

Development of the Mobile Application to Calculate Parameters of Underwear Patterns

ZAKHARKEVICH Oksana^{1,a}, KOSHEVKO Julia^{2,b *}, SHVETS Galyna^{3,c},
KULESHOVA Svetlana^{4,d}, BAZYLIUK Elvira^{5,e}, PARASKA Olga^{6,f} and
KAZLACHEVA Zlatina^{7,g}

¹⁻⁴Khmelnytskyi National University, Department of Technology and Design of Sewing Products,
st Instytutska 11, 29016, Khmelnytskyi, Ukraine

⁵Khmelnytskyi National University, Department of Design, st. Instytutska 11, 29016,
Khmelnytskyi, Ukraine

⁶Khmelnytskyi National University, Department of Chemistry and Chemical Engineering,
st. Instytutska 11, 29016, Khmelnytskyi, Ukraine

⁷Trakia University, Faculty of Technics and Technologies, st. Graf Ignatiev 38, 8600 Yambol,
Bulgaria

^azbir_vukladach@ukr.net, ^bjuliakoshevko@gmail.com, ^cgalyamet@ukr.net,
^dkuleshova_lana@ukr.net, ^ee.bazyliuk@gmail.com, ^folgaparaska@gmail.com
^gzlatinka.kazlacheva@trakia-uni.bg

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Abstract. The study aims to develop a mobile application to support the process of designing underwear. The application allows calculating parameters of underwear patterns. The method of semantic differential has been used to evaluate the developed mobile application. The resulting psychographic profiles of the application indicate a positive assessment by experts. The developed app allows achieving the same precision of the calculation as other calculation methods while the speed is much preferable. Besides that, the risk of accidental mistakes due to the human factor is excluded from the process of designing underwear patterns.

Introduction

COVID19 pandemic situation resulted in the global use of mobile technologies in the fields, which usually were not influenced by the new era of high-tech innovations. The range of papers is dedicated to using mobile devices for learning [1-5, 13-15]. While most of the researchers are concerned with the overall influence and/or impact of mobile learning on students in different areas [2-5, 13-15], several papers present possibilities for incorporating such technologies in the field of design including clothing design [1]. Many professionals in the field of garment design and apparel manufacturing are more than unambiguous positive on the question of using smartphones as a means to integrate innovations into garment design. Moreover, if such means are integrated into the education process it is even more impactful for the industry as it carries on the high quality of the future performance of clothing designers and patternmakers. The most obvious way to develop and improve communication channels of the apparel companies is to develop specific mobile applications that will serve as an interpreter between a customer and a company itself. The main hypothesis of the current study is that the mobile application is the way to improve not only communication channels but the design process itself.

Based on the monitoring of the existing mobile applications in the field of apparel design and manufacturing that was described in [9-11] we found out that there are no applications that purposed for the calculation of underwear patterns. Though, there are some applications for the calculation of other garment types patterns such as “CloStyler” [11], “SHOES Step-by-Step”, “RDMK Step-by-Step” [10], etc. These apps allow seeing the results of calculations instantly. A user can see the scheme by which he is instructed when constructing a pattern. The calculation itself is done in the same order as the pattern drafting method instructs. The main purpose of such an app is to reduce the time wasted while constructing patterns and at the same time to increase their accuracy.

The mobile applications that were found on the market and in the scientific papers are mostly concerned with top wear garments such as coats, jackets, dresses, skirts, and trousers. Therefore, the focus of the current work is underwear, the design process of which is not supported by mobile technologies till now.

Literature analysis of the scientific papers did not allow to find papers about mobile apps to support the underwear design process. Though, it was discovered that breast volume parameters and design of the bra are discussed from more than one perspective [6-8]. Besides that, it was determined that pattern design systems (PDS) that are usually used for garment design are not so useful in a case when underwear is in question. Due to the specifics of the manufacturing that is often referred to as small enterprises and bespoke clothing, it is much more convenient to use a simple calculation app that would be cheaper and faster than traditional PDS.

Therefore, the main goal of the paper is to develop a mobile application to support the process of designing the patterns of underwear garments.

Methodology

We used the method of prototyping to explore different aspects of the intended design of the app. On the preliminary study of the current research, we developed a prototype of the mobile application named “N_Underwear” that was described in the work [16]. The prototype was ranked by students studying apparel design as well as several clothing designers and researchers in the field. Results showed the necessity to improve the app as it allows to calculate only the parameters of the draft of the basic thongs. On the other hand, we discovered that the app allowed improving the accuracy of patterns’ construction. Besides that, all of the respondents indicated that it was convenient to use an app instead of the classic calculator or PDS especially if there is no one.

