

CHAPTER: 3

METHODOLOGY

- ***OPERATIONAL DEFINITION***
- ***FLOW CHART***
- ***LOCALE OF THE STUDY***
- ***SAMPLE SELECTION***
- ***PROCEDURE FOR DATA COLLECTION***
- ***TROUSER WEAR TRIAL***

CHAPTER 3

METHODOLOGY

3.1 OPERATIONAL DEFINITIONS

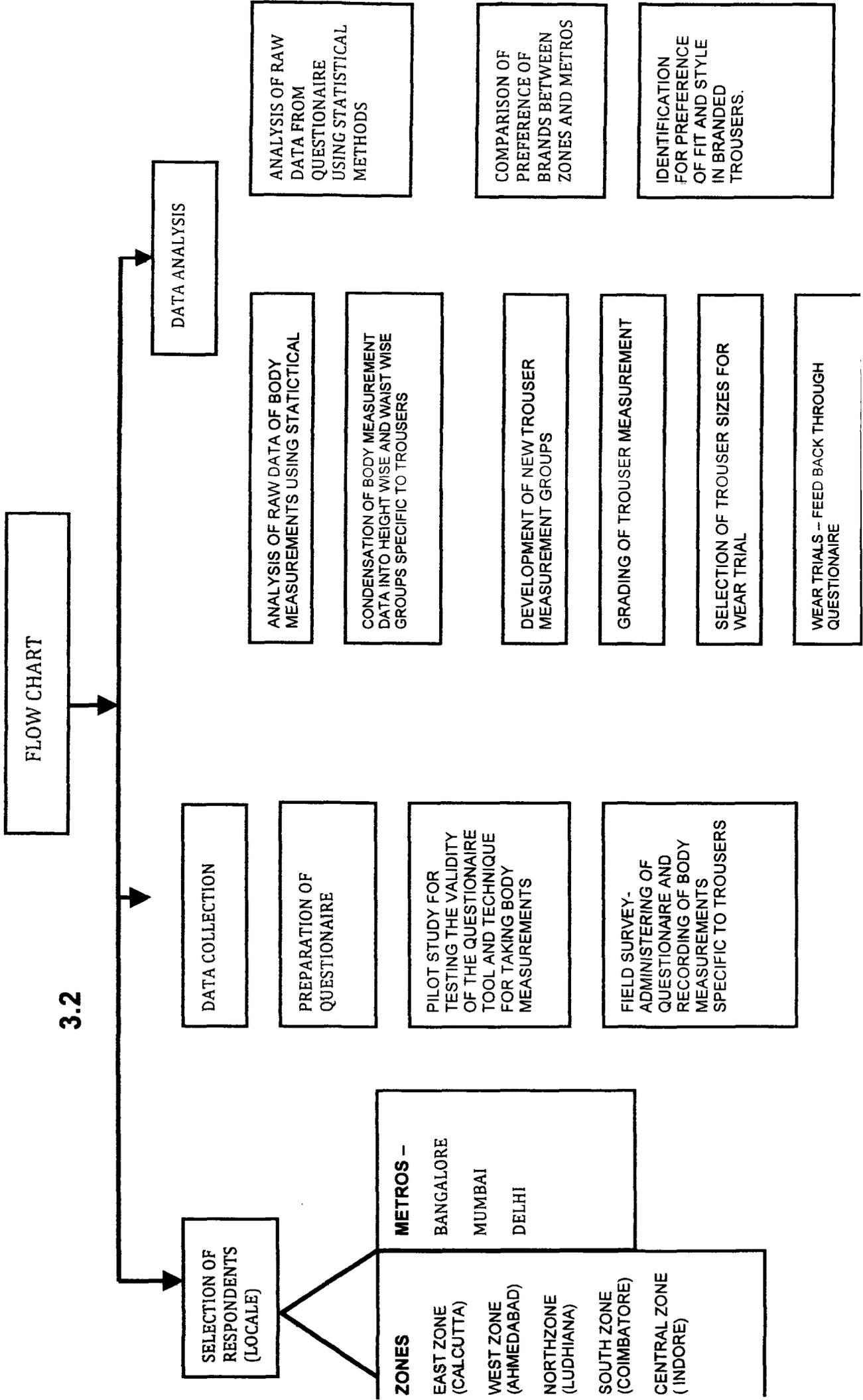
1. **Waist** – The narrowest part of the body above the hip where trousers are usually worn.
2. **Upper hip** – Measured 10 cms below the waist.
3. **Hip** – The widest part of the girth, or the seat gives the curvature from waist to the hip.
4. **Front Rise** – The distance along the fly from the top edge of the waistband of the trousers to the inside seam of the leg under the crotch.
5. **Upper Thigh** – Measured 1” below the crotch across the girth of the thigh.
6. **Back Rise** – The distance along the seat seam from the top edge of the waistband to the inside seam of the leg under the crotch.
7. **Out Seam Length** – Distance from the bottom edge of the trousers to the top edge of the waistband along the side seam.
8. **Inseam Length** – Distance from the bottom edge of the trousers to the crotch along the inside seam of leg.
9. **Comfort Fit** – The garment is made with adequate ease so as not to be oversized but gives the wearer adequate comfort while sitting, standing or walking.

