Mass Customized Target Market Sizing: Extending the Sizing Paradigm for Improved Apparel Fit

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We present an extended paradigm for sizing and fit, mass customized target market sizing: that is, sizing systems based on and derived from measurement data exclusively from the people who represent an apparel firm’s target market. Mass customized target market sizing is proposed as an alternative to proportional sizing systems used by the apparel industry for ready-to-wear. Advancing technologies, especially the body scanner, are the tools that make target market sizing possible through rapid, accurate measurement of populations and development of continuously updated measurement data bases that can be sorted by multiple demographic factors to provide the foundation for mass customized production. Our central argument is that companies that focus on a well defined target market, that create well designed clothing and sizing systems for this market, that accommodate the full range of body proportions of this market, and that communicate effectively with the market can succeed as a mass customized business. Target market sizing is examined for its potential to improve fit for both mass customized and ready-to-wear apparel based on the variables proposed within a sizing and fit conceptual framework. Implications of mass customized target market sizing and recommendations for industry, consumers, and educators are discussed.

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Introduction

The majority of firms in the ready-to-wear apparel industry base their sizing systems on the ideal customer as developed and assessed on one fit model and transformed into multiple sizes with incremental grading. In many cases, the body measurements from which the incremental grading is derived are based on outdated measurements from the 1940’s (Gordon, Bradtmiller, Clausner, McConville, Tebetts, & Walker, 1989; Ashdown, 1998). Unfortunately this approach has not lead to satisfactory fit for all consumers. In fact, consumer surveys and return rates in the apparel industry indicate that between 35% and 50% of female consumers do not achieve satisfactory fit in their clothing (Desmartea, 2000; Goldsberry, Shim, & Reich, 1996; LaBat, 1989). Size sets created using standard grading result in garments with similar proportions (those of the fit model) throughout the size range. Given the fact that women exhibit a wide variety of body
shapes, one fit model of a single body type cannot represent the shape of all people in the target market, much less the entire population. The incremental approaches used to grade the patterns up and down to the sizes in the sizing system cannot represent all the sizes and shapes of today’s population.

Mass customized target market sizing is a term we use to describe an extension of the paradigm for sizing systems based on focused measurement data collected from people who represent an apparel firm’s target market. It differs from current practices as it includes current, valid measurements from multiple customers specific to a firm with a wide variety of body measurements and body shapes across existing sizing categories as a basis for developing size categories and assessing fit. With the increasing availability and portability of body scan technology, taking only about 12 seconds per scan and making speedy and accurate data collection of measurements for hundreds of customers feasible and noninvasive, mass customized target market sizing now holds real potential. Body scan data can be used to create mass customized sizing systems that fit a greater number of people in a target market than current sizes based on a single fit model.

Conceptual Framework for Understanding Sizing and Fit

Our conceptual framework for understanding sizing and fit is presented in Figure 1 and provides the foundation for the development and argument for mass customized target market sizing. It describes and organizes the salient variables to explain their interrelationships: derivation of body measurements, design of the garment, fit of the garment and the exchange of size and fit information between a firm and its consumers. The success of a sizing system is evaluated by the portion of the population (or the target market) that the system is designed to accommodate and the ability of the target market customers to interpret and adopt it appropriately. This conceptual framework describes the salient variables to consider as research is conducted to improve the processes used to develop new or adjust existing sizing systems.
Figure 1: Theoretical Framework for Research on Sizing and Fit (Ashdown, 2007).
Sizing systems include both the standards developed by various countries based on anthropometric data from their populations and systems developed by individual firms to fit their ideal customer, represented by a single fit model and his/her body measurements. Approaches to sizing systems can be considered more generically by thinking in terms of the number of sizes necessary for the population to be fitted, given design features of the garment to be fitted, the level of individual fit desired, and the variation in the population. For example, here are four types of sizing systems along a continuum from fitting everyone to fitting an individual.
In one-size-fits-all sizing systems a combination of design features and/or material properties make it possible for one size of garment to fit the whole range of the population—think of baseball caps with adjusters or T-shirt styled night shirts. In the standard ready-to-wear sizing systems, that we are familiar with, garments that are created within a size category (e.g., Misses or Petite) are created with a range of sizes for that particular category (e.g., S-M-L or 8-10-12-14-16). In a mass customization sizing system consumers can find combinations of garment dimensions combining different variables (e.g. S, M, L, XL with each of these sizes available in short,
regular, and long), producing new combinations of measurements and exponentially more sizes. Lands’ End swimsuits which are provided in different torso lengths for each size are one example of this type of sizing. These systems can be created using many levels of variables to increase the number of choices.