To develop the app we choose the MIT App Inventor (USA) that allowed creating the application for the Android operating system.

The semantic differential method described in [12] was used to evaluate the developed application. At the first stage of using this method, pairs of words with opposite meanings are formed, which form a semantic differential. Each pair of Kansei words is a bipolar pair for a separate attribute of the developed application: speed, accuracy, complexity, convenience, relevance (needs). The scales of the semantic differential for each attribute of the mobile application were represented as bipolar pairs expressed by adjectives or adverbs. The scales are presented in the form of horizontal rulers in the questionnaire. Each scale has seven gradations of values, which are expressed in numerical form (-3, -2, -1, 0, +1, +2, +3). For ease of representation of Kansei words, all bipolar pairs were encoded with the first letters of words, which is common practice: SQ (Slow-Quick); CS (Complicated-Simple); AI (Accurate-Inaccurate); FU (User-Friendly interface – User-Unfriendly interface); NU (Necessary-Unnecessary). At the next stage of the study, the application was tested by experts and evaluated using the questionnaire. The

expert group consisted of 22 students and 14 faculty members (teachers etc.), clothing designers, and patternmakers.

The results of the preliminary survey were used to improve the prototype. The main features that were improved are as follows: the icon of the app was designed anew to be more recognizable (Fig. 1); the calculation of the bra patterns was added; the interface design was changed; the language of the app prototype was changed to English with some instructions in Ukrainian given simultaneously by using slash mark (/).

The input data for calculation are body measurements and the amount of eases. The body measurements and amount of eases must be entered by a user. The app gives users the option of completing the text fields by a shorthand method based on what has been typed before. Otherwise, the fields will be autocompleted by zeros. Flowchart displaying the work of the app “N_Underwear” is given in Fig. 2. The order of calculation is performed according to the pattern drafting method. The names of the constructive segments correspond to the points in the given figures of patterns blocks (Fig. 3).

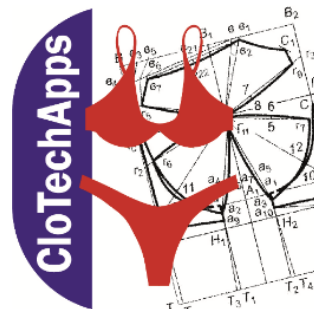


Fig. 1. The icon of the app “N_Underwear”.

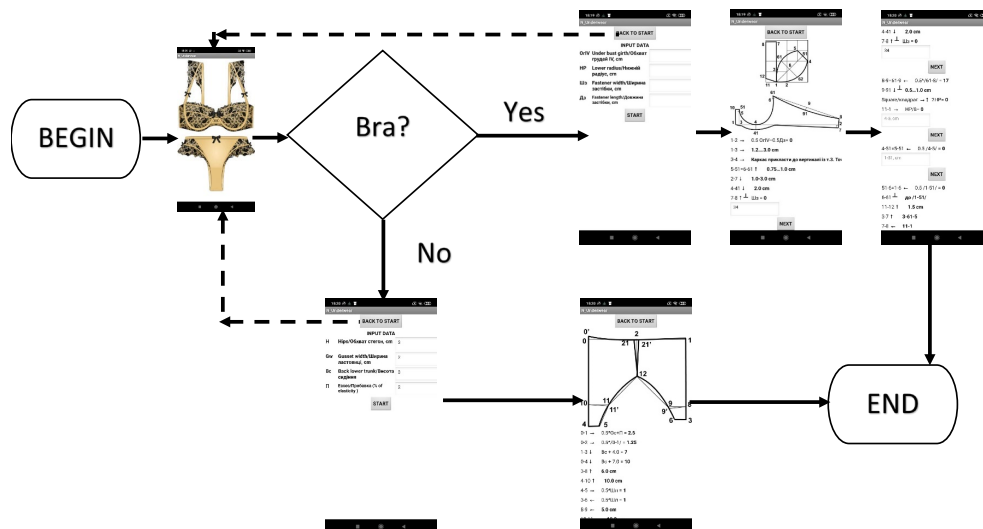


Fig. 2. The flowchart of the work of the mobile application “N_Underwear”.