- 10. Regular Fit** - This fit is between the comfort and slim fit. While this fit is not as close to the wearer's body as the slim fit it does not have as much looseness as the comfort fit.
- 11. Slim Fit** – When the trouser is stitched without too much ease and is fitted as close to the body as possible.
- 12. High Waist** – Trousers worn at the wearer's actual waist.
- 13. Mid Waist** - Trousers worn lower than the actual waist but much higher than the low waist.
- 14. Low Waist** – Trousers worn just above the hipbone and much below the actual waist.
- 15. Multi Brand Outlets** – These are stores that sell more than one brand of apparel and also more than one type of apparel.
- 16. Exclusive Brand Outlets** – These stores are usually brand stores that stock all merchandise pertaining to a particular brand.
- 17. Specialty Retail Stores** – These are stores that stock one product category only – say only trousers or only shirts.
- 18. Malls** – These are large format shopping destinations, which have a number of different stores, restaurants, theatres and other shops.
- 19. Fit** – Well-fitted garments are defined as those that are comfortable to wear, allow sufficient ease for freedom of movement, conform to present day fashion and are free of wrinkles, sags or bulges. (Madhu 2002).
- 20. Sizing Systems** – Are a set of sizes which are arrived at which makes available, clothing in a range of sizes that fits as many people as possible, with very few fitting issues.

- 21. Anthropometry** – Refers to the measurement of human beings. In apparel it is used to get the body dimensions of human beings in order to provide well-fitted garments for men and women.
- 22. Pleated Trousers** – Trousers, which have pleats in the front – one or two: knife pleats or box pleats.
- 23. Flat Front Trousers** – These are trousers with no pleats. Also called plain front trousers.
- 24. Fit Models** – A fit model is a person whom a company/brand/designer, feels is the best representative in size for their product. So all products are tried on this model for one size and all the other sizes are graded based on the fitting of this one garment. It is assumed that the graded sizes will fit all the consumers.
- 25. Zones** – Refers to the different parts of India. North Zone is Northern India with Ludhiana as the representative city. South Zone is South India with Coimbatore as the representative city. East refers to Calcutta. Central India is Madhya Pradesh with Indore being the representative City.
- 26. Size Range** – Refers to the differences in the major girth measurements between the smallest and the largest size in the size chart.
- 27. Size Charts** – Are of two types: a) Body Measurement charts – which provide body measurements for each size and the pattern maker uses these measurements with the requisite ease for constructing a pattern. b) Garment Measurement Charts – give details of the finished measurement specification for each size and is normally used for pattern grading and quality purposes.

