

THE **FLAW** OF

A V E R A G E S

**AND THE PURSUIT OF
TRUE ONE-TO-ONE PERSONALIZATION**

BROUGHT TO YOU BY:  TRUE FIT

The Flaw of Averages

and the Pursuit of True One-to-One Personalization

The exponential growth of data is emerging as a defining characteristic and key differentiator in today's retail environment.

While this abundance of data has created new opportunities for retailers to identify insights that can be transformed into better customer understanding and more business value, the data by itself isn't always enough. In many cases, retailers will also have to unlearn some bad habits they've picked up in the past in order to truly use all that new data to its fullest potential.

A perfect example of this can be found in "the flaw of averages" within data analytics. Understanding the variation between different data points can be difficult, so business leaders have often relied on taking the average value of all the data points in order to get a single data point they can use to plug in to their decision-making processes as an attempt to guide consumer experiences.

However, this approach is fundamentally flawed for one key reason: the average of a group of data points does not actually exist in the real world. If you depend on averages to help you understand who your customers are and what they're looking for, you will not have an accurate understanding of them as individuals. In this white paper, we will explore the flaw of averages and show its downfall, and offer key factors to implement a 1-to-1 personalization strategy so retailers can maximize the relationships they build with customers.

The End of Average

The dangers behind the flaw of averages are explored in detail in the book *The End of Average* by Todd Rose. In one particularly powerful example from the book, Rose details how the US Air Force had to identify and overcome the flaw of averages in order to create the ideal design for its new cockpit.¹

When the Air Force set out to redesign its cockpit in the early 1950s, they started by taking detailed measurements from over 4,000 pilots, with a plan to design the new cockpit based on the average values of all those measurements. The impetus behind the redesign project was that the Air Force had been experiencing an abnormally high number of crashes. The assumption was that these crashes were occurring because the existing cockpit designs were based on measurements from the 1920s, and that updating the measurements would address the issue.



However, one enterprising researcher noticed an important flaw in the plan. When he compared each of those 4,000 individual pilots across 10 dimensions of body size, he found that not a single one of the pilots fell within the average range across every dimension. This is particularly striking when you consider that pilots were preselected for a certain body type: people too far outside the norm would never have been recruited to be pilots in the first place.

The rest is history: the Air Force quickly realized that the crashes weren't being caused by outdated measurements, but rather by faulty assumptions. By trying to design a cockpit for an average pilot who did not exist, they ended up with a cockpit that fit nobody.

After coming to this realization, the Air Force shifted its focus to building a cockpit that could be personalized, or adjusted to fit each individual pilot. For the first time, they built adjustable seats and pedals into their cockpits. This made it easier for individuals of all sizes to thrive within the cockpit, and pilot performance improved significantly.



“True Fit’s algorithms match the fit and style preferences for each online shopper to the specific attributes of garments.”

THE WALL STREET JOURNAL.

The True Fit Genome™ is the largest set of connected fit and style data in the world and is unique to the apparel and footwear industry- with 60 million registered users and over 400 million unique buyer profiles and growing, it offers the best-in-class technology for style and fit preferences.

With the deep level of consumer and garment insight that the Genome provides, the True Fit recommendations engine is able to connect the right person to the right garment. We enable our partner retailers to make recommendations that take into consideration personal style preferences, technical fit, and size to significantly increase the likelihood that the shopper will love and want to keep an item. The crucial factor that makes our technology unique is that our recommendations are custom-tailored to what the shopper in question will like, and not to what someone similar to that shopper might like.

This translates into increased confidence to buy, a better shopping experience for consumers, and higher conversions and a reduction in returns for retailers and brands, resulting in real incremental revenue lift.

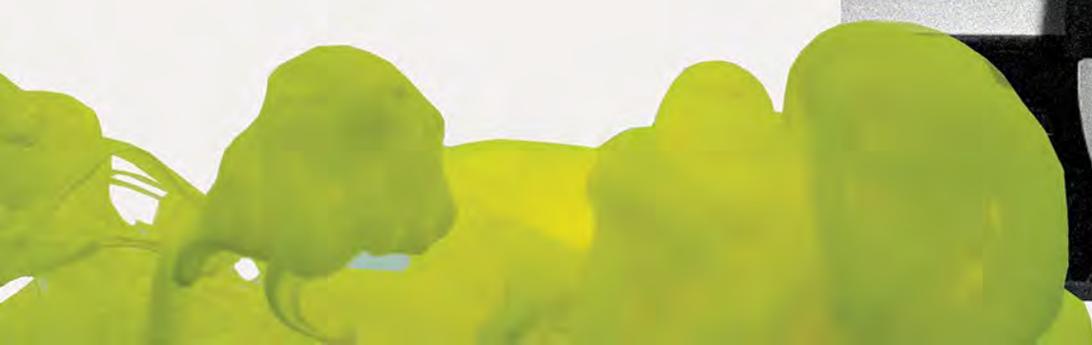
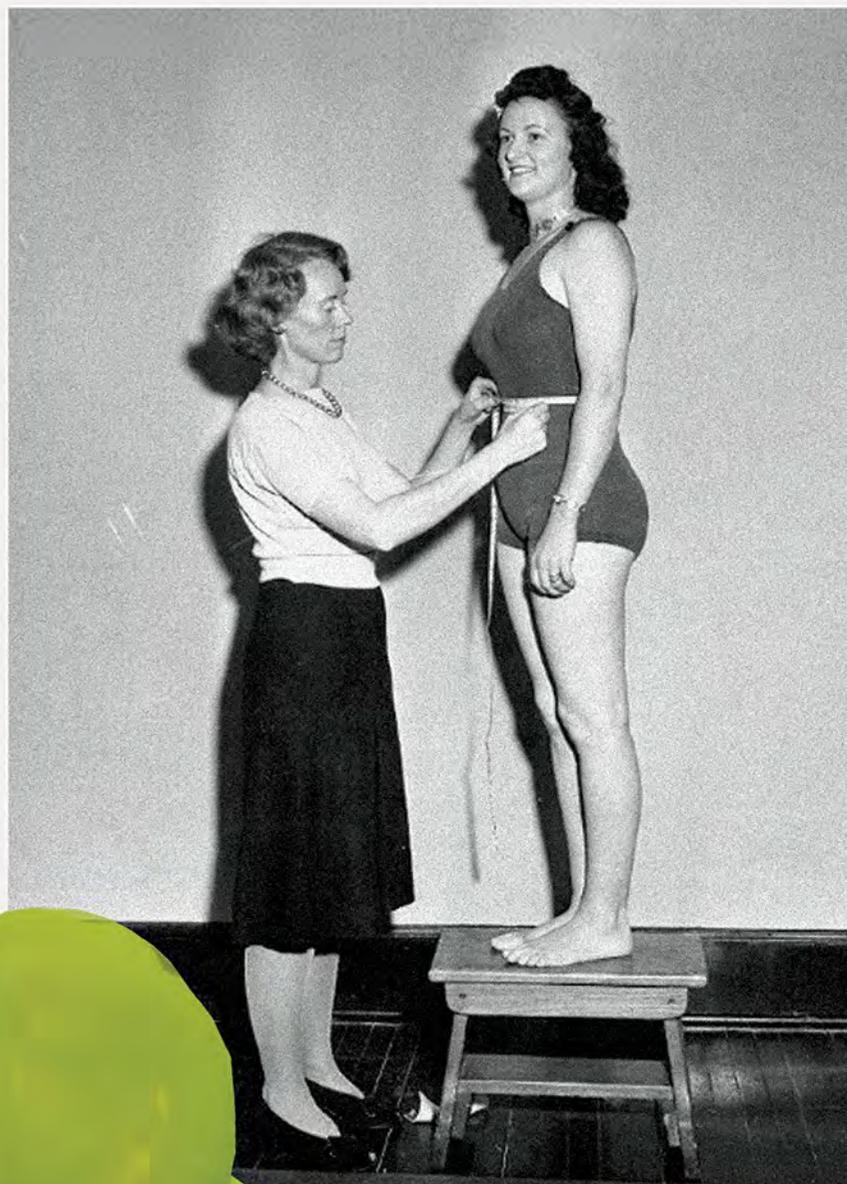


