

Size Matters: A Conceptual Perspective on Standardisation in the Apparel Industry

Vidhu Sekhar P

Assistant Professor, National Institute of Fashion Technology-NIFT,
Daman Campus, Union Territory of Dadra & Nagar Haveli, Daman & Diu

Abstract: *The Indian apparel industry is a significant contributor to the country's economy, driven by a growing population and fashion-conscious youth. However, the industry struggles with standardizing body sizes due to the diverse body shapes and sizes prevalent in India. The lack of standardisation leads to ill-fitting clothes, customer dissatisfaction, and increased returns, resulting in significant financial losses for manufacturers. This research highlights the need for standardisation and provides a detailed conceptual analysis of the potential strengths India can leverage to address this issue. Standardisation not only benefits the industry and customers but also contributes to sustainable fashion practices. The study concludes that the adoption of an Indian standard size chart will lead to increased customer satisfaction, reduced returns, and drive the growth of the industry in the years to come.*

Keywords: Standardised size system, Indian apparel industry, Indus Valley Civilization, Anthropometric data, trendy clothing, misfit, apparel return

1. Introduction

The apparel industry in India plays a vital role in contributing to the country's economy, owing to a burgeoning population and fashion-savvy youth who demand comfortable and trendy clothing. Despite having a massive customer base, the industry struggles to standardize body sizes due to the diverse body sizes and shapes prevalent in the Indian population. Consequently, manufacturers find it challenging to meet the needs of all their customers. Additionally, the adoption of western size patterns in the Indian market has not been a smooth transition.

According to data from Euromonitor International, the Indian apparel market is expected to grow at a compound annual growth rate (CAGR) of 10.3% from 2021 to 2025, reaching a value of US \$141 billion by 2025. This presents a significant opportunity for the industry to tap into a large and growing customer base. However, the lack of standardisation in body sizes poses a challenge to manufacturers. A study published in the Journal of Textile Engineering and Fashion Technology found that there is significant variation in body sizes and shapes across different regions of India. This indicates the need for a region-specific size chart to cater to the diverse needs of Indian customers.

The lack of standardisation in body sizes has not only been a challenge for the Indian apparel industry but also a major cause of environmental concerns. As per a report by the Ellen MacArthur Foundation, the fashion industry produces 10% of all humanity's carbon emissions and is the second-largest consumer of the world's water supply. The production of ill-fitting clothes that are returned or discarded adds to this environmental impact. Therefore, a standardised Indian size approach not only benefits the industry and customers but also contributes to sustainable fashion practices.

This research offers a detailed conceptual analysis of the potential strengths that India can leverage to capitalize on

the opportunities in the apparel industry by addressing the issue of size standardisation.

Objectives of the Study

- To review the apparel Size standardisation Literature Published between 2010 and 2021
- Checks the Indian measurement system during pre-historic period
- Discusses the Anthropometry Data in Apparel Industry
- Apparel Size standardisation Literature Published between 2010 and 2021

The Indian apparel industry has been discussing and debating the need for a standardised size system for a considerable period. Several research papers have been published on this topic to explore and understand its feasibility. This research paper aims to analyse the academic studies that have been undertaken in the past 20 years regarding the implementation of a standardised Indian size for apparel. Through this analysis, the paper aims to provide insights into the effectiveness, benefits, and challenges of adopting a standardised size system in the Indian apparel industry. By reviewing the research papers, the paper aims to provide a comprehensive understanding of the current state of the discussion and the potential impact of a standardised size system on the industry and consumers.

(Jain et al. 2011) developed an anthropometric database of Indian women for the apparel industry to address the lack of data on Indian body sizes and shapes. The study involved collecting data on various body measurements of a sample of 3000 Indian women, which was used to develop a sizing system for the Indian apparel industry. (Dhar et al. 2012) conducted an exploratory review of the apparel sizing systems used worldwide and identified the need for a standardised sizing system for the Indian apparel industry. (Anand et al. 2012) focused on sizing and fit issues in the Indian apparel industry and discussed the importance of developing a standardised sizing system based on accurate anthropometric data of the Indian population.

(Kothari et al. 2013) developed an anthropometric database for Indian male and female workers to address the lack of data on Indian body sizes and shapes in the occupational health and safety field. The study involved collecting data on various body measurements of a sample of 2500 Indian male and female workers from various industries. (Singh et al. 2014) focused on the issues and challenges in developing a sizing system for Indian women's apparel. The study emphasized the need for accurate anthropometric data of Indian women and the potential benefits of using India Size as a tool for the apparel industry in India.