- 28. Grading-** It is the process by which larger or smaller sizes are produced from a sample pattern using proportional system of measurement without loss of balance, line or fit.
- 29. Static and Dynamic Grade** –When the inseam length or the inside leg measurement remains the same for the same height it is called Static Grade. When the inseam length changes within the same height it is called Dynamic grade. (Cooklin, 1992)³⁵
- 30. Size intervals-** The amount by which a specific measurement changes from size to size. (Cooklin, 1992)³⁵
- 31. Increment** –The amount by which a variable quantity increases or decreases from size to size.
- 32. Identification Label (Nomenclature)** – Combination of trouser measurement and is designated with a unique code- alphabetical and numerical. This symbol provides the consumer instant recognition as to whether the trouser size is suitable or not.

3.2



The present study falls under **Descriptive type of Research**. **Survey Method** and **Cross Sectional Survey Design** were used to collect the primary data required for the study. Male respondents in the age group of 25 – 55 years who **wore branded trousers** were selected using **Purposive Sampling Method**.

The study was divided into 3 parts – **Part 1 of the study** consisted of taking specific body measurements of men for **Trousers**, for developing standard body measures chart. New graded range of size specification charts for trousers were prepared. using the above body measurement charts. The trouser measurement charts were also converted to computerized nested patterns for few of the selected sizes for all the zones and metros. Amongst all the zones and metros, the waist and height size, which occurred most frequently from amongst the respondents, was selected for construction of trousers. A total of 8 trousers were stitched (one trouser per city) and given for wear trials to 16 respondents to get their feedback regarding the fit and comfort of the new developed trouser using questionnaire tool.

In Part 2 a questionnaire was administered to the above respondents to be filled up to find out their preference of brands, style, fit, areas of alteration of ready to wear trousers and factors influencing the purchase of trouser brands. The questionnaire was self administered to a total of **1850 respondents** covering eight cities.

3.3: LOCALE OF THE STUDY

The respondents selected for the study were divided into **two groups-**

3.3.A. Zone wise - a) East b) West c) North d) South e) Central India.

3.3.B. Metro wise –Three cities were selected – a) Bangalore b) Mumbai and c) Delhi

3.3.A. Zonal samples were drawn from **Calcutta, Ahmedabad, Ludhiana, Coimbatore and Indore**. Zonal grouping of samples was aimed at obtaining geographic representation of the entire country. The **inclusion criteria** used for selection of respondents from these cities were, that, they should be in the age group of 25-55 years, should be using branded trousers only and were long time residents of that city.

3.3.B. Metro based samples: these were drawn from the three **metros Bangalore, Mumbai and Delhi**.

Metro wise samples were selected for the study, as it was felt that in metros, cosmopolitan respondents would be available who would have a different attitude and preference towards Branded trousers. The selection criteria of the respondents were the same as that of the respondents from the above zonal group.

3.4. SAMPLE SELECTION

A total of **1850** samples were selected for the study from the above zones and metros. These respondents were **measured** for trouser measurements as well as administered the **questionnaire**.

3.4.A. 300 respondents from each of the above five zonal cities **except Calcutta (200)** were measured and also administered the questionnaire. A total of **1400 respondents from the 5 zones** were included in the study.

Zone wise break up of respondents –

1.	East	(Calcutta)	200
2.	West	(Ahmedabad)	300
3	North	(Ludhiana)	300
4.	South	(Coimbatore)	300
5.	Central India	(Indore)	300

Total **1400 respondents.**

3.4.B. A mixed sample group of **150 respondents** each from Bangalore, Mumbai and Delhi were measured and self-administered the questionnaire. This sample size comprised of the following -

- | | | |
|----|-----------|-----|
| a. | Bangalore | 150 |
| b. | Mumbai | 150 |
| c. | Delhi | 150 |

Total **450 respondents.**

3.5 PROCEDURE FOR DATA COLLECTION

3.5.1. A **pilot study** was carried out in May 2006 by self administering the questionnaire to 30 men from Coimbatore to get their response to the clarity of instructions and statements in the structured questionnaire tool. The same respondents were measured for trouser measurements to check if the technique of taking body measurements was correct.

The required changes were made as per the feedback and incorporated in the final questionnaire. Similarly the feedback on the measuring process was also incorporated and the respondents were again measured to verify if the change in technique was more effective.