THE Ideal Form: Norma

The End of Average included another powerful example of the flaw of averages at work. In the early 1940s, the statue of Norma was created by a popular gynecologist based on the body measurements of more than 15,000 young adult women. The statue, which was put on display at the Cleveland Health Museum, was supposed to represent the ideal female form.

To capitalize on the popularity of the statue, the Cleveland Plain Dealer held a contest where women were encouraged to send in their body measurements, with prizes being given to those whose measurements came the closest to matching Norma's.

A woman is measured during the Cleveland Health Museum contest. Women who measured closest to Norma could win \$100, \$50, and \$25 in war bonds





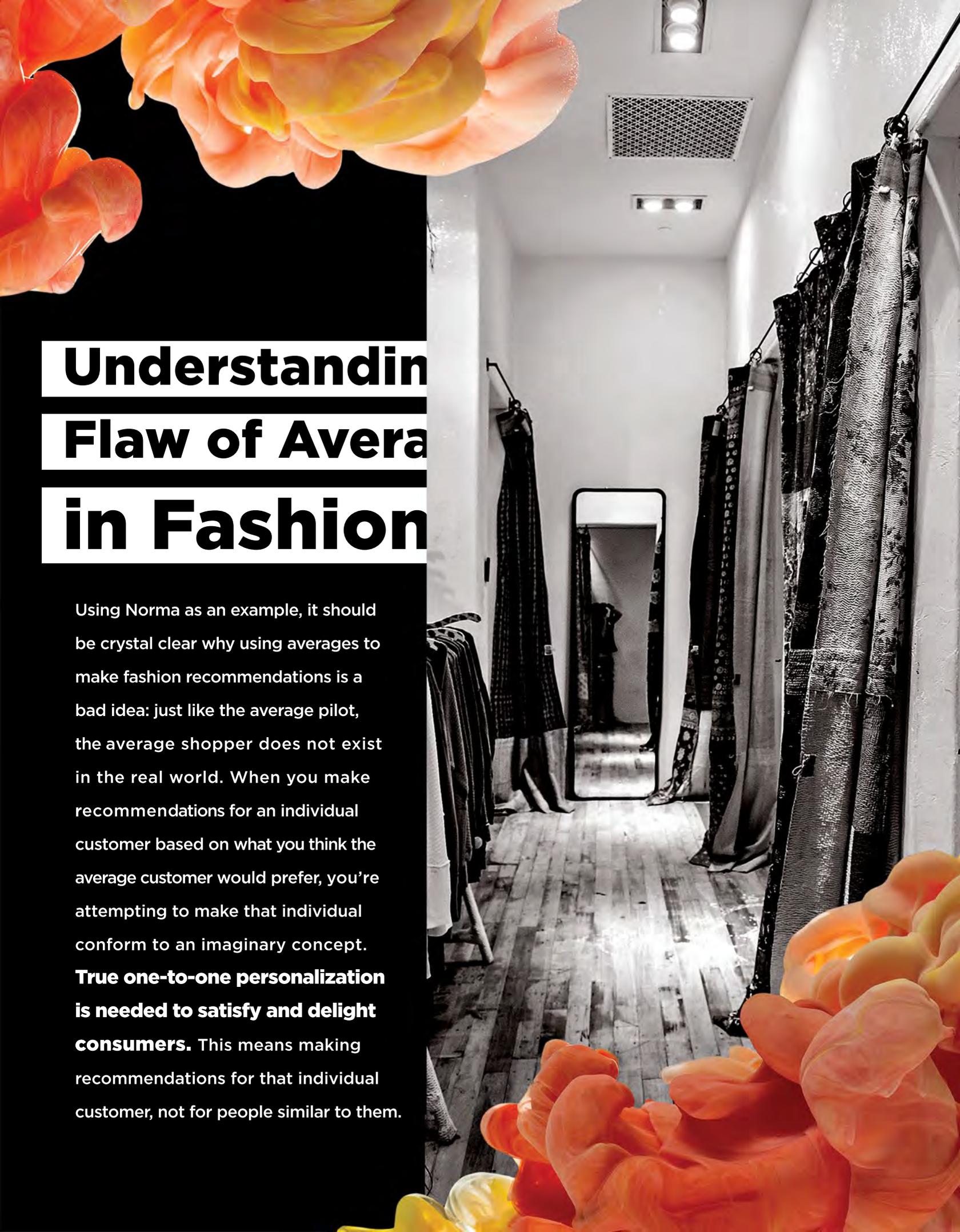
Out of over 3,864 entrants, less than 40 came close to matching Norma across just five out of the nine body dimensions measured.

Judges assumed that they would have no trouble finding “average” contestants, and that the winner would have to be decided by a margin of millimeters. Once again, they weren’t accounting for the flaw of averages. Out of over 3,864 entrants, less than 40 came close to matching Norma across just five out of the nine body dimensions measured. Not even the eventual winner matched Norma across all nine dimensions.

Though wrong and controversial, matching women to an ideal form is not a life-or-death situation like the one the Air Force was facing. However, businesses that rely on understanding and serving customers must reject the flaw of averages outright.



“When you make recommendations for an individual customer based on what you think the average customer would prefer, you’re attempting to make that individual conform to an imaginary concept.”



Understanding Flaw of Average in Fashion

Using Norma as an example, it should be crystal clear why using averages to make fashion recommendations is a bad idea: just like the average pilot, the average shopper does not exist in the real world. When you make recommendations for an individual customer based on what you think the average customer would prefer, you're attempting to make that individual conform to an imaginary concept. **True one-to-one personalization is needed to satisfy and delight consumers.** This means making recommendations for that individual customer, not for people similar to them.