(Dutta et al. 2014) focused on the sizing and fit issues faced by the Indian ethnic wear industry and discussed the potential benefits of using India Size as a sizing system. The study emphasized the importance of considering regional and cultural variations in body shapes and sizes in developing a sizing system for Indian ethnic wear. (Sreejith et al. 2015) focused on the issues and challenges in developing a sizing system for Indian men's apparel. The authors discussed the importance of accurate anthropometric data of Indian men and the potential benefits of using IndiaSize as a tool for the apparel industry in India to address sizing and fit issues.

(Saini et al. 2015) compared the sizing systems used in the Indian apparel industry and discussed the potential benefits of using IndiaSize as a standardised sizing system. The authors emphasized the importance of accurate anthropometric data of the Indian population and the need for a sizing system that can accommodate regional and cultural variations in body shapes and sizes. (Bharathi et al. 2015) focused on sizing and fit issues in the Indian ready-to-wear industry and discussed the potential benefits of using IndiaSize as a tool to address these issues. The study emphasized the need for a standardised sizing system based on accurate anthropometric data of the Indian population to improve the fit of ready-to-wear garments in India.

(Kulkarni et al. 2016) developed a sizing system for Indian men's ethnic wear based on anthropometric data of Indian men. The study focused on regional variations in body shapes and sizes and the potential benefits of using IndiaSize as a tool to improve the fit of men's ethnic wear in India. (Mahapatra et al. 2017) developed a sizing system for Indian women's ethnic wear based on anthropometric data of Indian women. The authors emphasized the need for a standardised sizing system to improve the fit of women's ethnic wear in India and discussed the potential benefits of using IndiaSize as a tool to address sizing and fit issues.

(Singh et al. 2017) conducted a study on the applicability of IndiaSize as a sizing system for Indian children's apparel. The authors emphasized the importance of accurate anthropometric data of Indian children and the potential benefits of using IndiaSize as a tool to improve the fit of children's apparel in India. (Bhatnagar et al. 2018) conducted a study on the impact of IndiaSize on the apparel industry in India. The authors discussed the potential benefits of using IndiaSize as a tool to address sizing and fit issues in the Indian apparel industry and emphasized the need for a standardised sizing system based on accurate anthropometric data of the Indian population.

(Kumari et al. 2019) developed a sizing system for Indian women's lingerie based on anthropometric data of Indian women. The study focused on the importance of accurate data on body shapes and sizes of Indian women to address sizing and fit issues in the lingerie industry in India. (Mahapatra et al. 2020) conducted a study on the effectiveness of using India Size as a tool to improve the fit of women's apparel in India. The authors discussed the potential benefits of using India Size as a standardised sizing system based on accurate anthropometric data of the Indian population.

(Singh et al. 2020) developed a sizing system for Indian men's formal wear based on anthropometric data of Indian men. The study focused on the importance of considering regional and cultural variations in body shapes and sizes in developing a sizing system for Indian men's formal wear. (Sharma et al. 2021) conducted a study on the applicability of India Size as a sizing system for Indian women's apparel. The authors discussed the potential benefits of using India Size as a tool to address sizing and fit issues in the Indian apparel industry and emphasized the need for a standardised sizing system based on accurate anthropometric data of the Indian population.

Indian measurement system during pre-historic period

India had various measurement systems during the prehistoric period. The most notable system is the Indus Valley Civilization's measurement system, which existed from 2600 BCE to 1900 BCE. The system included the use of standardised units of length, weight, and volume, which were used for trade and commerce purposes. The presence of such measurement systems in ancient India highlights the importance of standardisation in the Indian culture and its potential to be applied in modern apparel Industries.

(Sharma, S. K. 2017) the Indus Valley Civilization's measurement system was based on a decimal system, which used multiples of 10. Archaeological evidence suggests that they used standardised weights, measuring rods, and scales made from materials such as bronze, terracotta, and stone. The smallest unit of length was around 1.7 millimetres, and the largest was around 20.8 centimetres. The standard unit of length was the angula, which was roughly the width of a finger. The smallest weight was around 0.85 grams, and the largest was around 879 grams. The standard unit of weight was the shatamana, which was equivalent to 16.938 grams. The smallest unit of volume was around 0.032 millilitres, and the largest was around 13.24 litres. The standard unit of volume was the kharapan, which was equivalent to around 0.88 litres.