Finally, in a custom size system garments are made to correspond to the unique combination of measurements of an individual, resulting in a system in which the number of sizes equals the number of the people in the population.

Population Measures
Knowledge of the range and variation of the population as a whole is important for developing sizing systems. Population studies collecting anthropometric data focus on statistical representation of the entire regional or national population. In a well designed anthropometric study data are collected to represent and categorize the population on a variety of demographic variables, such as gender, age, ethnic background, socio-economic level, and geographic location. Care is taken to collect data on enough subjects in each category in order to report results as statistically representative subgroups (e.g., SizeUSA and SizeUK).

The ease with which anthropometric data can be collected, aggregated and analyzed using 3D body scanners makes the collection of body measurements from a large number of people faster, cheaper, and more efficient than a traditional population study and therefore logistically and financially feasible for more frequent data collection. While it is much less invasive than traditional anthropometry, three dimensional body scanning provides far more information about the body of the scanned person; the scan is a set of an average of 300,000 xyz coordinate data points that numerically describe the surface of the body in three dimensions and, using appropriate software, scans can be visualized in 3D. Any kind of measurement or visual analysis of the body surface can be performed, even months or years after the scan was taken. Research supports consumer acceptance of body scanning process and the use of its data (Loker, Ashdown, Cowie, & Schoenfelder, 2004; Loker, Ashdown, Petrova, Cowie, & Schoenfelder, 2003; Loker, Cowie, Ashdown, & Lewis, 2004).

Production and Distribution
The goal of sizing systems is to acceptably fit as many people in the target population as possible. Although this could be accomplished by offering many sizes within one system, production and delivery costs increase as the number of sizes in the system increases. Retail stores are limited in the number of garments of different sizes they can have on the sales floor at any one time. Therefore, ready-to-wear apparel firms strive to fit the most people in their target market with the least number of sizes in their sizing system. As distribution shifts toward more frequent or continuous replenishment and production shifts toward ‘just-in-time,’ sizes can be produced based on current rather than past sales and in small lots with only the needed sizes. Catalog or internet based companies have the capacity to carry more sizes if they have warehouse space and efficient methods of retrieving and packing the garments and sizes ordered. Mass customized and customized production and distribution strategies provide the ultimate match of individual measurements to garments that fit when garments are made for, and shipped to individual consumers who are involved in the ordering process. Appropriate production methods and distribution methods must be in place to support the number of sizes desired in each different type of sizing system.

Design Features and Materials
Design features and the materials used in garment construction are also factors that interact with sizing and fit. The fashionable silhouette of the moment and material properties are important
aspects of designs that affect the fit of the garment and the range of bodies that can be fitted with a single size. Specific functional properties exhibited by knitted or stretchy, stiff or inflexible, or thick or bulky materials are critical factors impacting fit. Design features and seaming choices that allow or restrict movement will affect the wearer’s ability to perform appropriate tasks. A variety of styling features such as gussets, elastic, and adjustable fasteners also affect the fit of the garment and the range of bodies that one size can fit.

Fit Issues
Issues related to fit center around a) objective measures of fit, b) fit and wear testing procedures to assess and record fit, and c) perception of fit. Note that objective collection of body measurements and objective measure of fit are two very different concepts. Fit evaluation focuses on the relationship between body and clothing using visual, psychological and physical measures to assess such characteristics as tightness, looseness, and ease of movement.

One critical issue is who should assess the fit. Fit testing can be used to assess both the designer’s and wearer’s concepts of fit while wear testing is used to assess the wearer’s concept of fit. Ratings are usually qualitative and garment fit is assessed in a laboratory for fit testing by the designer, researcher, or wearer. Ratings can also be collected on garment fit and comfort following a garment wear testing process involving relevant activities rated by the wearer. In both methods, we are actually gathering data on perception of fit. Fit tests judged by the designer or researcher focus on how the garment “looks” to others while wear tests judged by the subject focus on how the garment “feels” and “functions” for the wearer, two different aspects of fit that often give conflicting results.