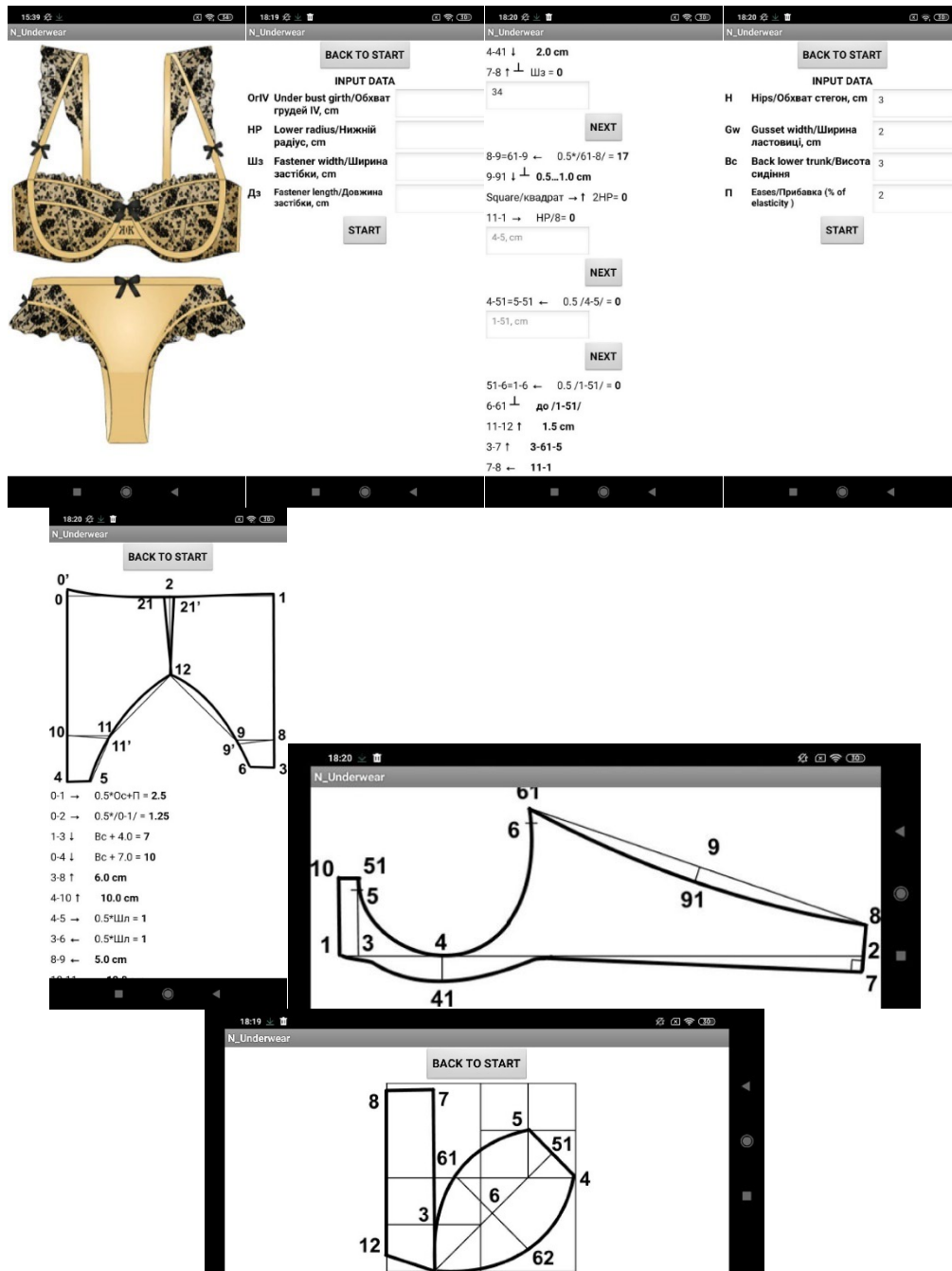


Fig. 3. Dialog boxes for working with a mobile application “N_Underwear”.

