
athletic shoes	55.26%	42
slip ons (ex: Toms)	31.58%	24
sandals/flip flops	76.32%	58
dress shoes (ex: high heels, Oxford's, etc.)	52.63%	40
flats	31.58%	24
Designer Boots	15.79%	12
Rainboots	6.58%	5
Crocs	1.32%	1
Water Shoes	13.16%	10
Total Respondents: 76		

Chart and Table 1: Most Common Shoes Results Out of 78 Responses



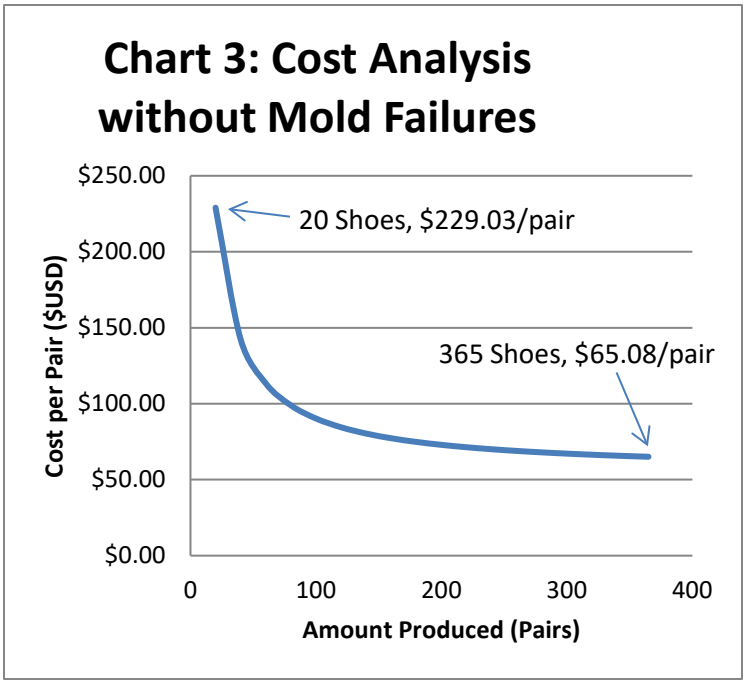


Chart 3: Cost Analysis without Mold Failures
$250.00
$200.00
$150.00
$100.00
$50.00
$0.00
Cost per Pair ($USD)
20 Shoes, $229.03/pair
365 Shoes, $65.08/pair
0
100
200
300
400
Amount Produced (Pairs)

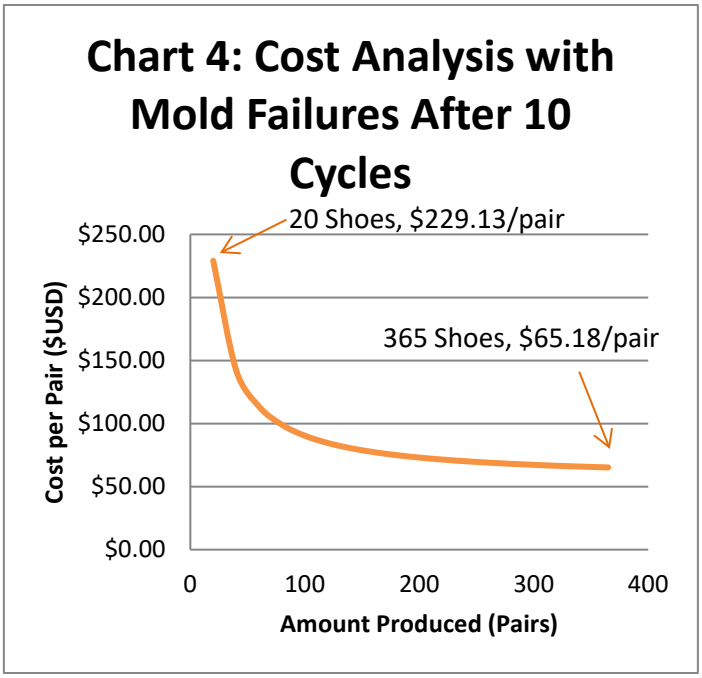


Chart 4: Cost Analysis with Mold Failures After 10 Cycles
20 Shoes, $229.13/pair
365 Shoes, $65.18/pair
$250.00
$200.00
$150.00
$100.00
$50.00
$0.00
Cost per Pair ($USD)
0
100
200
300
400
Amount Produced (Pairs)