3.5.2. ACTUAL FIELD SURVEY –

Administering of the questionnaire and taking the body measurement of the respondents was done over a period of approximately 24 months, starting from June 2006 in eight selected cities in the study. The questionnaire was administered personally to the respondents at various locations like residences, offices and designated venues.

The **final survey questionnaire** was redrafted and finalized with the help of a panel of academicians. This established the **validity** of the research tool. The final questionnaire contained in all **10 items**. Of these **9 items were close ended**, keeping in mind the factors of simplicity, ease of response and time required for filling in the questions. **1 item was open ended**. The questionnaire contained **personal profile** of the respondents, and their **usage and attitude** towards ready to wear trousers, **which included** major areas like – preference of brands, factors influencing purchase of branded trousers, style and cut preferred, areas of trouser alteration and whether the same size trousers were purchased across all the brands.

The raw data was collected in **two parts – a. specific body measurements** required for trousers and the **b. information** from the **filled questionnaire through survey method**.

3.5.2.a. DATA COLLECTION AND ANALYSIS OF BODY MEASUREMENTS SPECIFIC TO TROUSERS– For administering the questionnaire to the respondents in eight cities and also taking their body measurements for trousers, **help of an external agency** was taken. The researcher and two agency persons together screened the respondents and only those who fulfilled the required criteria were included in the study.

Measuring of respondents and noting down the measurements was done using measure tape, metal scale, Velcro tapes and pencil. Body sketch was prepared and the areas to be measured were marked clearly and handed over to the trained tailor who took the required measurements. A total of **seven measurements** per person were recorded. These were - **height, waist, upper hip, hip, upper thigh, in seam length and out seam length**. **All measurements were taken in centimeters**. A total of 1850 respondents were measured.

The **primary data** obtained was coded and tallied using Microsoft Excel. Using SPSS (Statistical Package for Social Sciences) package, version 15.0, descriptive Statistics like mean, mode, median, standard deviation, CV % and

percentages were calculated. In addition, other statistical methods like - **ANNOVA Test** was used to find out if there are significant differences in body measurements of respondents from different cities specific to trousers and with the help of **SCHEFFE'S Test**, the means of body measurements of the respondents of the selected cities of the **five zones** and **three metros** were compared to find out which of the cities are significantly different on body measurements specific to trousers. **KARL PEARSON'S COEFFICIENT OF CORRELATION ('R')** or R Test - was used to correlate the body measurements specific to trousers for the selected 8 cities from the five zones and the three metros.

The analyzed data was used to design standardized body measurement charts and develop graded range of sizes for trousers for all 8 cities.

3.5.2.b: ANALYSIS OF THE QUESTIONNAIRE FROM THE FIELD SURVEY.

The questionnaire contained in all **10 items**. Of these **9 items were close ended**, keeping in mind the factors of simplicity, ease of response and time required for filling in the questions. **1 item was open ended**.

The questionnaire included **personal profile** and **trouser profile**, of the **respondents** which contained questions on their **usage and attitude** towards ready to wear trousers, wherein major areas like – preference of brands, factors influencing purchase of branded trousers, style and cut preferred, areas of trouser alteration and whether the same size trousers were purchased across all the brands were covered. A total of 1850 respondents were administered the questionnaire across the country in 8 cities.

The **raw data** obtained from the questionnaire was coded using Microsoft Excel. Using SPSS (Statistical Package for Social Sciences) package, version 15.0, descriptive statistics like frequency count (tallying), mean, percentage and standard deviation were calculated. In addition, **Chi-square** test of

association was used to test the association of variables between and within five cities of the zones and three cities of the metros.

3.6: DEVELOPMENT OF NEW TROUSER MEASUREMENT GROUPS

A total of **1850** men were **measured** specifically for trousers from 8 cities. **Seven measurements** per individual were recorded viz; height, waist, upper hip, hip, upper thigh, inseam length and out seam length. The body measurements obtained was **grouped** in **Height wise** and **Waist wise** categories

- **Spacing of Height wise** class intervals were at 5 cms. Accordingly based on this, mean of the other body measurements were calculated and used. For all the 8 cities, 6 height wise class interval groups were formed.
- **Waist wise** class intervals were at 2 cms interval. This was done in order to cover a larger number of waist sizes. Based on the above classification, the other mean body measurements were calculated for each waist category.
- The above height wise and waist wise class interval groups were made for all the eight cities in order to develop **the new trouser measurement charts**. Each group was assigned **identification labels**.