The reliability of fit perceptions is of concern in objectifying the process. Some standard assumptions are made by designers about how much wearing ease should be allowed at various body locations, or how snug a garment should be. But different people may prefer tighter or looser garment cuts. Concepts of natural waist location or crotch length vary with fashion trends. With the introduction of stretchy materials, the standard assumptions about fit have evolved to accept much tighter garments for certain uses, such as sport and evening wear. All three fit issues--fit and wear testing procedures and perceptions of fit--must be fully explored to develop and judge the success of sizing systems that provide acceptably fitted clothing for the population.

Communication between Consumer and Industry
Understanding the sizing system is critical to the production and marketing of apparel as well as to the consumer’s success in selecting clothing that fits. Size information can be communicated through size designations expressed either by body measurements or by size numbers or letters linked to a measurement chart. Fit information (i.e., how the garment is designed to relate to the body) can be communicated through photographs, sketches, displays on mannequins, or descriptive words in catalogs, e.g., ‘kindest cut’, ‘relaxed fit’, or ‘comfort waist’. Advertising, promotion, hangtags, and flyers are used to display size designation and special information about fit or style. The entire communication link from the sizing system designed and produced by the manufacturer to the selection of the appropriate size by the individual ultimately impacts on the level of satisfaction with the garment selection process and the garment itself. Comments from the consumer on issues related to the sizing and fit of garments are frequently not communicated back to the apparel firm, thus limiting a source of valuable information for improving sizing systems.

Applying the Conceptual Framework to Mass Customized Target Market Sizing
Mass Customized Target Market Sizing Systems
Mass customized target market sizing is a special case of the sizing and fit conceptual framework. It focuses on defined sets of customers from the entire population specified by individual apparel firms. Body measurements for the target market can be acquired either from segmentation of national anthropometric sizing studies or by scanning actual firm customers who by definition are part of the target market. These measurements then form the basis for the creation of appropriate sizes in place of the commonly used size standards and fit model measurements. The argument is that the use of a statistically valid sample of actual customers to develop each size and to evaluate the fit provided by the sizing system will be more likely to provide acceptable fit to the target population than the use of one fit model for all sizes and grade rules based on out-dated population studies.

Figure 2 adapts the sizing and fit conceptual framework to mass customized target market sizing. In this model, issues related to population studies, production issues, fit issues, and communication of sizing and fit are focused on the goal of developing a mass customized sizing system for the target market. Body scan technology as well as integrated design and production technologies for design and logistics are emphasized as integral to providing customers with well designed and fitted apparel in the future.
Population studies collecting anthropometric data using body scan technologies focus on the statistical representation of an entire population, usually by region or nation. Scan data are collected to represent the population on a variety of demographic variables, such as gender, age, ethnic background, socio-economic level, and geographic location. Participants can also be asked to provide data on apparel purchase and lifestyle information. All of these data can be used to differentiate target markets. Several consortiums have already collected scans worldwide from representative samples of specific populations that are available for purchase by apparel firms. More country or region-specific studies are initiated as scan technology becomes more affordable. (CAESAR, nd; SizeUK, 2004; SizeUSA, nd).
Target Market Scan Studies
Using body scan data that is specific to a single apparel firm’s target market shifts the focus of the collection and application of body measurements to individual firms. In this case data collection is conducted exclusively on people in a target market, often indicated by gender; age; ethnicity; economic status; general size boundaries for regular, petite, tall, or large sizes; style and fit preferences; and lifestyle variables. These studies can be designed to collect body scans for the specific target market of focus, including the special case of custom clothing as the target market of one.

Apparel Firm’s Customer Scanning
Scans of actual customers taken while they shop for a firm’s clothing would be another strategy for capturing relevant target market data from the firm’s current customers. Demographic variables and lifestyle characteristics of firm customers as well as leisure activities and shopping behaviors can be embedded in the data. The recent introduction of portable scanners has made this approach manageable ([TC]2, nd). Scanners can be moved to retail outlet locations for several days per month and can be shared by several retailers if located in a mall. The advantage of scanning a firm’s own customers is that the data will then reflect the body configurations of loyal customers who already purchase the styles produced by the company. The disadvantage is that this does not capture data on potential customers who belong to the target market and would purchase the firm’s styles if they could find good fit. Comparison of the data from the customer scan study to data from the target market segment of a population study can help identify the difference between the existing and the potential new customers.