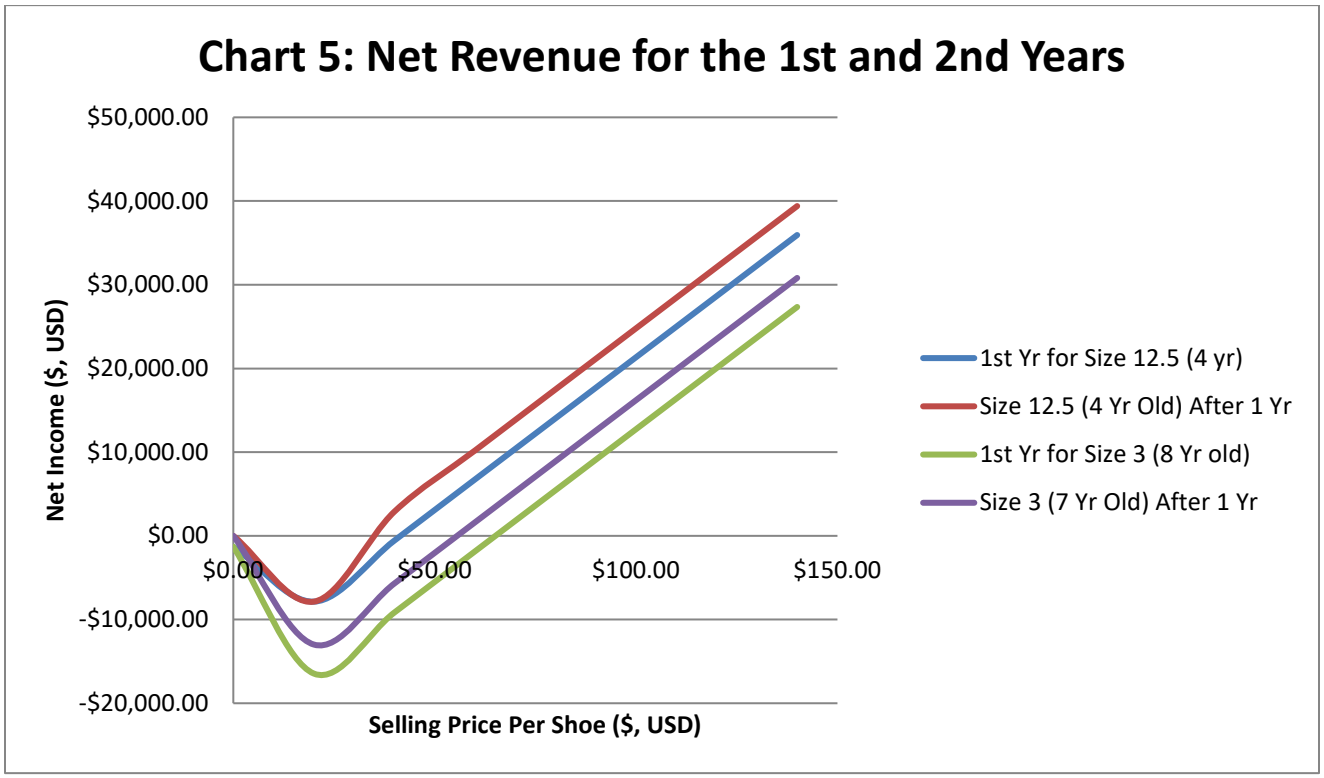


Chart 5: Net Revenue for the 1st and 2nd Years
$50,000.00
$40,000.00
$30,000.00
$20,000.00
$10,000.00
$0.00
-$10,000.00
-$20,000.00
Net Income ($, USD)
$0.00
$50.00
$100.00
$150.00
Selling Price Per Shoe ($, USD)
1st Yr for Size 12.5 (4 yr)
Size 12.5 (4 Yr Old) After 1 Yr
1st Yr for Size 3 (8 Yr old)
Size 3 (7 Yr Old) After 1 Yr