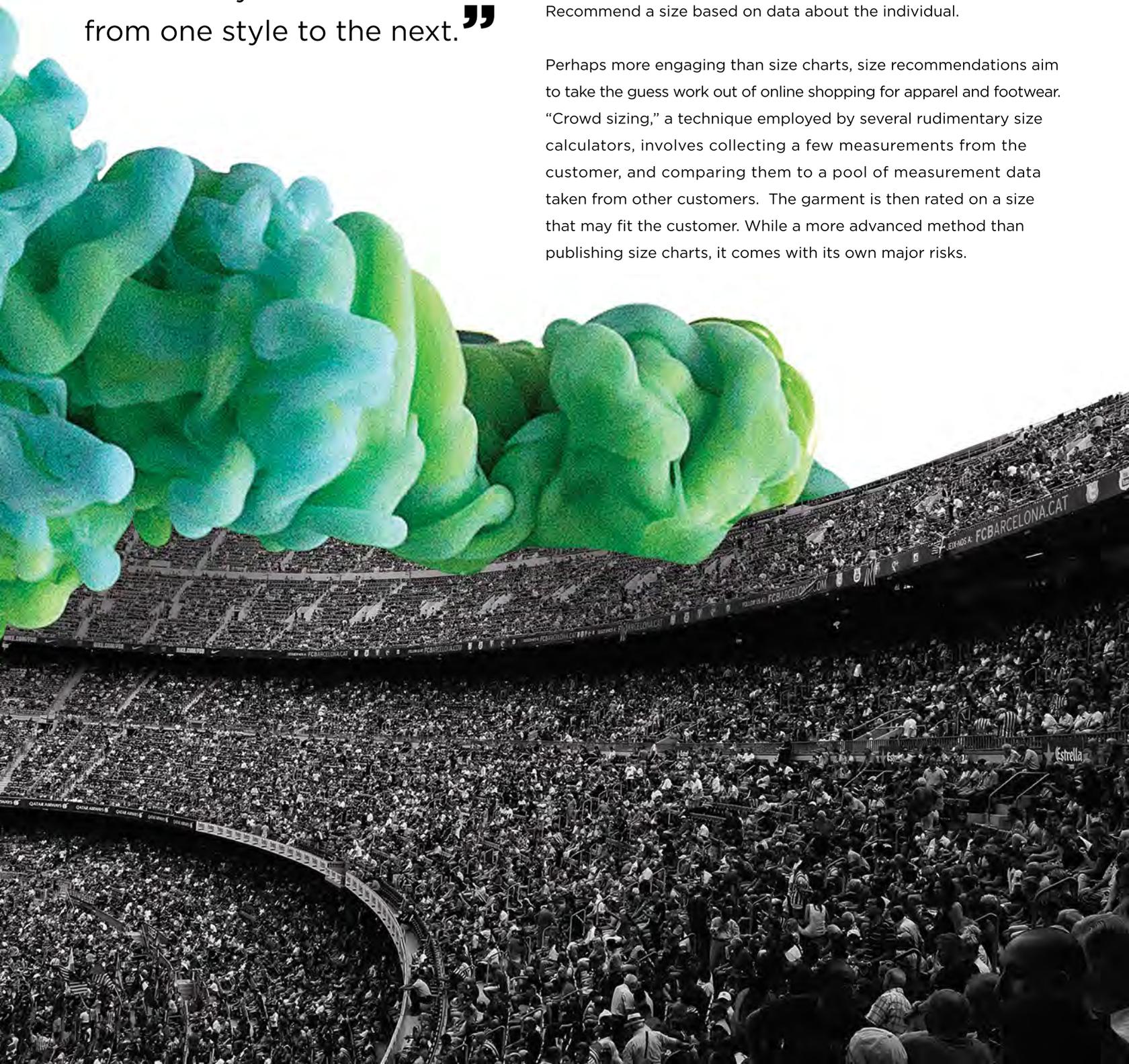
“ There is no standardized sizing or fit system in the apparel market

– a size 6 in women’s jeans is not always a size 6 from one style to the next.”

Consumers see this issue arise on multiple occasions throughout their shopping journey; the first example comes with the use of size charts as primary fit guides. Size charts – think “small,” “medium” and “large” – vary tremendously when it comes to fit, not just across different brands and designers, but across different styles. There is no standardized sizing or fit system in the apparel market – a size 6 in women’s jeans is not always a size 6 from one style to the next.

Size charts are developed to reflect the average consumer of a brand, and as we learned from the above story about Norma, there is no “average” consumer. So, what is a retailer to do better inform consumers about their best size to fit and flatter? Recommend a size based on data about the individual.

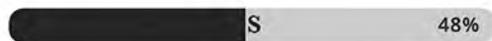
Perhaps more engaging than size charts, size recommendations aim to take the guess work out of online shopping for apparel and footwear. “Crowd sizing,” a technique employed by several rudimentary size calculators, involves collecting a few measurements from the customer, and comparing them to a pool of measurement data taken from other customers. The garment is then rated on a size that may fit the customer. While a more advanced method than publishing size charts, it comes with its own major risks.





You Have Two Matching Sizes:

M and S



People with your approximate height, weight and fit preference bought sizes M and S in roughly equal numbers

For instance, if a garment such as the one above is recommended as a 52 percent match for a consumer,

can you really say it's a match at all?

Crowd Sizing & Size Sampling

One risk of crowd sizing is that it can facilitate size sampling – as seen in the image below. Size sampling, or the behavior by an unsure consumer where he or she orders the same product in one or more sizes, is detrimental to the retail business. Retailers must assume that at least 50% of the purchase made when size sampling will be returned, if not more.

But perhaps the biggest risk with crowd sizing lies in the flaw of averages. The flaw of averages manifests itself in the fashion world in the form of “crowd sizing.” Fit recommendations cannot be accurate by just taking average measurements from the consumer.

Combating Crowd Sizing

Based on previous studies, it seems clear that fit recommendations cannot be accurate by just taking average measurements from the consumer. Let's look at four examples that dig deeper into the issue of fit recommendations and crowd sizing. We took four common body types - two male and two female - and compared the average size recommendation based on either height and weight with the standard deviation to see how well crowd sizing would perform.



MEN

Height: **5'9**
Weight: **195 lbs**

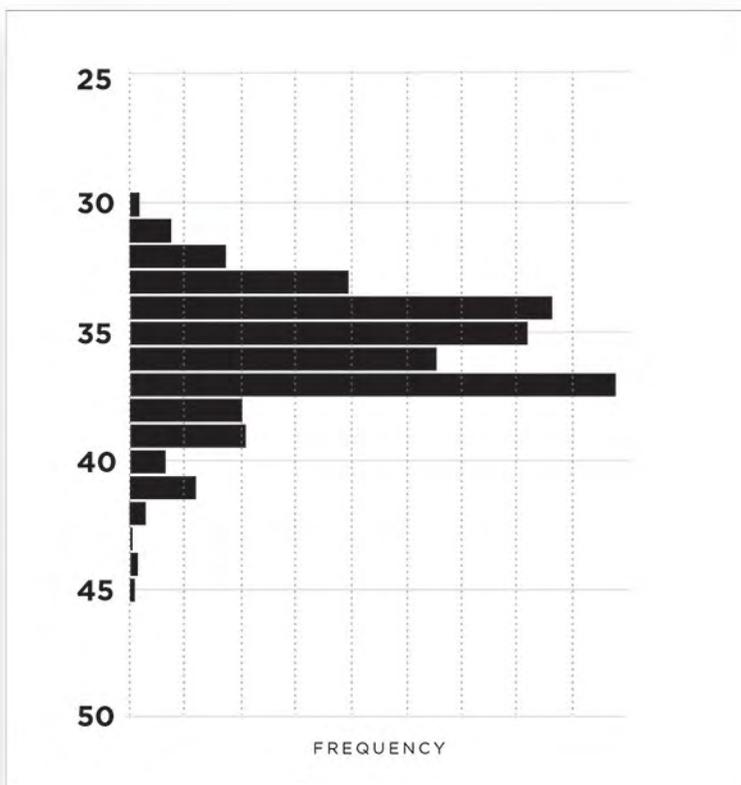
MEAN = **35.6 INCHES**

What this means for Personalization

The Center for Disease Control (CDC) defines the average US male as approximately 69 inches tall and weighs 195 pounds. We analyzed almost 900 male consumer profiles within True Fit's Genome who matched the CDC's average height and weight measurements. The mean waistband size from this sample stood at 35.6 inches. Crowd source sizing might recommend that men purchase a pants size that corresponds to the mean waistband size, but how accurate is that recommendation?