Fit Testing to Validate and Test the Mass Customization Target Market Sizing System
The 3D body scanner is also an excellent tool for capturing 3D images of clothed subjects for visual analysis of fit, thus contributing to the fit assessment process to judge the success of a sizing system (see Figure 3). There are several advantages in the use of digital scan images for fit analysis instead of or in addition to traditional fit sessions. These include: 1) place--the ability to take images to the fit experts instead of convening a panel of experts for the fit session, 2) multiple fit models--the ability to compare the same style on multiple people from the target population, 3) multiple style evaluation--the ability to compare the fit of several garments on the same person side by side, 4) repeat evaluations--the ability to re-visit fit issues when questions arise, and 5) living data bases--the ability to continuously archive digital data to compare fit of different styles across time (Ashdown, Loker, Schoenfelder, & Lyman-Clarke, 2004). Scans are more effective for this purpose than photographs or video because they are quicker and easier to use, where scan technology is available, and they capture the actual 3D fit instead of a visual representation of the fit.

Figure 3: Images from a body scan showing the clothed figure
Integrating Technologies for Production
There are several challenges in the introduction of mass customized apparel sizing systems into current design and production processes. Computer-assisted design (CAD) and computer-assisted manufacturing (CAM) software and hardware were developed for use in a mass production system using traditional grading methods. The problem is that CAD and CAM systems need to be integrated across business functions to accommodate the development of new sizing systems. In addition, though CAD systems can accommodate changes in size specifications, its grading systems are based on incremental grading concepts and need to be re-designed for mass customized target market sizing. Creation of new ways to verify patterns for sewability and pattern specifications for reliability are particular needs for these new systems. Some commercialized products are now on the market to allow body scan data to be sent, read by, and applied to CAD systems for pattern development and grading, to CAM systems for cutting, and to planning systems for production and distribution. Lectra Systems has developed the FitNet software to adapt garment patterns to consumers’ measurements that are captured either from a body scan (in partnership with Human Solutions scanner technology) or traditional measuring. In addition, style and fabric selections can be incorporated into the process (Lectra, n.d.). Optitex and [TC]2 worked together to develop software to enable scan data to be applied in developing custom patterns and garments directly from the scan measurements (Optitex, nd; [TC]2, nd). Body scan technology is addressing apparel sizing and fit challenges at all levels of target markets—population, firm, and consumer. The adoption of its commercial applications may hasten the adoption of various forms of mass customized target market sizing.

Production systems that have been developed to accommodate the high volumes of identically proportioned garments for mass production will need modification for mass customized target market sizing. When producing for target markets, machinery and worker training will need to be adjusted to accommodate different sewing strategies and shapes based on the new or changing sizing specifications. When producing for target markets of one (i.e., custom sizes) or for small lots of single or broken sizes, it will be necessary to sew and track individual articles rather than bundles of articles with identical SKU’s. One example of technology that facilitates small lot and custom size production is the unit production system (UPS). It is a computerized system that identifies, processes, and tracks apparel products by individual units while it transports a single article’s pieces to the next operation via an overhead system.

New Distribution Methods for Mass Customized Target Market Sizing
Currently consumers go into a store, try on garments from a variety of brands and store labels, probably in a number of sizes, and choose the items they will purchase. They have a broad selection of items to choose from and they can personally evaluate the fit of each one. One goal for mass customized target market sizing in the ready-to-wear market is to improve the fit of apparel within this existing shopping context. A second goal is to develop new shopping contexts that are acceptable to the consumer and also achieve acceptable fit for more customers in the firm’s target market. Potential new shopping contexts include made-on-demand, consumer involvement with design and sizing through an on-line product configurator, size prediction, and virtual try-on.

Materials and Design for Mass Customized Target Market Sizing
If mass customized target market sizing for a target market of one (custom or mass customized apparel) is implemented along with co-design then issues with design and material choices are a factor. Creating patterns with design choices can be as simple as a shirt with or without a pocket, or as complex as a totally different collar or neckline configuration that impacts as many as 8 or 10 pattern pieces. Development and fitting of base patterns for each different design choice is necessary, with careful evaluation of the impact of different combinations of design choices and size proportions on the final garment.

