

# Development of a Mobile-Based Application Software Body Size Calculator

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## Abstract

*Clothing fit is one of the important factors affecting consumers' purchasing behaviour and clothing satisfaction. The aim of this study was to develop a mobile-based body size calculator program to compare standard mass production body measurements with female body measurements taken individually. Another aim of the study was to investigate the effects of size difference between the body measurements taken individually and mass production-based measurements on pattern drafting. At the end of the study, the program developed was run, the differences between the patterns examined and pattern modifications made according to the results obtained.*

**Key words:** *body size calculator, measurement software, body measurements, fit mapping, clothing fit, mobile operating system, mobile-based APP.*

## Introduction

Clothing fit is one of the significant factors affecting consumers' purchasing behaviour and clothing satisfaction [1, 2]. In order for a garment to be able to fit the body, measurements to be used in preparing the pattern must be compatible with the body measurements of the person. Manufacturing clothing that can fit the body is one of the important competitive advantages for businesses like boutiques, fashion houses, ready-made clothing shops, etc., which have mass production-based measurements. Calculating a secondary size based on basic measurements taken from a person is a study which is time consuming, demanding because of the formulas being complicated, and can lead to pattern drafting errors caused by wrong calculations. In the scope of the study, the development of a mobile-based body measurement program makes the research important since it removes the above-mentioned negative factors.

Mobile-based applications used in the textile and apparel sector are increasing day by day. Some research conducted on this subject can be summarised as follows.

Bulgun and Başer [3] designed packaged software in order to assist clothing businesses during the process of design and order acceptance. Trousers were chosen as the sample item in the study. In the scope of the study, different trouser models were designed, production parameters for each model calculated, and all the data were entered into the computer program. In this way, when a clothing business wants to manufacture any trou-

ser model, it can easily obtain data such as the unit sewing time, unit quantity and unit cost of the most suitable model for requests among the pre-designed models in the program [3].

Mete [4] developed a new women's bodice pattern making technique, called Ephesus, which is based on direct body measurements. In the study, the pattern making steps were explained in detail, and new patterns were cut out from the patterns created and tested in terms of form and fit. Within the scope of the research, 12 adult women with different upper body forms were studied and a total of 16 body measurements taken from each model. At the end of the study, it was stated that the newly developed Ephesus Pattern system can be applied to all bodies regardless of body type and measurements, as it fully conforms to each part of the body [4].

Vuruşkan [5] developed computer software for the systematic execution of the estimated cost calculation phase, which can be regarded as the beginning of workflow for knitwear apparel businesses. The estimated cost module prepared within the scope of the study works to do product specification and unit cost calculations during product development and the order acceptance process [5].

In his study, Bal [6] analysed polyester, viscose and elastane blend woven fabrics, examined the values obtained as a result of the analysis, calculated the product values and yarn consumption of the new fabrics by looking at a known fabric structure, and emphasised planning the requirements of businesses by means of these values obtained. At the end of the study,

a computer program covering all these topics was developed [6].

Ak [7] developed web-based software that can calculate the fabric expenses of different T-shirt models. Technical drawings, size tables, a cutting plan, order details and 3-D drawings of different T-shirt models were obtained from the enterprise determined as the field of application. In this respect, the software designed with model pictures and the unit expense value was aimed to contribute to the rapid calculation of the fabric cost for a similar model during the order acceptance process [7].

Yeşilpınar et al. [8] developed computer software that can calculate the fabric consumption amount of ready-made clothing manufacturers. Jeans were worked on as the sample item. The program developed can quickly calculate the fabric costs of the new patterns by making use of previously prepared cloth spreading plans and stored production data [8].

Değirmenci and Çelik [9] designed a computer program that helped calculate the unit costs of double-fleece and elastane knitted fabrics. Within the scope of the study, the production and unit cost calculated with the help of formulas was converted into an interface. If requested, the program can only be used for production calculation [9].

In their study, Özdemir et al. [10] designed software to calculate the unit cost of products manufactured by small-scale weaving enterprises and ran a sample application. The design of the application could be viewed in both mobile operating systems and the Windows environment.

The basic factors affecting the unit cost of woven fabrics in weaving enterprises operating on the order basis were weaving preparation, raw materials, labour, energy, and amortization costs. Within the scope of the study, apart from these basic cost elements, yarn waste, product waste, the shrinkage ratio and hidden cost elements that cannot be calculated were included in the calculation of the unit cost [10].

The aim of this study was to develop a mobile-based body size calculator program to compare standard mass production body measurements with female body measurements taken individually. Another aim of the study was to investigate the effects of the size difference between the body measurements taken individually and mass production-based measurements on pattern drafting.

## Materials and method

First of all, a Body Size Calculator application program was prepared and run. The program is available on the Internet at <http://textile.erkanyesil.com/>.