The standard deviation for the sample size shown here is 2.3 inches, which means the waist circumference of just 68 percent of the sample size can vary up to 2.3 inches above and below the mean, or average. In fact, the waist circumference with highest frequency in this sample size is 37 inches.

WAISTBAND SIZE



When translated into men's jeans sizes, the disparity between the standard deviation can account anywhere from 5 to 6 full sizes, depending on the brand. That means by using crowd sourced averages as fit recommendations, the consumer risks purchasing an item, in this case jeans, that could very easily be several sizes too big or small.

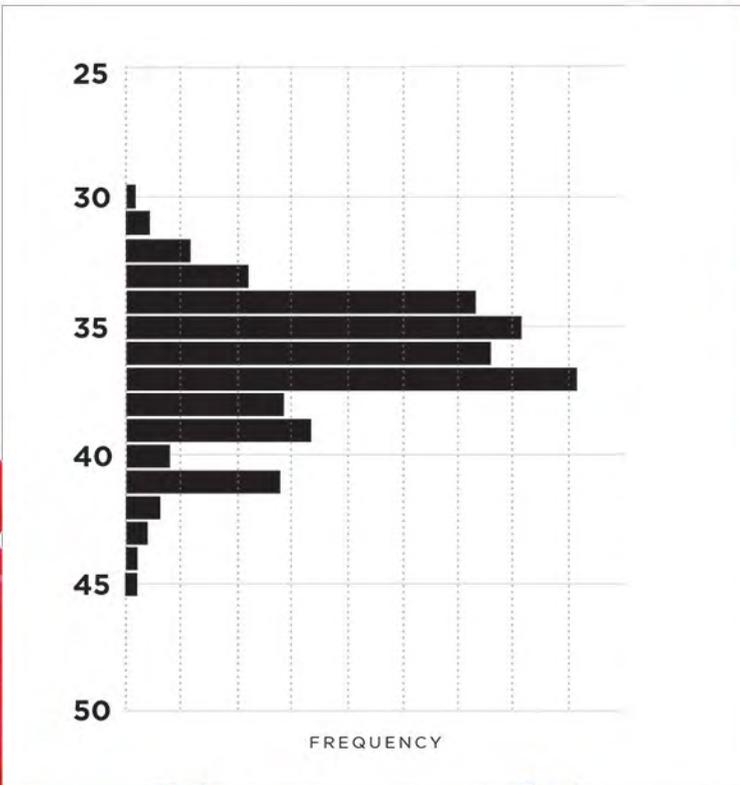
Men who report their height at 72 inches and weight at 200 pounds have an even larger range of deviation from the average. In a sample of 1971 male profiles taken from the True Fit Genome that matched this specific height and weight category, the standard deviation stands at 2.7 inches. This means that while the average waistband circumference is 36.6 inches, 68 percent of the sample size lies between a 33.6 and 39 inch waistband circumference, a difference of more than 5 inches. When translated into men's jeans, there are 6 possible sizes represented in this range (depending on the brand).



MEN

Height: **6'0**
Weight: **200 lbs**

MEAN = **36.3 INCHES**



WAISTBAND SIZE



So, we ask, how can a size recommendation be accurate by just taking average measurements from the consumer?



WOMEN

Height: **5'3**

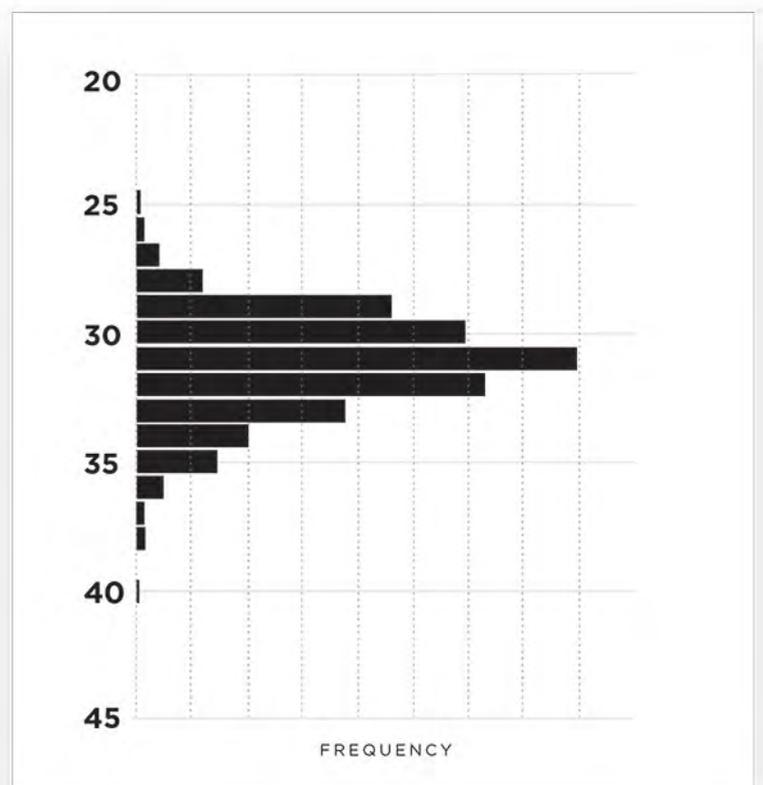
Weight: **168 lbs**

MEAN = 31.3 INCHES

When analyzing the same data for women, the same proves true - **crowd source sizing misses the mark..**

The CDC's average US female is approximately 64 inches tall and 169 pounds. A sample of 973 women with these recorded measurements in True Fit's Genome yielded an average waist circumference of 31.3 inches. While the most frequent waistband circumference for this group was in fact around 31 inches, the standard deviation is 2.1 inches, creating a range of waistband circumference between 29.2 and 33.4 inches. That means that the represented 68 percent of the sample size varies upwards to 5 sizes when translating to multiple women's denim brands.

WAISTBAND SIZE





“Fashion is simply too personal to rely on assumptions based on averages. When a customer finds a garment they really love, it feels like an extension of themselves.”