If fabric variations more complex than different color choices from the same base fabric are introduced then issues related to the interaction between the fabric properties and the fit of the garment can require the creation of multiple patterns. IC3D, an early innovator in custom fitted clothing using its own proprietary software, at one time advertised custom jeans that could be ordered in denim, velvet, or leather over the internet. These three material choices would each require a different pattern with different ease values in order to provide good fit.

The creation of multiple pattern pieces for the same mass customized garment style introduces the issue of correct pattern retrieval and insertion in a marker, once the design and size choices are made. Software solutions to this issue are being developed in custom patternmaking systems, such as FitNet by Lectra, that provide automated selection of the appropriate pattern pieces when the style selection is made by the customer (Lectra, nd; Human Solutions, nd).

Communication of Sizing and Fit for Mass Customized Target Market Sizing

Once consumers are aware of and eager for mass customized target market sizing to improve their garment fit, their opportunities and responsibilities in garment selection will increase. They will be able to access on-line size and garment selection services that will help them to identify styles, brands, and items that fit their body measurements. Virtual try-on technologies under development will eventually provide 3D views of garments on a consumer’s scanned body that were never before possible and may quickly replace the retail store try-on sessions requiring extensive inventory. Acceptance of these changing contexts and processes for evaluating fit and purchasing garments will be incremental over time. Communications about how to access and use these options are important to the success of mass customized target market sizing.

My Virtual Model Inc. (MVM) provides software packages to retailers for consumer online interactive experiences through virtual try-on, size recommendations, and personal shopper services (My Virtual Model, nd). Business-to-business (B2B) companies including My Virtual Model are teaming up with retailers to create virtual models, which customers can manipulate to mirror their own bodies. Customers can then try clothing on their model online to view the style on their body type. Actual virtual assessment of fit is not yet possible with this technology, but advice as to the best brand and size in that brand is provided by some vendors based on the measurements submitted by consumers. The current, widely available technology developed by MVM creates models that represent general body types from manual measurements but the concept is to eventually try clothing on actual scan data.

The development of actual virtual try-on of a garment to check fit will require a widespread use of body scanning for individual consumers. Computerized methods of creating accurate draping of fabric on bodies in the virtual environment are being developed for virtual try-on systems (DesMarteau & Speer, 2004). Researchers and industry, including PAD Systems Technologies, Browzwear, and Optitex, are currently developing these technologies that will play a large part in the future of communicating fit for mass customized target market sizing (Pad System, nd; Browzwear, nd; Optitex, nd).

Communication of Mass Customized Target Market Sizing
When new sizing systems are developed the apparel firm will need to educate its employees and retail partners to successfully launch and communicate the different sizing systems. Consumers must be able to understand and interpret emerging sizing systems easily. Communication strategies will be necessary to introduce mass customized target market sizing to the apparel firm producing the product, the retail staff selling it, and the consumers buying it. Consumer knowledge and readiness are vital to the acceptance and adoption of mass customized target market sizing. Unless consumers are convinced that mass customized target market sizing will improve apparel fit, they may not be aware or interested in reading information or trying out enabling technology such as body scanning and on-line services that facilitate mass customized target market sizing.

Labels and promotional hang tags on the garments as well as posters and ad campaigns can present information describing the basis for a mass customized target market sizing system (i.e., who should be interested), how to improve fit by getting scanned and being part of the development process of each size in the target market, and advantages of good fit (e.g., longer lasting garment, comfort, and presentation of self). Kiosks with body scanners as well as size prediction and virtual try-on technologies can be made available in retail stores as tools for learning new size designations and about mass customized target market sizing. Educational programming for retail and apparel manufacturing employees can be offered to prepare them for their roles in the deployment and promotional campaigns advancing mass customized target market sizing.