The application was developed using ASP.NET via the Microsoft Visual Studio and was designed to be compatible with desktop and mobile systems. Data entry and reporting can be done with 2 different language options – Turkish and English. It reports 11 variables as a result

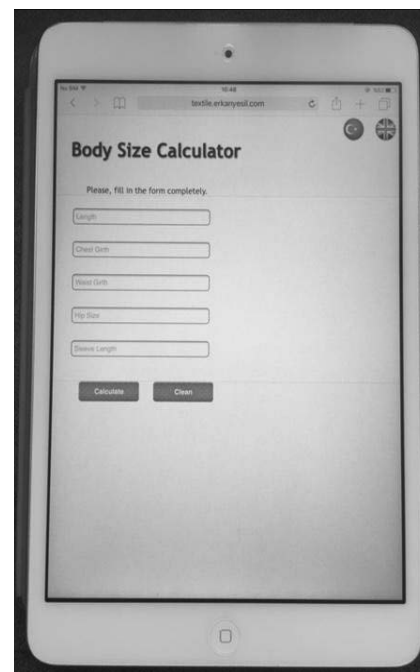
of the operation performed on the five variables that are required to calculate the body measurements.

There are data controls for the 5 areas where the user can enter data, and these controls check for unfilled areas. One of the two existing buttons is used to clear the text boxes used for data entry, and the other to operate on the variables entered. The interface of the application is illustrated in *Figure 1*.

The infrastructure of the Body Size Calculator program is based on the Muller Pattern System. After the five basic measurements are entered into it, the program can calculate 11 measurements using the auxiliary measurement calculation formulas given in *Table 1*.

Within the scope of the study, personal measurement techniques were also utilised. Accordingly the positions of the front and back body measurements taken from an individual are displayed in *Figure 2* (see page 106), and the explanations are presented in *Table 2*.

Within the scope of the study, using the Body Size Calculator program, women's body measurements taken individually and standard body mass measurements were compared. The practice made use of body measurements from standard tables of body size 38 and average body measurements obtained from 100 young



*Figure 1. Interface of Body Size Calculator application program.*

women between the ages of 18 and 50 who were of body size 38.

## Findings

Women's body measurements obtained from standard tables are shown in *Figure 3*, and average women's body measurements obtained from 100 women are illustrated in *Figure 4*.

*Table 1. Measurement calculation table used in women's wear [11-14].*

Basic measurements	
Full length	Body height including the head while standing on naked feet.
Chest girth	Taken from the widest part of the body parallel to the ground without leaving a space.
Waist girth	Taken from the waist hole without leaving a space.
Hip size	Taken from the widest part of the hip parallel to ground without leaving any space.
Sleeve length	Taken from the shoulder cap to the wrist bone.
Auxiliary measurements	
Hollow forearm depth	Chest girth 1/10 + 10.5 cm
Back length	Full length 1/4
Hip drop	Hollow forearm depth + back length without addition
Back neckline	1/10 of the 1/2 chest girth + 2 cm
Chest drop I	Chest drop 2 + back neckline
Chest drop II	Chest girth 1/4 + 3/4 cm
Front length I	Front length 2 + back neckline
Front length II	For a body size between 80 - 90 cm, back length + 3.5 cm For a body size between 91 - 100 cm, back length + 4. cm For a body size between 101 - 110 cm, back length + 4.5 cm For a body size between 111 - 120 cm, back length + 5 cm For a body size between 121 - 130 cm, back length + 5.5 cm For a body size larger than 131 cm, back length + 6 cm
Back girth	Chest girth 1/8 + 5.5 cm
Hollow forearm width	Chest girth 1/8 - 1.5 cm
Front girth	Chest girth 1/4 - 4 cm

*Table 2. Set of women's body measurements.*

Basic measurements	Line
Full length	1-2
Chest girth	3-4 & 5-6
Waist girth	7-8 & 9-10
Hip size	11-12&13-14
Sleeve length	15-16
Auxiliary measurements	Line
Hollow forearm depth	17-26
Back neckline	17
Hip drop	17-18
Chest drop I	22-24
Chest drop II	23-24
Front length I	24-21
Front length II	20-24
Back girth	5-6
Hollow forearm width	3-5 /4-6
Front girth	3-4
Back length	17-19

