

FUTURE OF BANGLADESHI GARMENTS SIZING SYSTEM-REVIEW

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Abstract: *The Bangladeshi garment industry, a leading global exporter, faces significant challenges with sizing standards, largely due to its reliance on Western size charts that fail to accommodate the diverse body types of non-Western consumers. This research reviews the need for a localized sizing system informed by anthropometric data specific to Bangladesh. Current sizing practices, adapted from Western standards, often lead to high return rates, customer dissatisfaction, and financial and environmental costs due to wasted resources. Anthropometric studies, widely utilized in other Asian markets, have shown potential for creating regionally adaptable sizing systems; however, Bangladesh lacks a comprehensive, population-specific database of body measurements. The study highlights recent advancements in 3D body scanning and AI-driven predictive sizing models, which can offer precise measurements and accommodate diverse body types. Nonetheless, adoption remains limited due to technological and financial barriers. Furthermore, collaboration between industry stakeholders and academic institutions is necessary to address the gap in demographic and regional data, facilitating the development of an inclusive and accurate sizing system. This review underscores the potential benefits of a customized sizing framework for Bangladesh's garment industry, including reduced return rates, improved consumer satisfaction, and sustainability gains. By investing in anthropometric research and advanced technologies, Bangladesh could establish a pioneering, adaptive sizing standard that enhances the industry's global competitiveness while fostering size inclusivity and sustainability. The findings advocate for a coordinated approach to creating a comprehensive anthropometric database to better serve both local and international markets.*

Keywords: Anthropometric Data, Garment Sizing System, Bangladeshi Apparel Industry, 3D Body Scanning, Size Inclusivity.

BUDUĆNOST SISTEMA ODREĐIVANJA VELIČINA ODEĆE U BANGLADEŠU

Apstrakt: *Bangladeška industrija odeće, vodeći svetski izvoznik, suočava se sa značajnim izazovima sa standardima veličine, uglavnom zbog oslanjanja na zapadne tabele veličina koje ne uspevaju da prilagode različite tipove tela nezapadnih potrošača. Ovo istraživanje razmatra potrebu za lokalizovanim sistemom dimenzionisanja zasnovanim na antropometrijskim podacima specifičnim za Bangladeš. Trenutne prakse određivanja veličine, prilagođene zapadnim standardima, često dovode do visokih stopa povrata, nezadovoljstva kupaca i finansijskih i ekoloških troškova zbog rasipanja resursa. Antropometrijske studije, koje se široko koriste na drugim azijskim tržištima, pokazale su potencijal za stvaranje regionalno prilagodljivih sistema dimenzionisanja; međutim, Bangladešu nedostaje sveobuhvatna baza podataka o telesnim merenjima koja je specifična za stanovništvo. Studija naglašava nedavna dostignuća u 3D skeniranju tela i modelima za predviđanje veličine vođenih veštačkom inteligencijom, koji mogu ponuditi precizna merenja i prilagoditi različite tipove tela. Ipak, usvajanje je i dalje ograničeno zbog*

tehnoloških i finansijskih prepreka. Štaviše, neophodna je saradnja između zainteresovanih strana u industriji i akademskih institucija da bi se rešio jaz u demografskim i regionalnim podacima, olakšavajući razvoj inkluzivnog i tačnog sistema određivanja veličine. Ovaj pregled naglašava potencijalne prednosti prilagođenog okvira veličine za industriju odeće u Bangladešu, uključujući smanjene stope povrata, poboljšano zadovoljstvo potrošača i dobitke u pogledu održivosti. Ulaganjem u antropometrijska istraživanja i napredne tehnologije, Bangladeš bi mogao da uspostavi pionirski, prilagodljivi standard veličine koji poboljšava globalnu konkurentnost industrije, istovremeno podstičući inkluzivnost veličine i održivost. Nalazi se zalažu za koordinisan pristup stvaranju sveobuhvatne antropometrijske baze podataka koja bi bolje služila i lokalnim i međunarodnim tržištima.

Ključne reči: Antropometrijski podaci, sistem određivanja veličine odeće, industrija odeće u Bangladešu, 3D skeniranje tela, uključenost veličine.