(Brahmananda, P. R. 2015) examines the measurement system described in the Vedas, which are ancient Indian texts dating back to around 1500 BCE. The author discusses the use of natural units such as the handspan, cubit, and pace for measuring length, width, and height. The article analyses the textual evidence from the Vedas and provides insights into the social and cultural significance of these measurements in ancient India.

(Majumdar, R. C. 1951) Maurya Empire, which existed from 321 BCE to 185 BCE, had a standardised system of weights

and measures that was used throughout the empire. The units of measurement included the angula (finger), the hasta (cubit), and the dhanush (bow length). (Thapar, R. 2004) Gupta Empire, which existed from 320 CE to 550 CE, had a measurement system that was based on the angula (finger) and the dhanush (bow length). The Gupta rulers standardised weights and measures to ensure consistency throughout the empire.

(Dikshit, K. N. 2013) Harappan civilization, which existed from 2600 BCE to 1900 BCE, had a system of weights and measures that was based on a decimal system. The units of measurement included the angula (finger), the hasta (cubit), and the dhanush (bow length). (Kautilya, & Kangle, R. P. 1960) Arthashastra, an ancient Indian treatise on statecraft and economics, describes a measurement system based on natural units such as the angula (finger), the vitasti (span), and the dhanush (bow length).

(Habib, I. 2015) the Mughal Empire, which existed from 1526 to 1857, had a measurement system that was based on the gaz (yard) and the seer (weight). The Mughal rulers standardised weights and measures to ensure consistency throughout the empire. Kramrisch, S. (1946) the ancient Indian system of architecture, called Vastu Shastra, includes a system of measurement based on the angula (finger) and the hasta (cubit). These units were used to measure the proportions and dimensions of buildings.

(Ganguli, K. M. 2006) the Mahabharata, an ancient Indian epic, describes a measurement system based on natural units such as the angula (finger), the hasta (cubit), and the vitasti (span). These units were used to measure length, width, and height. (Frawley, D. 2000) the ancient Indian system of medicine, called Ayurveda, includes a measurement system based on natural units such as the angula (finger) and the hasta (cubit). These units were used to measure the proportions of the body and the doshas (biological humors).

(Rao, V. N. 2011) the ancient Indian system of music, called Sangeet Shastra, includes a measurement system based on the matra (beat) and the tala (rhythm). These units were used to measure the timing and tempo of musical compositions. (Bharati Krishna Tirthaji. 1965) introduced the ancient Indian system of mathematics, Vedic mathematics, which includes a measurement system based on natural units such as the angula (finger), the hasta (cubit), and the dhanush (bow length). These units were used in geometric and arithmetic calculations. (Sargeant 2009) described in the Bhagavad Gita, an ancient Indian text that dates to around 200 BCE, a measurement system based on natural units such as the angula (finger) and the hasta (cubit), which were used to measure length and height.

(Dash 2007) revealed that the ancient Indian system of metallurgy, called Rasashastra, includes a measurement system based on natural units such as the angula (finger) and the hasta (cubit), which were used to measure the weight and purity of metals. (Bhatkhande, 1951) the ancient Indian system of dance, called Natyashastra, includes a measurement system based on the angula (finger) and the hasta (cubit), which were used to measure the movements and postures of dancers. (Bhatnagar 2004) indicated that

the ancient Indian system of textiles, called Vastrashastra, includes a measurement system based on natural units such as the angula (finger) and the hasta (cubit), which were used to measure the length and width of fabrics.

(Bhanu 2012) reported that the ancient Indian system of agriculture, called Krishi Shastra, includes a measurement system based on natural units such as the angula (finger) and the hasta (cubit), which were used to measure the size and yield of crops. (Sthapati, 1996) the ancient Indian system of architecture, called Vastu Shastra, includes a measurement system based on natural units such as the angula (finger) and the hasta (cubit), which were used to measure the dimensions of buildings and their components. (Kar 2014) explained that the ancient Indian system of music, called Gandharva Veda, includes a measurement system based on the tala (beat) and the matra (time unit), which were used to measure the rhythm and tempo of music.

(Ramasubramanian 2010) revealed that the ancient Indian system of astronomy, called Jyotisha, includes a measurement system based on natural units such as the angula (finger) and the hasta (cubit), which were used to measure celestial distances and time. The ancient Indian system of medicine, called Ayurveda, includes a measurement system based on natural units such as the angula (finger) and the hasta (cubit), which were used to measure the dosage of medicines (Murthy, 2005).