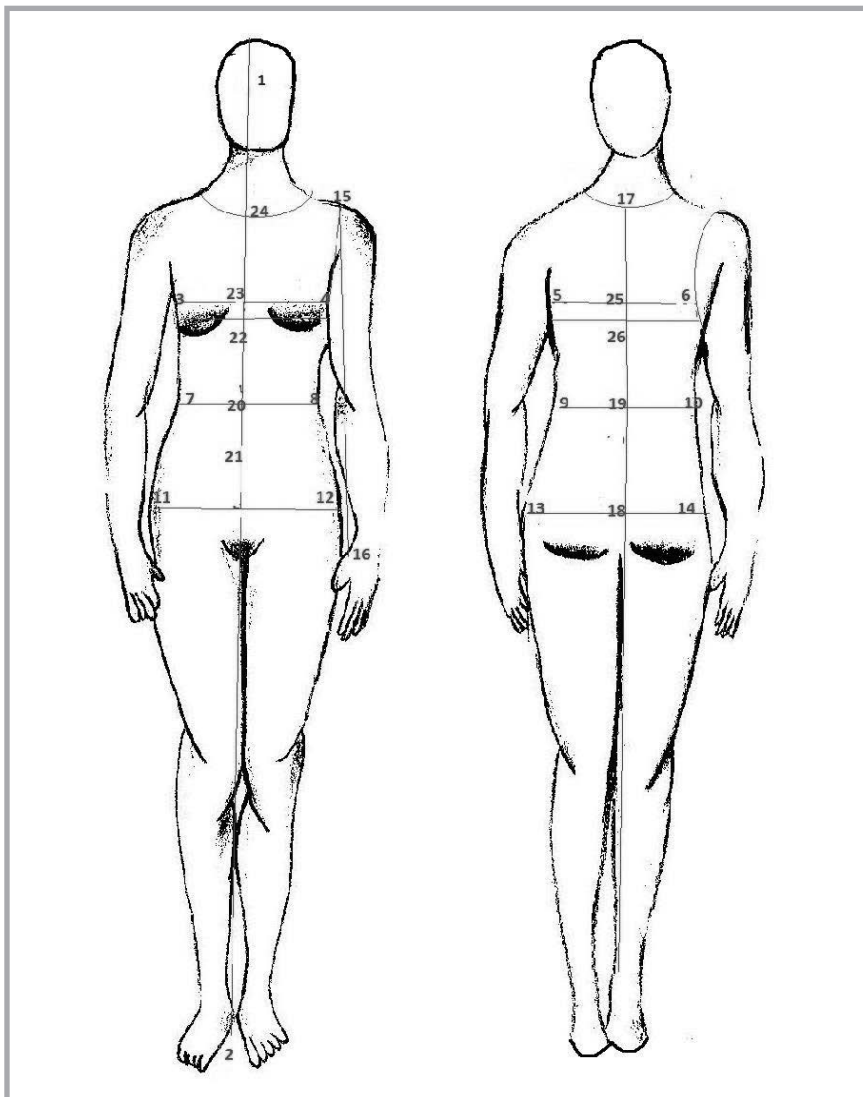


Figure 2. Women's body measurement parts.

Figure 5 displays the differences between the basic body pattern drafts (red line) obtained by calculating the average body measurements of women of size 38 and the basic women body pattern (black line) drawn with standard body mass measurements of size 38.

In Figure 5, the following modifications were made according to the standard table;

- Chest girth between (3-4) and (5-6) was reduced by 3 cm
- Waist size between (7-8) and (9-10) was increased by 3 cm
- Hip size between (11-12) and (13-14) was increased by 2 cm
- Hollow forearm depth between 1-6 was reduced by 0.3 cm
- Center back length between 1-10 was increased by 1.25 cm
- Hip drop between 1-14 was increased by 0.95 cm
- Back neckline between 1-15 and 16-17 was reduced by 0.15 cm

- Chest drop II measurement between 18-21 was reduced by 0.75 cm
- Center front length II measurement between 18-27 was increased by 0.25 cm
- Back girth between 6-26 was increased by 0.4 cm
- Hollow forearm circumference between 25-26 and 4-22 was increased by 0.4 cm
- Front girth between 3-22 was reduced by 0.75 cm.

### Conclusion and discussion

As a result of this study, mobile-based body calculation software was developed for easy, practical and accurate calculation of mass production measurements used in the drafting system. The program can calculate auxiliary measurements of all different body sizes as well as standard measurements. At the end of the study, the basic body pattern prepared with mass produc-

### Body Size Calculator

Please, fill in the form completely.

Calculate
Clean

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Hollow Forearm Depth: 19.3  
 Center Back Length: 40  
 Hip Drop: 59.3  
 Back Neckline: 6.4  
 Chest Drop I: 31.9  
 Chest Drop II: 25.5  
 Center Front Length I: 44  
 Center Front Length II: 50.4  
 Back Girth: 16.5  
 Hollow Forearm Circumference: 9.5  
 Front Girth : 18

Figure 3. Women's body measurements obtained from standard tables of size 38.

### Body Size Calculator

Please, fill in the form completely.