- The trouser measurement charts were based on the above waist and height groups. The measurement charts were developed for the six height categories, which ranged from 155 to 184 cms, using waist and other trouser measurements. For e.g. 1) In case of **Calcutta** and **Ahmedabad** **24 waist** wise class interval groups across **6 height** groups were developed. 2) In case of **Ludhiana**, **26 waist** measurements were developed across 6 categories. 3) In **Coimbatore** **23 waist** measurements across 6 height wise class intervals were developed. 4) In **Indore** **25 waist** wise class intervals across 6 height wise groups were formed. 5) In the Metros- in **Bangalore** **22 waist** wise groups across 6 height categories were made. Similarly in **Delhi** **23** and in **Mumbai** **19** waist wise class interval groups were formed across 6 height categories.

3.7 GRADING OF SIZES FOR TROUSER MEASUREMENT CHARTS

New graded trouser measurement charts were **developed** using the **body measurements of Men** from 8 different cities. This chart was based on different height and waist groups. The number of waist groups were many in each city. However, the height categories were six in number. Development of the new trouser measurement charts and grading was done with the help of Professional Pattern Maker.

PATTERN GRADING is a technique which is used to increase or decrease the size of the garment pattern according to measurements in the given size chart, without changing the style and cut. It is also the process by which ranges of larger and smaller sizes are produced from a sample pattern using a proportional system of measurement. It will **faithfully reproduce the design without loss of balance, line or fit. (Bray, 1986).**

For grading trousers, Stack and Nest grading method was used.

STACK AND NEST GRADING METHOD: In stack grading method the base pattern is used to grade all the sizes, and each component has a common origin for the sizes grade from the same component. In nested grading, all sizes are superimposed on top of each other.

Stack Grading: In stack grading the base trouser size selected was **88 cms** waist measurement. The other sizes were graded up and down from this base size. 88 cms (34.5") was selected, as it is the medium size for men's trousers. The most popular waist sizes across trousers are from 82 cms to 92 cms waist. The grading was done - waist wise and height wise. For 6 different height categories the same range of waist measurements were used; so as to provide a perfect fit for all waist and height groups. For e.g. in the case of Ahmedabad and Calcutta, there were 24 waist groups. These 24 waist sizes were used in all the 6 height categories. While some measurements like the waist, hip, knee, thigh and bottom opening did not change with **change in height**, other measurements like the inseam, outseam, front rise and back rise changed with the different heights. In Ludhiana there were 26 waist groups in each height category. In Indore there were 25 waist groups in each of the 6 height categories. This was followed for all 8 cities.

ADDITION OF EASE

For converting body **measurements** of individuals to **garment measurements** some ease has to be added to the body measurements. Ease is added to the garment for easy body movements and comfort. The amount of ease to be added to the different measurements varies, depending upon the amount of comfort required in that area. The ease added to the trouser measurements is as follows;

- Waist = Round waist + 1 cms for all sizes.
- Hip= seat = Round hip + 6cms, up to 96 cms waist. Above 96 cms waist, only 1 cms is added, as only the stomach increases and not the hip.
- Thigh = Round thigh + 8 cms.

In the graded trouser blocks, the **Size Interval** in the waist measurement was 2 cms and the waist size changed after every 2 cms. Similarly the size interval for height measurement was 5 cms and the height category changed after every 5 cms.

➤ **INCREMENTS IN SIZES WITHIN THE SAME HEIGHT CATEGORY**

The increment in the trouser measurements varied from size to size. Like for example, the waist and hip increased by 2 cms for every size. The outseam by 3 mm; front rise by 3 mm; back rise by 4 mm and thigh by .7 cm for every size.

Inseam = **Static Grade Rule** has been used. For the same height category the inseam remained static (no change) even though all other measurements changed.