According to True Fit's Genome, the sample with the most size variance are women who are 62 inches tall and 200 pounds. The mean waistband circumference for the 1718 women who fell into this category was 34.6 inches, with the standard deviation reaching 3.2 inches! With 68 percent of the sample within the 31.4 - 37.8 waistband circumference range, and depending on the brand of jeans desired, this deviation includes both standard and plus sizes. Again, a crowd sourced recommendation that reflects the average consumer size based on height and weight hugely misses the true personalization mark.

Fashion is simply too personal to rely on assumptions based on averages. When a customer finds a garment they really love, it feels like an extension of themselves. One-to-one personalization is necessary to truly delight today's consumers. And we have to get it right.



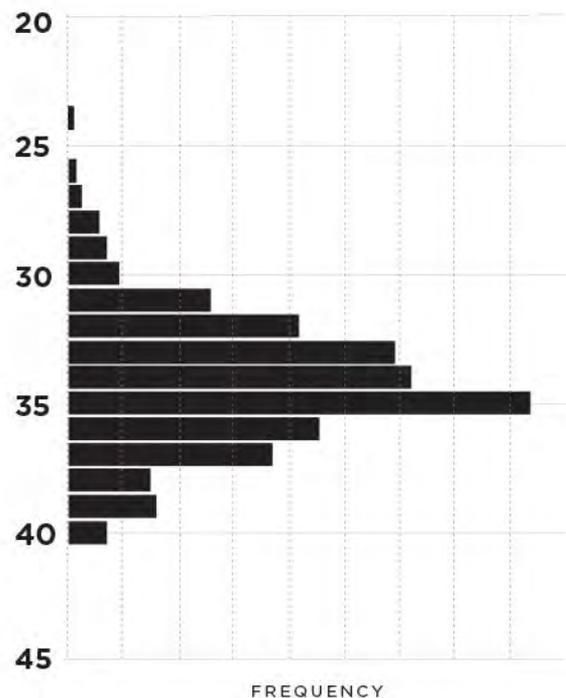
WOMEN

Height: **5'1**

Weight: **200lbs**

| MEAN = **34.6 INCHES**

WAISTBAND SIZE





Personalization, powered by data

At True Fit, we believe the experience of shopping for apparel and footwear should be as unique and individualized as the people doing the shopping. The only way to accomplish this is to stop relying on the flaw of averages, and start creating recommendations that are truly personalized to each individual shopper, on a 1-1 basis. In order to accomplish true personalization, retailers need to access, analyze and understand data-driven insights to make accurate style and fit recommendations for each unique customer.

“ With machine learning solutions, the primary driver for excellent results is having massive data. **What’s exciting about True Fit is that they’ve organized this huge database of structured rich data**, and have deployed a concert of proven algorithms, which is already driving enormous benefits for consumers, brands and retailer alike. ”



Anand Rajaraman
*Asst. Professor, Computer Science,
Standord University
Former Director of Technology, Amazon*



In collaboration with the world's leading retailers and brands, True Fit created the Genome, the largest - and only - set of connected fit and style data in the world for apparel and footwear. True Fit's Genome is designed to help consumers find styles that they will love and keep, by pairing manufacturing design data from more than 11,000 apparel and footwear brands, with consumer order data across 200+ retailers and individual preference data.



When consumers create a True Fit profile, they answer a few questions about themselves, their bodies, and how they like to wear their clothes. This information provides an ideal starting point for making personalized recommendations, **but it's really only the tip of the iceberg.**



We also look at sales and returns, based on over \$100 billion in anonymized transaction data provided by our retail partners, to find out which styles customers buy—and more importantly, which ones they keep. Crucially, we analyze this data from both a collective and an individual perspective and map it with technical garment manufacturing specs from thousands of brands.

Over time, the tool continues to gather data about consumers, and uses the power of machine learning to form a more complete, accurate picture of their style preferences. This picture is updated every time an individual consumer makes a purchase or returns a prior purchase. The insights the Genome provides can help create predictive algorithms that show which garments a particular shopper might love, with those algorithms growing more predictive and accurate over time.

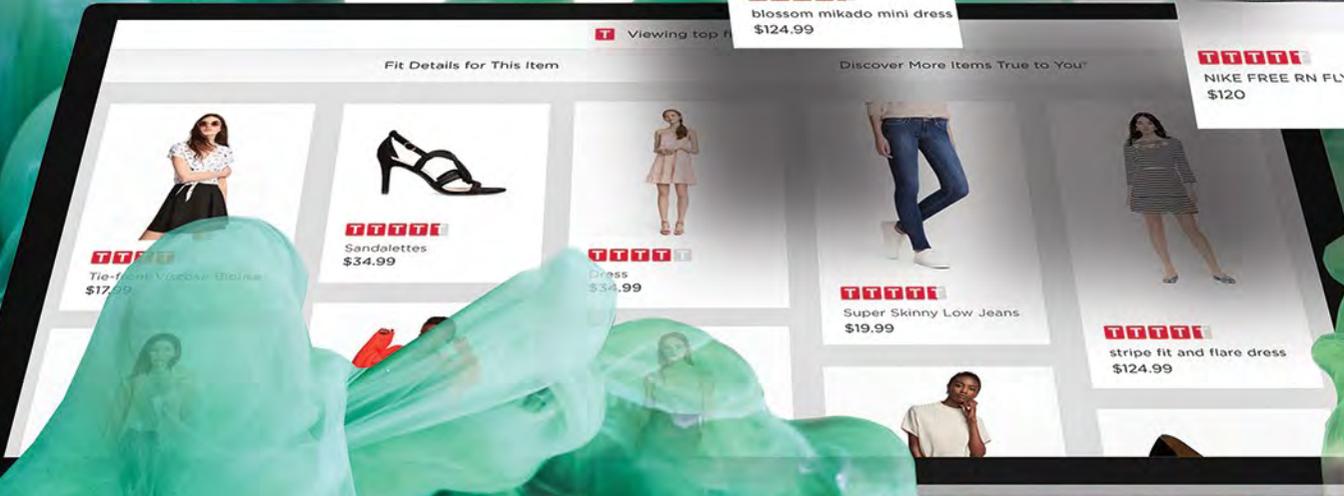


“ One of the advantages of e-commerce in the online experience is there’s a lot of data we can learn from. ”

Marc Rosen
Levi’s Executive Vice President
and President of Global e-commerce

Personalization in Action

At True Fit, our philosophy about providing a personalized experience for consumers is simple: we believe consumers want curated collections of the garments they will love and keep. Only True fit has the deep level of industry, product, and consumer data needed to provide this level of personalization.





When making personalized recommendations, you must account for everything that might cause a shopper to like or dislike a particular item.

True Fit can help answer detailed questions about the shopper, such as:

01

What is the shopper's size?

02

What is the shopper's body shape?

03

What are the shopper's style preferences?

04

What are the shopper's brand affinities?

05

How does the customer prefer to wear a particular style - tight, loose, in between?

To really personalize fit and style you need to understand the details and construction behind each style and its relationship to the consumers who buy and keep them.

Just because a customer has the same size dimensions as another, doesn't mean that they will prefer the same style or even the same size. When it comes to true one to one personalization, there is no average. The details are in the data. Transformative personal digital experiences are only as good as the data driving them.

Jen Jones



Excellent Fit!