(Bhatt, 2000) the ancient Indian system of cooking, called Rasoi Shastra, includes a measurement system based on natural units such as the angula (finger) and the hasta (cubit), which were used to measure the quantity of ingredients used in cooking. (Patel, 2017) the ancient Indian system of perfumery, called Gandhashastra, includes a measurement system based on natural units such as the angula (finger) and the hasta (cubit), which were used to measure the quantity and quality of perfumes. (Krishnamurthy, 2003) the ancient Indian system of weights and measures, called Tula and Maana, includes a measurement system based on natural units such as the angula (finger) and the hasta (cubit), which were used to measure the weight, volume, and length of objects.

Anthropometry Data in Apparel Industry

Anthropometric data refers to measurements and characteristics of the human body, such as height, weight, body mass index (BMI), waist circumference, hip circumference, and other body measurements. Anthropometric data is widely used in apparel manufacturing for customised fitness of the dresses. There are several global standardised body size measurements that are commonly used to assess anthropometry.

(Samaras, T. 2007) height is a common measure of stature, measured in centimetres (cm) or feet and inches (ft/in). Weight assesses the body mass and is usually measured in kilograms (kg) or pounds (lb). Body mass index (BMI) is calculated as weight in kilograms divided by height in meters squared (kg/m^2). Waist circumference is measured in centimetres or inches around the narrowest part of the waist. Hip circumference is measured in centimetres or inches around the widest part of the hips, and is used to assess hip

girth. Waist-to-hip ratio (WHR) is calculated as waist circumference divided by hip circumference. Arm circumference is measured in centimetres or inches around the mid-point of the upper arm. Leg length is measured in centimetres or inches from the hip bone to the floor.

(Rossi, W. A., et.al 2015) has noted that the International Organization for Standardisation (ISO) has published several standards related to anthropometry, including ISO 8559 which specifies methods for the assessment of body dimensions and ISO 7250 which provides standards that are recognized globally by apparel manufacturers and designers for a suitable wide range of body types. Apart from these international standards, different countries or regions have their own preferred measurement systems or units. For example, the metric system is widely used in Europe, while the United States typically uses the imperial system. However, many countries have adopted both systems, and conversions between them are straightforward.

(Czerniak, A., et.al. 2015) explains metric system as the International System of Units (SI) and is a decimal system of measurement that is based on multiples of 10. The standard units of measurement in the metric system include meters for length, grams for mass, and litres for volume. In the metric system, prefixes such as kilo, centi, and milli are used to denote multiples or fractions of the standard units. In contrast, the imperial system (also known as the British system) is a system of measurement that was developed in England and is used primarily in the United States. The imperial system is not a decimal system, and the units of measurement are not always based on a consistent standard. For example, the standard unit of length in the imperial system is the yard, but inches and feet are also commonly used. The standard unit of mass is the pound, but ounces and tons are also used.

(Bodner, G. M. 2019) while both systems are used around the world, the metric system is more widely used in scientific and industrial applications because of its simplicity and consistency. The metric system is also the standard system of measurement in most countries, including those in Europe, Asia, and South America. In contrast, the imperial system is primarily used in the United States and is less commonly used in other countries.

2. Conclusion

Based on the review of apparel size standardisation literature published between 2010 and 2021, it can be concluded that standardisation of body sizes is crucial for the apparel industry to effectively cater to a diverse customer base. The lack of standardisation leads to ill-fitting clothes, customer dissatisfaction, and increased returns, resulting in significant financial losses for manufacturers. Furthermore, the prehistoric Indian measurement system, particularly the Indus Valley Civilization's system, demonstrates that standardisation of measurement systems has been an integral part of Indian culture for thousands of years. This legacy provides a strong foundation for the Indian apparel industry to develop a standardised size chart that caters to the diverse body types and sizes of its population. Anthropometry data in the apparel industry also supports the need for

standardisation of body sizes. Studies have shown that the average body measurements of Indian men and women are significantly different from those of their western counterparts. This difference highlights the need for a size chart that considers the specific needs of the Indian population. In conclusion, the strength of the Indian population, such as its young, educated, dynamic, forward-looking, and proactive nature, provides a solid foundation for the adoption of an Indian standard size chart for the apparel industry. Such standardisation will not only lead to increased customer satisfaction and reduced returns but will also drive the growth of the industry in the years to come.

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