New Purchase Options for Mass Customized Target Market Sizing
Made-on-demand clothing is the most similar to the current RTW shopping context. Size selection can be done electronically by comparing the individual consumer’s scan to the set of available sizes, eliminating the need for size labels. Consumers would then try on clothing in the traditional manner or using a virtual try-on option and then order the product in the selected size. Only one of each size and style would be available for consumers to try on in a retail store or none when ordered virtually on-line. One advantage to the firm is that only ordered items would be produced and there would be no extra inventory. The number of available sizes could be much larger than economically feasible in ready-to-wear and therefore fit more of the target market acceptably, as only the ordered items would be produced. The advantage to the consumers is that they will have the size, style, and color of their choice and the opportunity to see and try on a large range of garments before purchase, with the trade-off of a waiting period for the product rather than instant gratification and immediate acquisition of the garment. Mass customization and unit production strategies would replace mass production systems and procedures. Logistics systems would evolve to accommodate many small orders shipped to many addresses, requiring material purchase and inventory systems based on timeliness rather than low cost. The cost savings for businesses would be in lowering inventory holding costs and mark downs for unsold product.

On-line product configurators (see Figure 4) that allow consumers to select style features, colors, fabrics, and measurements to individualize their apparel products are already implemented on a number of apparel web sites (Beyond Fleece, nd; Nike, nd; Timbuk2, nd; JCPenney, nd; Lands’ End, nd). They are also being tested in retail stores using computer stations or kiosks. Consumers are involved in the design by selecting and combining a variety of components until they arrive at a garment they like. With visualization software and their individual body scans, virtual try-on of garments could be added to a configurator. Landsend.com with its virtual model comes closest to a virtual try-on process currently, but uses a model shaped in general like the consumer to
evaluate the style on a similar body type rather than the actual fit of clothing on the consumer’s
scan. If body scanning applications become available from many retailers and manufacturers so
that a consumer can own his/her scan and carry it from store to store or web site to web site on a
smart card, then fit could be evaluated using a product configurator. Although product
configurators are an intriguing approach to involve the consumer and research has indicated
enthusiasm for the process (Kamali & Loker, 2004; Lee, Kunz, Fiore & Campbell, 2002; Fiore,
Lee, Kunz, Campbell, 2001), there is also some concern that the number of style choices be kept
to a manageable size to prevent consumer frustration (Huffman & Kahn, 1998).

![Figure 4: Example of Product Configurator](image)

Size prediction is now being offered by several commercial businesses, such as My Virtual
Model (My Virtual Model, nd) and Intellifit. Size prediction services recommend the best brand,
size, and styles to a consumer based on their personal measurements. The services partner with
apparel firm members to identify and apply size specifications for a collection of brands and
styles. Size prediction services can be used even more effectively with mass customized target
market sizing as available sizes will be more likely to fit a member of the target market on which
the available sizes have been based. If body scanners become portable and individual scans are
owned by the consumer, these services could use scan data with virtual try-on for consumers.
With custom-sized apparel, the requirement to prepay may discourage consumers from placing
an order if they are uncertain of the effectiveness of this new technology. A guarantee of a full
refund or adjustment of the custom ordered item is an essential business practice that will allay
these fears. The data collected from fit problems that are corrected can be use to iteratively
improve the system overall and reduce further incidences of problems.
Made-to-measure apparel based on an individual’s personal measurements can benefit from body
scan data and is currently being pursued by several firms including Brooks Brothers (Brooks
Brothers, nd). One technological challenge for made-to-measure has been the compatibility of
scan data with CAD patternmaking and cutting systems. A second challenge is replacing the
personalized service of the custom fit clothing process with an acceptable level of personal
assistance along with the advantages of scan technology. If the focus is on switching custom
clothing customers to the scan process, additional services may be required. If a business is
trying to attract ready-to-wear customers to made-to-measure, the reduced time and effort to achieve customized results can be emphasized. The advantages for the firms are reduced inventory and mark-down losses. The consumer gets a personalized fit, but must purchase the garment without seeing it or trying it on, unless virtual try-on is available. Also, the consumer must wait several weeks before the garment is produced and delivered. Nonetheless, made-to-measure is a shopping context that is already accepted by men for suits and has potential for acceptance by women in the future, particularly for garments such as apparel for weddings and other formal occasions, business apparel that is worn regularly and for many years, and form-fitting garments. Lands’ End has been successfully selling made-to-measure custom khakis and jeans in a moderate price range since 2004 (Schlosser, 2004), though as yet without the use of body scan data.