TTTTT 4.5/5

Fit	Tight	True Fit	Loose
Hips:	<input type="range"/>	<input checked="" type="checkbox"/>	<input type="range"/>
Waist:	<input type="range"/>	<input checked="" type="checkbox"/>	<input type="range"/>
Thighs:	<input checked="" type="checkbox"/>	<input type="range"/>	<input type="range"/>

Fit	Short	True Fit	Long
Inseam:	<input type="range"/>	<input checked="" type="checkbox"/>	<input type="range"/>

SIZE 28



Good Fit

TTT 3/5

Fit	Tight	True Fit	Loose
Hips:	<input checked="" type="checkbox"/>	<input type="range"/>	<input type="range"/>
Waist:	<input type="range"/>	<input checked="" type="checkbox"/>	<input type="range"/>
Thighs:	<input checked="" type="checkbox"/>	<input type="range"/>	<input type="range"/>

Fit	Short	True Fit	Long
Inseam:	<input type="range"/>	<input type="range"/>	<input checked="" type="checkbox"/>

Kelly Lane



True Personalization isn't just about size

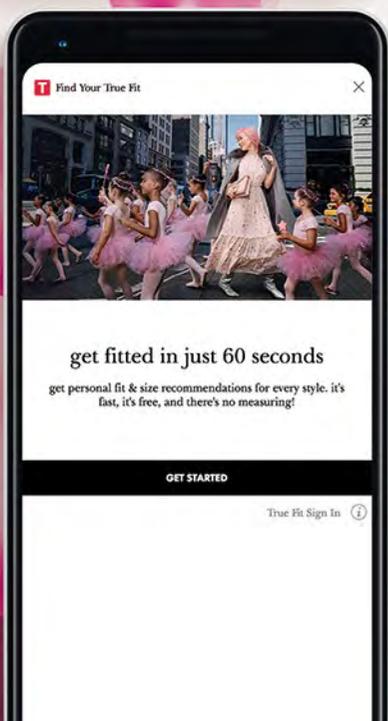
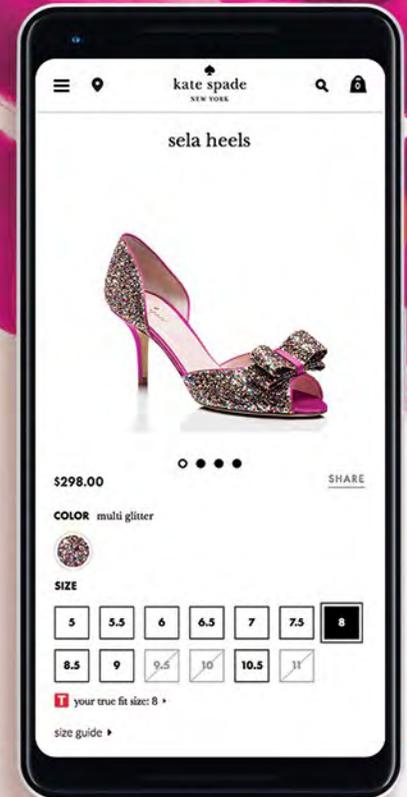
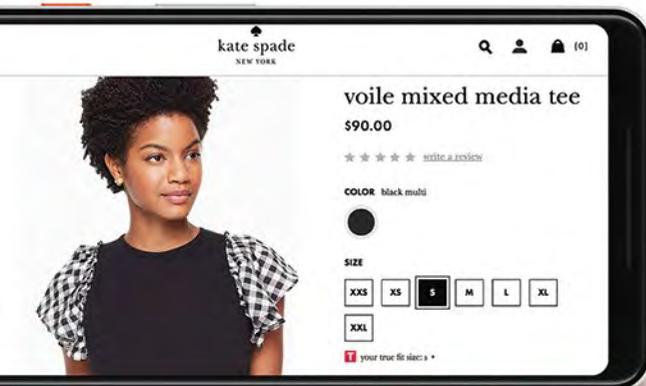
These two people often wear the same size, but they have very different preferences, shape and style.

kate spade

Drives Improved Results with Personalization

By applying True Fit to enable greater personalization, our partner brands and retailers are gaining an important competitive edge that allows them to increase conversion rates, maximize value per shopper, and keep returns to a minimum.

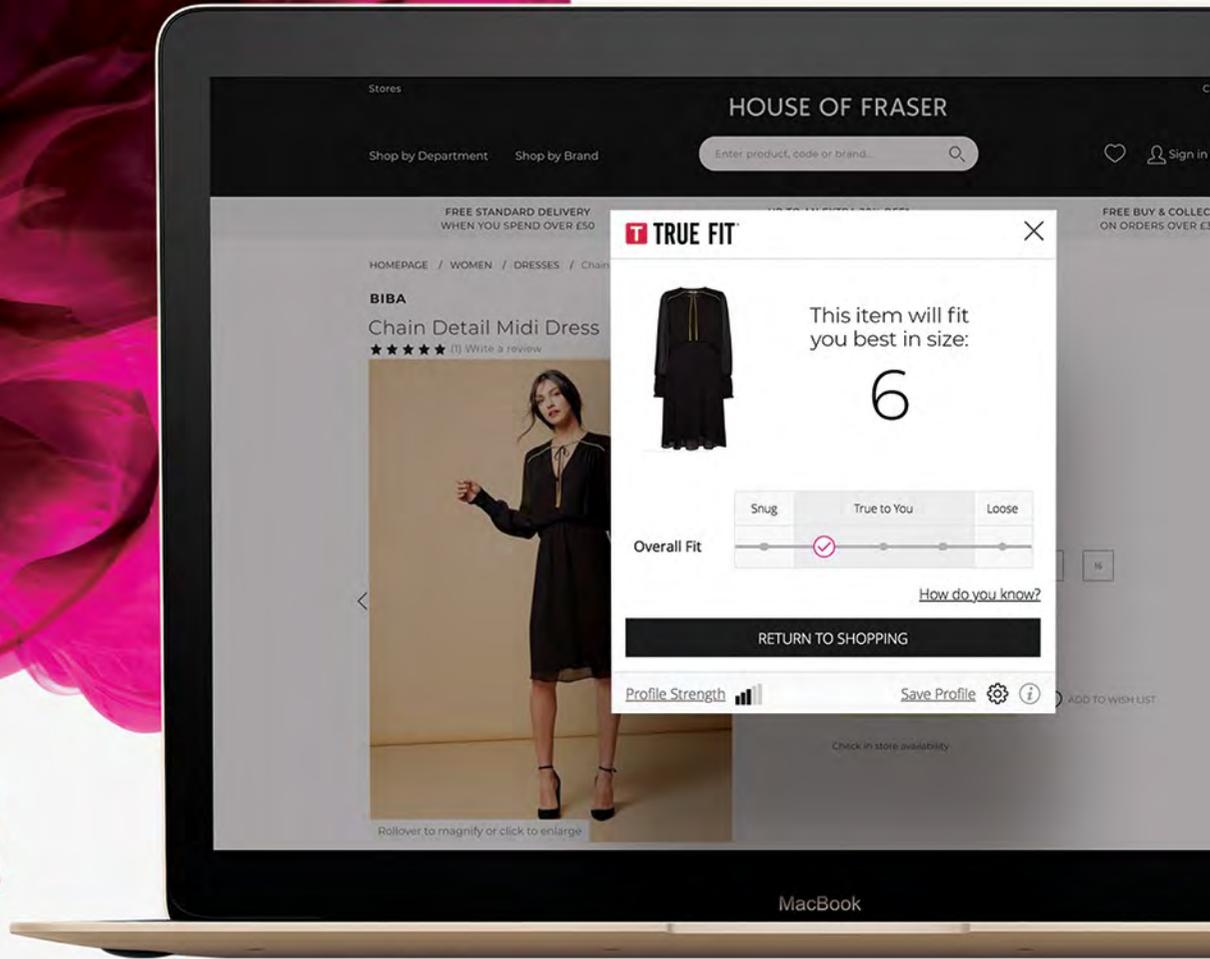
For example, Kate Spade found that **customers who use True Fit convert to ready to wear at more than double the rate of customers who do not.**