1. INTRODUCTION

The global apparel industry has increasingly prioritized the need for accurate, inclusive sizing systems as markets expand and consumer expectations evolve. Bangladesh, a leading garment exporter, particularly in fast fashion, plays a pivotal role in this global supply chain. However, the Bangladeshi garment industry faces unique challenges related to sizing due to the diverse body shapes and sizes of consumers across its export markets. The majority of sizing systems used in the Bangladeshi garment sector are based on Western standards, which may not be ideally suited to local or international consumers with different body proportions. The absence of an efficient, standardized sizing system not only affects consumer satisfaction but also has economic implications due to returns and exchanges related to poor fit.

Background and Previous Research

Historically, garment sizing systems have relied on anthropometric data from limited demographics, leading to sizing systems that may not be inclusive of diverse body types. Studies have shown that in countries like Bangladesh, where clothing exports predominantly go to Western markets, manufacturers often adopt Western sizing systems such as the U.S. or European standards, which may not align with the body types of consumers in Asia or other regions [13]. This misalignment results in a high rate of returns due to sizing issues, contributing to financial losses and environmental waste. Previous research in countries with similar industry structures, such as Vietnam and China, has demonstrated the importance of localized sizing studies in creating efficient, size-inclusive garment production [14].

Efforts to improve sizing systems include using 3D body scanning technology, which can help capture more accurate anthropometric data across populations. A study by Rahman and Farah (2019) on the po-

tential for 3D body scanning in Bangladesh suggested that this technology could lead to more effective sizing systems if implemented on a larger scale. However, high costs and limited access to technology remain barriers for many Bangladeshi manufacturers [1].

Prospects

The future of sizing in the Bangladeshi garment industry lies in adopting more advanced technology and creating standardized sizing systems based on comprehensive anthropometric data. The use of Artificial Intelligence (AI) and Machine Learning (ML) has shown promise in predictive modeling for sizing, allowing for customization and adaptation to regional preferences [4]. Additionally, collaborations with international retailers to develop sizing systems specific to target markets could reduce return rates and enhance customer satisfaction. Sustainable and size-inclusive apparel production, underpinned by accurate sizing, will not only boost consumer trust but also support the industry in aligning with global sustainability goals.

In conclusion, with the right advancements, the Bangladeshi garment industry has the potential to become a global leader in size inclusivity and customization. This shift could be facilitated by an increased investment in technology, partnerships, and research aimed at developing a locally appropriate, globally relevant sizing system.

2. PRESENT SITUATION AND CURRENT RESEARCH

The Bangladeshi garment industry, a cornerstone of the country's economy, faces both opportunities and challenges in adapting its sizing systems to meet the demands of diverse global markets. Presently, the industry largely relies on Western sizing standards, which may not align with the body proportions of consumers in regions like Asia and Latin America,

where demand for Bangladeshi garments is also rising. This reliance on non-localized sizing leads to a high rate of returns, customer dissatisfaction, and ultimately, financial losses. As a result, there is a growing interest among industry stakeholders and researchers in exploring data-driven, regionally relevant sizing solutions.

Recent research has highlighted the limitations of current sizing practices in Bangladesh's garment sector. For instance, [12] pointed out that most Bangladeshi manufacturers continue to follow traditional, Western-centric sizing charts without considering the variation in body shapes across different regions. Their study found that a significant percentage of returns and exchanges were due to poor fit, leading to wastage of resources, increased carbon footprint, and higher costs for manufacturers. Additionally, research by [15] emphasized that a localized sizing system could reduce the rate of returns by as much as 30%, underscoring the economic benefits of investing in regionally adaptive sizing frameworks.

Technological advancements such as 3D body scanning and digital anthropometry offer promising solutions. While still in nascent stages in Bangladesh, 3D body scanning technology is gaining attention as a means to gather precise body measurements across diverse populations, facilitating the creation of standardized sizing systems. [15] explored the feasibility of using 3D body scanning in Bangladesh, noting its potential to provide accurate anthropometric data and support a more inclusive sizing model. However, they also observed barriers to adoption, including the high cost of equipment and limited technological infrastructure within the Bangladeshi garment industry. This has led researchers like Ahmed et al. (2021) to call for greater investment in technology and training to make 3D body scanning more accessible [2].

Other research has focused on AI and machine learning applications to create adaptable sizing systems. In their study on AI-driven sizing solutions, Chowdhury et al. (2023) demonstrated that machine learning models could predict size recommendations based on demographic data [4], enabling manufacturers to cater to specific regional requirements more effectively. Their findings suggest that incorporating machine learning in sizing could address a wide range of consumer demands while reducing the margin of error caused by traditional, one-size-fits-all approaches. Despite these advancements, the adoption of AI and machine learning for sizing is still limited in Bangladesh due to cost and knowledge gaps, particularly

among smaller manufacturers who form a large part of the industry.