➤ **INCREMENT IN SIZES BETWEEN DIFFERENT HEIGHT CATEGORIES**

From one height category to the next height category, the **outseam** and **inseam** measurements **increased by 3 cms**, the **front rise** and **back rise** by **1 cms** each. The other measurements did not change with change in height category.

COMPUTERISED PATTERN GRADING AND NESTING -

Grading from measurement charts – A Number of systems have developed made to measure systems that allow construction of patterns directly from a set of measurements. (Aldrich, 1997). Graded trouser measurement charts of all 8 cities for the selected waist and height sizes was given to a professional company which specializes in computerized patterns in Bangalore, viz., **Reach Technologies**. They used their CAD CAM software for development of nested patterns from the given measurement charts. The computer produced nested Patterns of six of the most common sizes for every city. The trouser sizes generated were from 82 cms to 92 cms waist measurements for height categories from 165-170 cms. For the CAD CAM software, the base pattern was made in size 88 cms waist. The other sizes were then nested accordingly.

3.8 SELECTION OF SIZES FOR CONSTRUCTION OF NEW TROUSERS

The vast data of body measurements, of men from 8 cities, was condensed to height wise and waist wise class interval groups. The waist wise class intervals were kept at 2 cms interval and the height wise class intervals were kept at 5 cms interval. From the derived categories of class intervals, the most frequently occurring (maximum percentage of respondents in that category) height wise category and waist size was selected for each city. The corresponding trouser measurements for this category was taken from the **Graded Trouser Measurement Charts** developed for each city.

3.8.1 SELECTION OF HEIGHT AND WAIST MEASURES OF TROUSERS FOR WEAR TRIALS (FOR ALL 8 CITIES)

A. ZONE

a. EAST ZONE – CALCUTTA:

In Calcutta, the maximum number of respondents (29.5%) were in the **165-169 cms height** category. (Refer Table: 4.1.A.a.5), and the maximum number of respondents (11.5%) had **waist measurements** in the **84-85 cms** category (Refer Table: 4.1.A.a.6).

The trouser for wear trial for Calcutta was made in size 84-85 cms waist and in the 165-169 cms height. (Refer Table: 4.1.A.a.8.3). The trouser

identification label is (E-W 10/H4), where, E is East Zone, W is the waist, 10 is the class interval where the waist measurement is and H4 is the Height Class Interval.

The new constructed trouser was given to 2 respondents to get their feedback on the fit and comfort.

b. WEST ZONE –AHMEDABAD:

In Ahmedabad, the maximum number of respondents (39%) were in the **165-169 cms height** category (Refer Table: 4.1.A.b.5), and the maximum number of respondents (12.33%) had **waist measurements in the 84-85 cms** category (ReferTable: 4.1.A.b.6).

The trouser for wear trial for Ahmedabad was made in size 84-85 cms waist in the 165-169 cms height (Refer Table: 4.1.A.b.8.3) The trouser Identification label is (W-W 10/H4), where W is West Zone, W is waist, 10 is the class interval where the waist measurement is and H4 is the height class interval.

The new constructed trouser was given to 2 respondents to get their feedback on fit and comfort.

c. NORTH ZONE – LUDHIANA:

In Ludhiana, the maximum number of respondents (35.67%) were in the **170-174 cms height** category (Refer Table: 4.1.A.c.5), and the maximum number of respondents (10%) had **waist measurements** in the **90-91 cms** category (ReferTable: 4.1.A.c.6).

The trouser for wear trial for Ludhiana was made in waist size 90-91 cms in the 170-174 cms height category (Refer Table: 4.1.A.c.8.4).

The trouser Identification label is (N-W12/H4), where N is North Zone, W is waist, 12 is the class interval where the waist measurement is and H4 is the height class interval.

The new constructed trouser was given to 2 respondents to get their feedback on fit and comfort.

d. SOUTH ZONE – COIMBATORE:

In Coimbatore, the maximum number of respondents (35.3%) were in the **165-169 cms height** category (Refer Table: 4.1.A.d.5), and the maximum number of respondents (9.33%) had **waist measurements** in the **90-91 cms** category (Refer Table: 4.1.A.d.6).