Since the launch of True Fit, Asics has seen a 150% increase in conversion from product page to cart

- ✚ Asics found that customers using True Fit keep about 20% more of the products they try.
- ✚ Asics also reports a reduction in size sampling anywhere from 30% to 50%

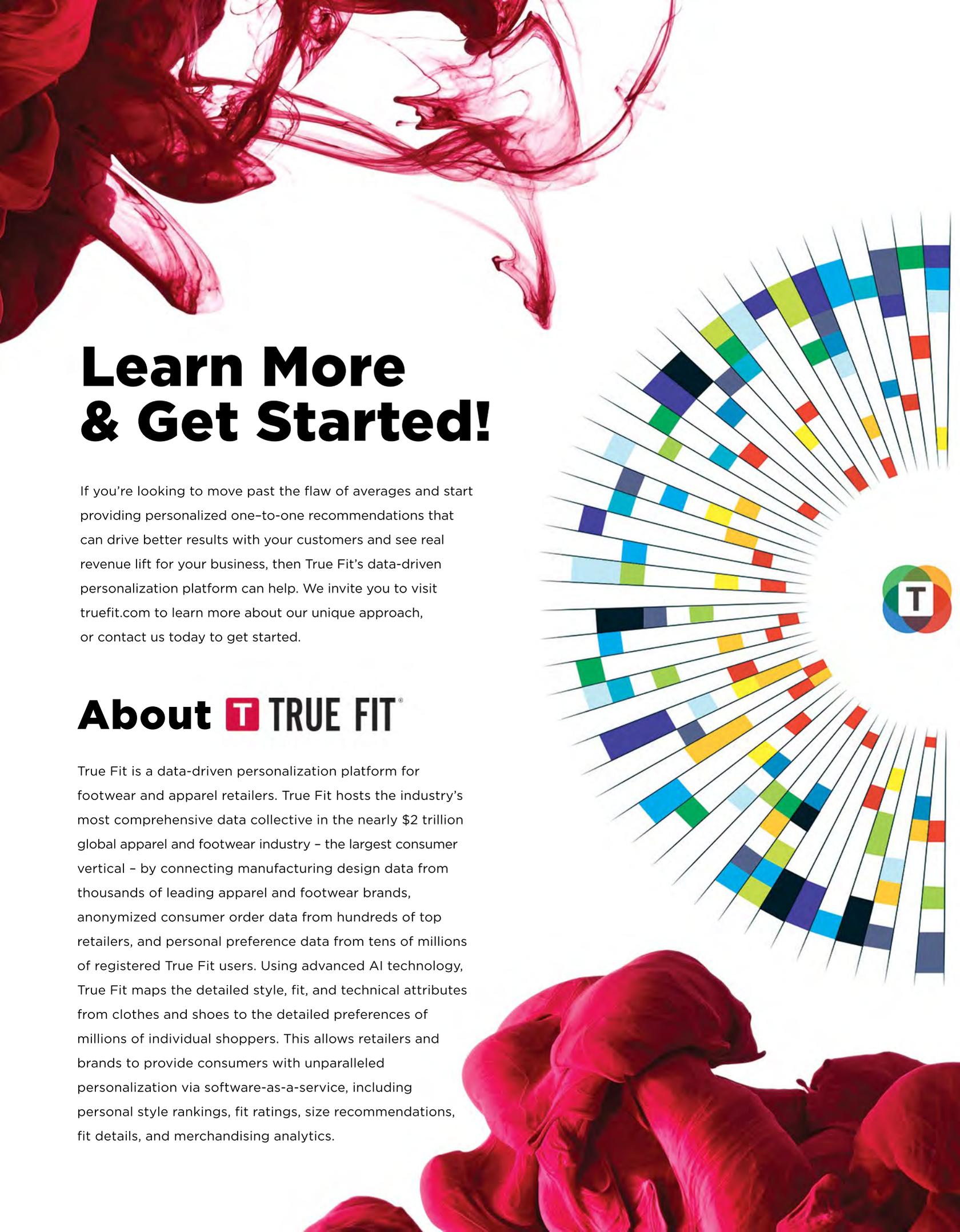


HOUSE OF FRASER

“ We have had around 3.5 million customers sign up for a True Fit profile on the site, have recommended sizes 20 million times, and seen huge adoption rates. **We find customers that do interact with it return a lot less than those that don't.** True Fit helps drive 6%-8% in net revenue. The data insight is really powerful, and helps us spot gaps and know where to expand the range. ”



Madeleine Melson
Director of Customer Insight | House of Fraser (2016)