In response to these challenges, there is a growing push from industry stakeholders for standardized sizing protocols that consider both local and international markets. Collaborative research initiatives involving academic institutions, garment manufacturers, and export partners are becoming more common, with the aim of establishing a database of regional body measurements to create more effective sizing charts [13]. These collaborations highlight the potential for Bangladesh to establish its own sizing standards that can be adapted for export markets while meeting the demands of regional consumers.

In summary, while the Bangladeshi garment industry currently faces limitations with Western-centric sizing systems, ongoing research and technology adoption efforts indicate a promising path forward. By developing a localized sizing framework informed by 3D body scanning, AI, and regional data, Bangladesh can address sizing issues, reduce return rates, and improve sustainability outcomes, ultimately strengthening its position in the global apparel market.

Anthropometry Research Gaps in Bangladesh for Creating a Garment Size Chart

In the context of the Bangladeshi garment industry, the lack of comprehensive anthropometric data is a critical barrier to developing an accurate, standardized sizing chart tailored to various body types. Unlike many developed countries, where extensive anthropometric studies have provided the foundation for well-adapted sizing systems, Bangladesh has not yet conducted large-scale, population-specific body measurement studies. This gap in anthropometric data results in significant challenges for local garment manufacturers who primarily rely on Western sizing charts, which may not suit the body proportions of all consumers, especially those in non-Western markets.

Lack of Representative Anthropometric Data

One of the main gaps in anthropometry research for the Bangladeshi garment industry is the absence of a representative database of body measurements specific to the Bangladeshi population. Current sizing charts used by local manufacturers are often adapted from Western standards, which were developed based on body measurements from Western populations with different body proportions [3,5] Conse-

Table 1: Summery of the research related to Bangladeshi garments sizing system [12,14,16-30]

Research Area	Key Findings	References
Western Sizing Standards and Limitations	Reliance on Western sizing standards leads to poor fit and high return rates in Bangladeshi garment exports.	Majumder & Habib (2021); Ali & Rahman (2020)
Need for Population-Specific Sizing Data	Lack of anthropometric data specific to Bangladeshi population results in non-inclusive sizing.	Islam & Majumder (2021); Kabir & Ahmed (2021)
High Return Rates Due to Sizing Issues	Poor fit based on Western sizes causes increased returns, waste, and consumer dissatisfaction.	Khan & Alam (2020); Tanvir & Chowdhury (2020)
Role of 3D Body Scanning Technology	3D body scanning can improve accuracy in sizing, but adoption in Bangladesh is limited by cost barriers.	Rahman & Farah (2019); Ahmed et al. (2021)
AI and Machine Learning for Sizing	AI-driven predictive sizing models offer potential for customizable sizing but face adoption challenges.	Chowdhury et al. (2023); Zaman & Rahman (2020)
Demographic and Regional Variability	Research lacks focus on diverse body types across age, gender, and regions within Bangladesh.	Chowdhury et al. (2023); Kabir & Hossain (2019)
Environmental and Financial Impact of Returns	Returns due to poor fit increase financial losses and environmental waste.	Huq & Ahmed (2019); Sultana & Islam (2022)
Importance of Collaborative Research	Industry-academic partnerships needed for a national anthropometric database.	Islam et al. (2022); Siddique & Chowdhury (2019)
Inclusive and Localized Sizing Efforts	Some efforts have begun to adapt sizing based on regional anthropometric studies in other Asian countries.	Nguyen et al. (2020); Ali & Rahman (2020)
Consumer Satisfaction with Fit	Improved fit through localized sizing enhances consumer satisfaction in international markets.	Rahman & Hossain (2020); Tanvir & Khan (2019)
Role of Technology in Size Inclusivity	Technologies like 3D scanning and AI can create size-inclusive systems but require infrastructure investments.	Hasan & Rahman (2021); Khan & Chowdhury (2020)
Anthropometric Diversity in Bangladesh	Limited research on body shape diversity impacts inclusive sizing development.	Kabir & Ahmed (2021); Alam & Hossain (2018)
Challenges in Standardizing Size Charts	Standardization requires comprehensive demographic data, which Bangladesh currently lacks.	Begum & Rahman (2018); Yousuf & Ahmed (2019)
Sizing Systems in Competitive Markets	Asian markets like Japan and Korea benefit from anthropometric databases; Bangladesh could follow suit.	Nguyen et al. (2020); Farah & Rahman (2019)
Implications of Sizing for Sustainability	Localized sizing can reduce waste and support sustainable practices in the garment industry.	Sultana & Islam (2022); Begum & Kabir (2020)

quently, the garments produced are often a poor fit for both local consumers and consumers in non-Western export markets, where body shapes may differ significantly.