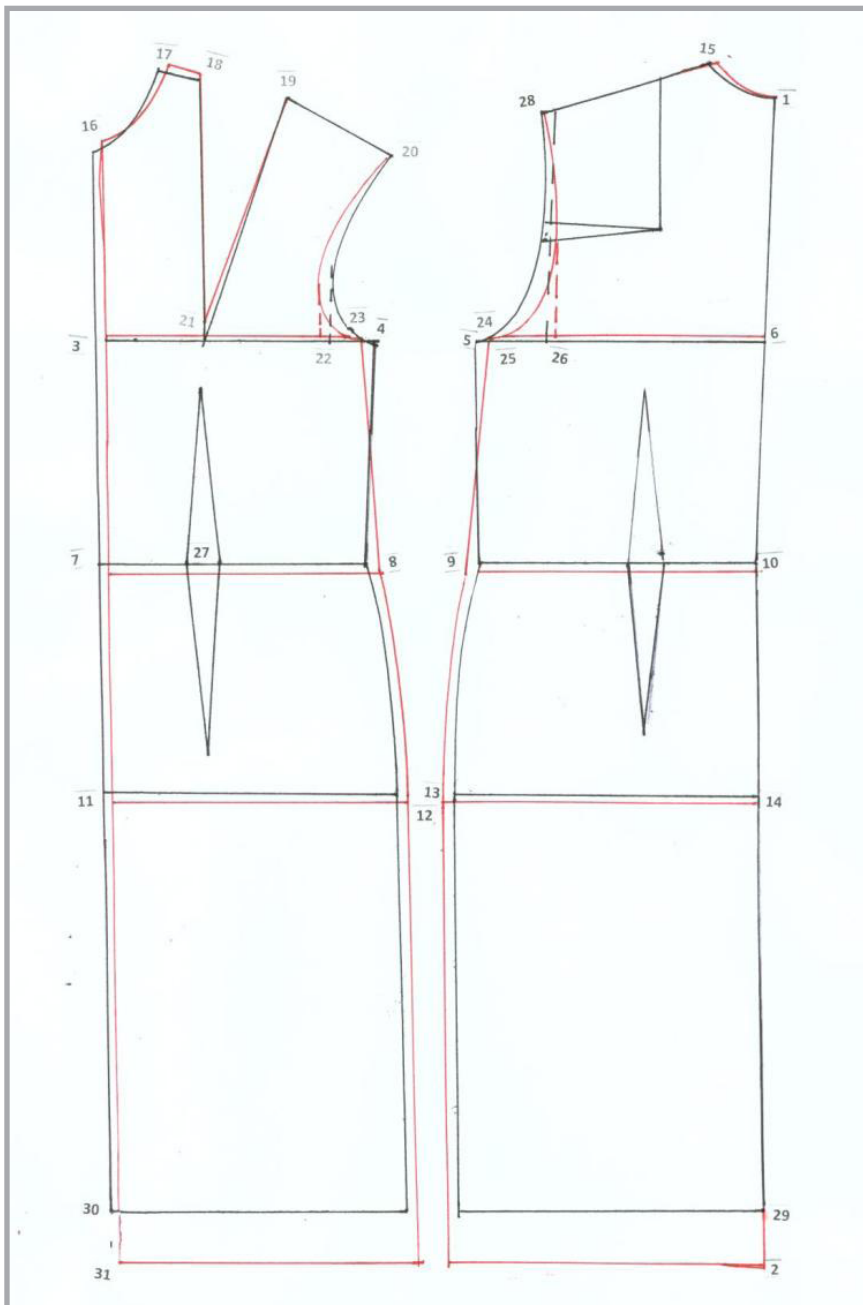
Calculate
Clean

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Hollow Forearm Depth: 19  
 Center Back Length: 41.25  
 Hip Drop: 60.25  
 Back Neckline: 6.25  
 Chest Drop I: 31  
 Chest Drop II: 24.75  
 Center Front Length I: 45.25  
 Center Front Length II: 51.5  
 Back Girth: 16.125  
 Hollow Forearm Circumference: 9.125  
 Front Girth : 17.25

Figure 4. Women's average body measurements obtained from women of size 38.

tion measurements and the average body measurements of women of body size 38 were calculated in the mobile-based



**Figure 5.** Comparison of basic body patterns prepared according to mass production measurements, marked with a black line, and measurements obtained personally, marked with a red line

body measurement calculation program, and it was determined that there are differences when two patterns were compared. The differences between the basic body pattern prepared with the measurements obtained individually and the pattern prepared according to mass production measurements can be summarised as follows:

1. The front and back body girths were narrower,
2. The waist girth and hip girth measurements were wider,
3. The hollow forearm depth and width were narrower,

4. The back neckline size was wider,
5. Front length I was shorter,
6. Front length II, the back length and hip drop sizes were calculated to be longer, which was reflected in the pattern drafts.

In this way, customer satisfaction can be ensured by making pattern modifications according to individually obtained measurements and increasing clothing comfort with pattern drafts that fit the body of the individual.

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