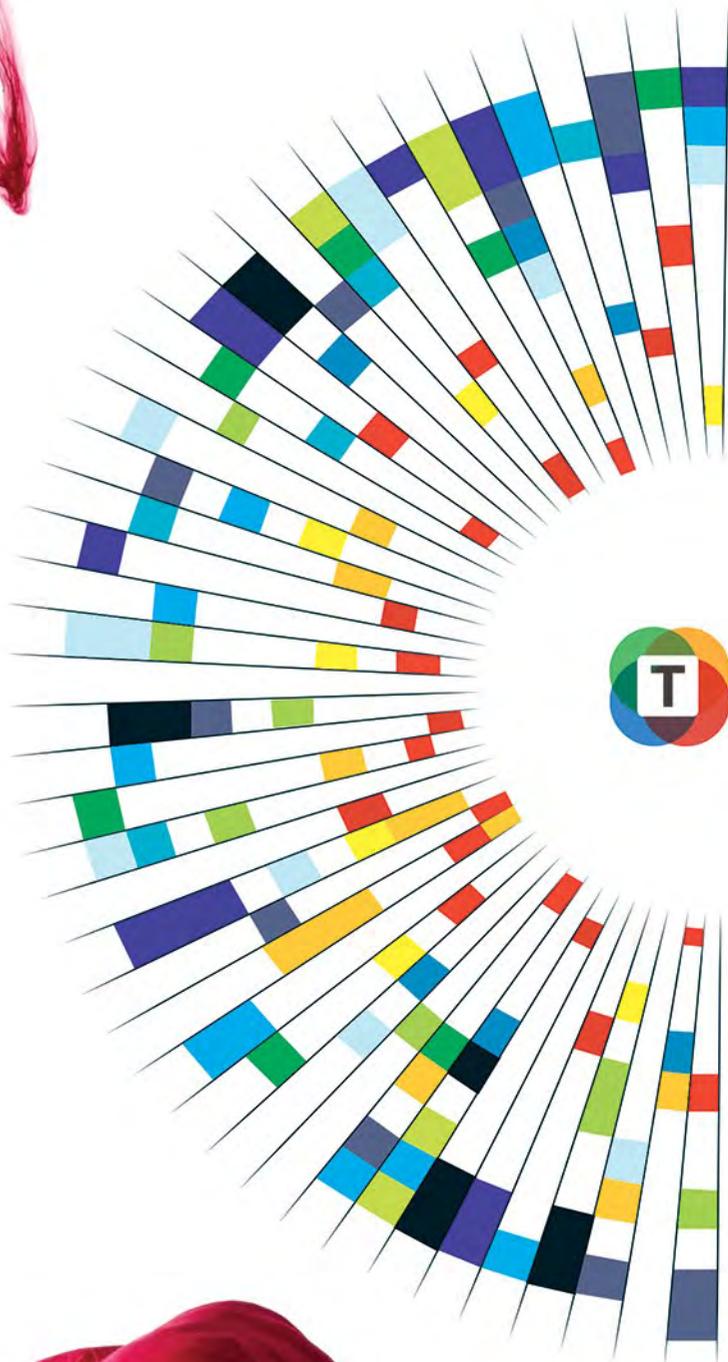


Learn More & Get Started!

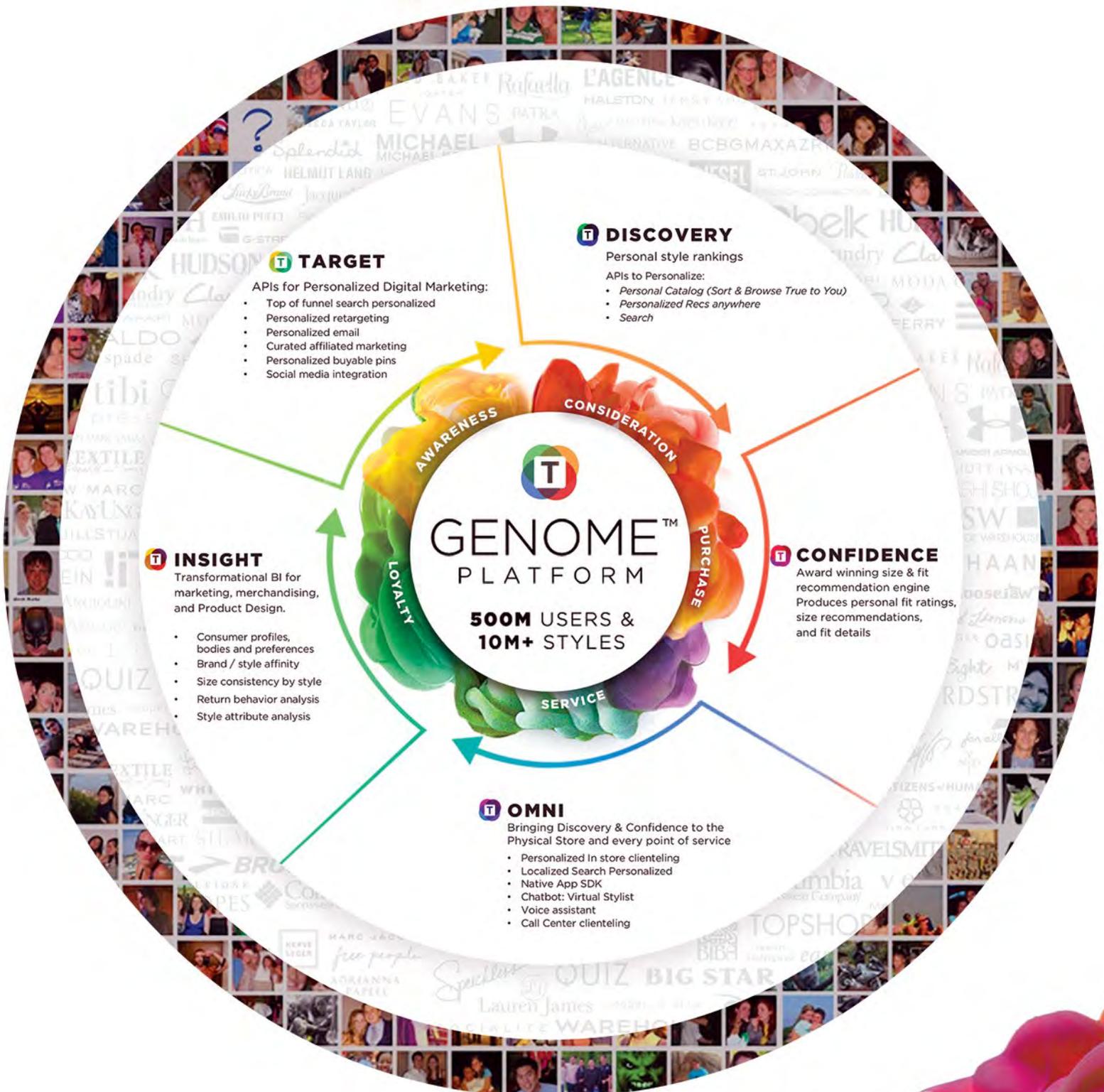
If you're looking to move past the flaw of averages and start providing personalized one-to-one recommendations that can drive better results with your customers and see real revenue lift for your business, then True Fit's data-driven personalization platform can help. We invite you to visit truefit.com to learn more about our unique approach, or contact us today to get started.

About TRUE FIT®

True Fit is a data-driven personalization platform for footwear and apparel retailers. True Fit hosts the industry's most comprehensive data collective in the nearly \$2 trillion global apparel and footwear industry - the largest consumer vertical - by connecting manufacturing design data from thousands of leading apparel and footwear brands, anonymized consumer order data from hundreds of top retailers, and personal preference data from tens of millions of registered True Fit users. Using advanced AI technology, True Fit maps the detailed style, fit, and technical attributes from clothes and shoes to the detailed preferences of millions of individual shoppers. This allows retailers and brands to provide consumers with unparalleled personalization via software-as-a-service, including personal style rankings, fit ratings, size recommendations, fit details, and merchandising analytics.



Personalizing **every touchpoint** of the customer journey



SOURCES CITED:

- 1.) *The End of Average* by Todd Rose
- 2.) *Historical Imagery from the Library of Congress*

POWERED BY TRUE FIT'S
GENOME



True Fit is a data-driven personalization platform for footwear and apparel retailers. True Fit hosts the industry's most comprehensive data collective in the nearly \$2 trillion global apparel and footwear industry – the largest consumer vertical – by connecting manufacturing design data from thousands of leading apparel and footwear brands, anonymized consumer order data from hundreds of top retailers, and personal preference data from tens of millions of registered True Fit users. Using advanced AI technology, True Fit maps the detailed style, fit, and technical attributes from clothes and shoes to the detailed preferences of millions of individual shoppers. This allows retailers and brands to provide consumers with unparalleled personalization via software-as-a-service, including personal style rankings, fit ratings, size recommendations, fit details, and merchandising analytics.

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