In comparison, countries like Japan, China, and South Korea have invested in national anthropometric surveys that reflect their populations' body types,

enabling manufacturers to create tailored and inclusive size charts [14]. In Bangladesh, there is a pressing need for similar studies to compile accurate, population-specific body data. This lack of data not only impedes the development of size charts that suit Bangladeshi consumers but also limits the country's potential to offer custom-fit garments to international markets.

Limited Use of 3D Body Scanning Technology

Another research gap in the Bangladeshi context is the limited adoption of advanced measurement technologies like 3D body scanning, which has proven effective in generating precise anthropometric data in other regions. Studies show that 3D body scanning technology can capture detailed measurements, such as body circumference, posture, and body shape, more accurately than manual methods, allowing for more representative and inclusive sizing systems [7,8]. However, this technology remains underutilized in Bangladesh due to high costs, lack of access, and insufficient technical knowledge among manufacturers. Without this technology, it is challenging to collect the in-depth data needed to create a nuanced and adaptable sizing system.

Inadequate Focus on Diverse Body Types and Regional Variability

Anthropometric research in Bangladesh has not sufficiently explored the variation in body types across different demographics and regions within the country. A one-size-fits-all approach to sizing ignores the diversity of body shapes, leading to a lack of inclusivity in garment production. According to Chowdhury et al. (2023), localized sizing standards must consider differences in body proportions across gender, age groups, and even geographic regions within Bangladesh to meet the needs of all consumers effectively. Unfortunately, there has been little research aimed at examining these demographic and regional variations, leaving a substantial gap in developing a truly inclusive sizing chart.

Insufficient Data Sharing and Collaboration

Another critical gap in anthropometry research for sizing is the limited collaboration between industry stakeholders, academic institutions, and international partners in Bangladesh. In many garment-exporting countries, collaborative research efforts have led to the development of comprehensive anthropometric databases used to create adaptable sizing standards [9,10,11]. Bangladesh, however, lacks a centralized data-sharing mechanism that could facilitate the development of such a database. This lack of collaboration stymies progress in anthropometry research and restricts the industry's capacity to evolve towards size inclusivity and improved fit.

Addressing the Anthropometry Research Gaps

To address these research gaps, Bangladesh could consider undertaking a national anthropometric survey, leveraging partnerships with academic institutions, government bodies, and garment industry stakeholders. Investing in 3D body scanning technology and creating a centralized database of body measurements would enable a more accurate and regionally adapted sizing chart. By filling these gaps, the Bangladeshi garment industry would be better positioned to cater to both local and international markets with garments that fit well and meet the demands of diverse body types, ultimately reducing return rates and improving customer satisfaction.

3. CONCLUSION

The development of a standardized, regionally adaptive garment sizing system is essential for the Bangladeshi apparel industry to remain competitive in the global market. As a leading garment exporter, Bangladesh faces unique challenges and opportunities related to sizing. The industry's reliance on Western sizing systems, which may not align with the body shapes of diverse international consumers, has led to high return rates, increased waste, and decreased consumer satisfaction. However, these challenges also present an opportunity for Bangladesh to pioneer a tailored, data-driven approach to garment sizing that could set new standards in inclusivity and sustainability.

Addressing the anthropometric research gaps in Bangladesh is crucial for establishing an effective sizing system. The absence of a comprehensive, population-specific database of body measurements limits the industry's ability to create garments that fit well across different demographics. Embracing advanced technologies like 3D body scanning and leveraging AI for predictive sizing could enable the industry to create more inclusive size charts that serve a broader range of body types. Collaborative research efforts, involving partnerships between academic institutions, industry stakeholders, and government bodies, are essential for compiling a database that reflects the true diversity of consumer body types.

Investing in anthropometry research and adopting technology-driven solutions can have far-reaching benefits. A well-defined, inclusive sizing system would not only reduce return rates and improve sustainability but also enhance customer satisfaction and loyalty in both domestic and international markets. For Bangladesh, establishing a customized

and data-backed garment sizing system represents a significant step towards becoming a leader in size-inclusive, sustainable fashion, reinforcing the country's status as a vital player in the global apparel industry.

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