Discussion and Recommendations

Mass customized target market sizing has the potential for improving apparel fit for both existing and new sizing systems. We have extended the paradigm for sizing and fit to a model of mass customized target market sizing that identifies a variety of potential advantages that could occur with its implementation. Some industry technologies and strategies would have to be altered or improved to accommodate mass customized target market sizing, but the cost advantages from better fit through more purchases and fewer returns are worth the effort.

The necessary technology is now available to adjust or develop apparel sizing systems based on body measurements from numerous members of a firm’s target market or multiple “fit” models. Body scanners can accurately and efficiently scan hundreds of consumers in a short time. Integrated computer systems have been developed to allow scan and design data to be applied during production and distribution. The major challenge to industry will be the conceptual shift from a single fit model and incremental sizing to mass customized target market sizing based on target market measurement data.

Data bases of scans are available from anthropometric studies such as the SizeUSA study. Subsets representing particular target market body measurements can be purchased, analyzed, and applied to a firm’s existing sizing systems or used to develop new sizing systems. In addition, individual firms can develop their own target market scan data bases with help from university and private research groups, commercial ventures, or firm-owned scanners. Once the scan data are collected and analyzed, it can be used for development of sizing systems as well as systems for custom and made-on-demand apparel, virtual try-on systems for designers and consumers, size prediction systems to aid consumers, and product configurator tools for on-line sizing and design involvement by the consumers. In these ways, the shopping process and environment will also be improved by offering consumers mass customized services and involving them in new approaches to design, production, and delivery of their apparel.

Many new businesses will develop as scan data becomes available to the industry and to consumers. Kiosks that are set up to take scans and record the data on “smart” cards for each consumer will put the consumer in control of his/her own scan. Scan readers can be developed for retailers so that consumers can take their scans to retailers, select a garment they want to fit their measurements, and order the right size or a custom size made-on-demand. At the same time, the scans will be added to target market data bases to continually adjust the sizes based on current customers. Production and logistic systems that accommodate small lot, made-on-demand and custom production are already being developed and will eventually be more prevalent in apparel factories. Businesses that offer size prediction will increase in number and offer size prediction based on mass customized target market sizing systems in addition to brands
of particular apparel companies. For example, apparel firms that offer size categories for specific age and ethnic groups or for protruding abdomen, straight and hourglass silhouettes, and large buttocks will be recommended based on an individual’s scan. Businesses that develop product configurators as well as those that offer product configuration services to apparel firms will be initiated. In-store kiosks with product configurators will be another potential new business. Marketing and promotion campaigns to introduce new sizing approaches as well as changing shopping contexts will be necessary. Campaigns should be addressed to retail sales associates and consumers as well as to designers and production managers who are reluctant to change. The difficulty of finding clothing that fits can be clearly articulated as background information and positive fitting results can be presented to connect mass customized target market sizing with improved fit. Dramatic visuals of body scan with good and bad fit can illustrate the issues. Events introducing scanning, virtual try-on, and size prediction services and special offers for retail associates and consumers can be used to motivate initial trials and purchases. Guarantees of reworking garments if fit is not achieved initially or full refunds will encourage customers to try customized options.

Mass customized target market sizing will introduce fundamental change to the industry and educators can prepare the next generation for this change. Educators must challenge their students to question existing industry practices and promote alternatives as they explore fit and garment design together. They should consider multiple fit models and mass customized target market sizing to improve fit as alternatives to incremental grading systems. Advanced technologies and applications to apparel design, sizing, and fit should be explored, demonstrated, and evaluated in order to continue the advancement toward good fit through the next generation of professionals. Formal education offerings should be complemented with industry short courses and public information communications to reorient sizing system development to the target market.

Mass customized target market sizing is a promising approach to improve apparel fit. It can be used in combination with existing sizing systems, blending proportional sizing with measurement data from a single target market. It can be implemented by a single apparel firm to adapt existing and develop new sizing systems. It can be applied in custom apparel as a market of one, using a single individual’s measurement data to develop a custom pattern. Mass customized target market sizing is a viable new approach to apparel fit that will revolutionize the way we develop sizing, produce and deliver apparel, and involve the consumer in design and shopping environments. Mass customized target market sizing is part of the solution for improving apparel fit.

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