The trouser for wear trial for Coimbatore was made in waist size 90-91 cms in the 165-169 cms height category (Refer Table: 4.1.A.d.8.3)

The trouser Identification label is (S-W 12/H5), where S is South Zone, W is waist, 12 is the class interval where the waist measurement is and H 5 is the height class interval.

The new constructed trouser was given to 2 respondents to get their feedback on fit and comfort.

e. CENTRAL ZONE – INDORE:

In Indore, the maximum number of respondents (28%) were in the **165-169 cms height** category (Refer Table: 4.1.A.e.5), and the maximum number of respondents (10%) had **waist measurement** of **88-89 cms**. (Refer Table 4.1.A.e.6).

The trouser for wear trial for Indore was made in waist size 88-89 cms in the 165-169 cms height category (Refer Table: 4.1.A.e.8.3). The trouser Identification label is (CI-W13/H4), where CI is Central Zone, W is waist, 13 is the class interval where the waist is and H 4 is the height wise class interval.

The constructed trousers were given to 2 respondents to get their feedback on fit and comfort.

B. METROS

a. BANGALORE:

In Bangalore, the maximum number of respondents (29%) were in the **170-174 cms height** category (Refer Table: 4.1.B.a.5), and the maximum number

of respondents (11.3%) was in the **waist category of 92-93 cms.** (Refer Table: 4.1.B.a.6).

The trouser for wear trial for Bangalore was made in waist size 92-93 cms in the 170-174 cms height category (Refer Table: 4.1.B.a.8.4).

The trouser Identification label is (M-BW9/H 4) where, M is metro, B is Bangalore, W is waist, 9 is the class interval where the waist is and H 4 is the height wise class interval.

The constructed trousers were given to 2 respondents to get their feedback on fit and comfort.

b. MUMBAI:

In Mumbai, the maximum numbers of respondents (22.6%) were in the **165-169 cms height category** (Refer Table: 4.1.B.b.5), and the maximum number of respondents (17.3 %) was in the **86-87 cms waist** category (Refer Table: 4.1.B.b.6).

The trousers for wear trial for Mumbai was made in waist size 86-87 cms waist in the 165-169 cms height category (Refer Table: 4.1.B.b.8.3)

The trouser Identification label is (M-MW 11/H 4) where M is metro, M is Mumbai, W is waist, 11 is the class interval where the waist measurement is and H 4 is the height wise class interval.

The trousers were given to 2 respondents to get their feedback on fit and comfort.

c. METRO – DELHI:

In Delhi, the maximum number of respondents (23.6%) were in the **170-174 cms height** category. (Refer Table: 4.1.B.c.5), and the maximum number of

respondents (8.67%) was in the waist category of **80-81 cms; 82-83 cms; 88-89 cms and 92-93 cms.**

The trouser for wear trial for Delhi was made in the 92-93 cms waist in the 170-174 cms height category. (Refer Table: 4.1.B.c.6)

The trouser Identification label is (M-DW 14/H4) where, M is Metro, D is Delhi, W is waist, 14 is the class interval where the waist is and H4 is the height wise class interval.

The trouser was given for wear trial to 2 respondents to get their feedback on fit and comfort.

3.8. 2 CONSTRUCTION OF NEW TROUSERS

A total of **8 trousers** were stitched (one for each city) and were given for trial wear to 16 respondents along with the questionnaire in order to get their feedback on the fit and comfort of these trousers.

The **new graded trouser blocks** were given to the tailor in Bangalore, who drafted and stitched them as per the given size specifications and specified style i.e. flat front trousers in regular fit and worn at mid waist level. For the trousers, Poly-viscose blended suiting fabrics was used in different colors.

3.8.3 ANALYSIS OF THE FEEDBACK ON FIT AND COMFORT OF THE NEWLY CONSTRUCTED TROUSERS IN SELECTED GRADED SIZES BY CONDUCTING WEAR TRIALS

For the selected 8 cities, 8 trousers as per the specifications were constructed and given to 16 respondents (2 per city) for the trial wear along with the questionnaire, to get their feedback on the fit and comfort of the newly developed trousers