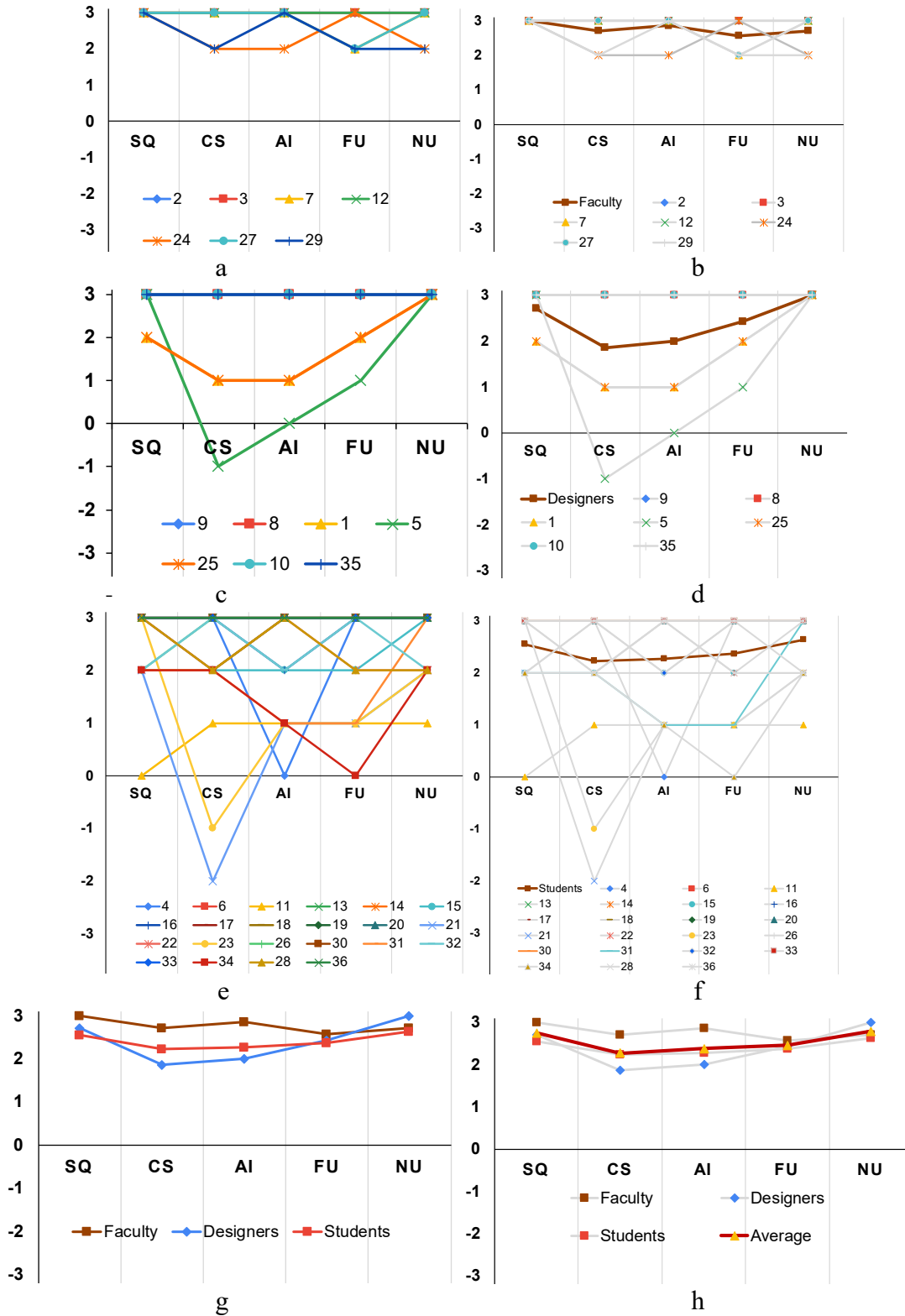


Fig. 4. Psychographic profiles of the mobile application "N_Underwear": a, b – expert group of faculty members (group K1); c, d – an expert group of clothing designers (group K2); e, f – an expert group of students (group K3); g, h – the average values of the evaluation coefficients of the three expert groups (K).

Results and Discussion

As a result of the survey, psychographic profiles of the developed mobile application were obtained (Fig. 4, a – h). The profiles display the average values of the evaluation coefficients for each pair of Kansei words. As the coefficients correspond to the positive values of Kansei words, the results of the survey indicate that the experts approved the mobile application "N_Underwear".

As one can see from Fig. 4, the application is assessed mostly with marks related to the positive meaning of Kansei Words. While the average values of the evaluation coefficients of the three expert groups form psychographic profiles that have identical forms experts of group K3 showed much more contraversions points while assessing the app. The most controversial point is the CS (Complicated-Simple) when assessed by students. It might be explained by their lack of the experience. This attribute evaluated by professional designers as well as teachers got the same level of positive response as all other attributes.

Summary

As a result of the evaluation of the developed mobile application "N_Underwear" by the methods of Kansei Engineering, the level of its competitiveness was confirmed by the positive values of the average evaluation coefficients in the psychographic profiles: 2.75 (quick); 2.27 (simple); 2.38 (accurate); 2.46 (convenient); 2.78 (necessary).

The developed app allows achieving the same precision of the calculation as other calculation methods while the speed is much preferable. Besides that, the risk of accidental mistakes due to the human factor is excluded from the process of designing underwear patterns.

The application is the only one on the market of mobile applications in the field of garment design that allows calculating parameters of underwear patterns.

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References

- [1] D. Borisenko. The use of mobile applications in the development of a design product in the training of future design professionals, *Information Technologies and Learning Tools* 68 (2018) 47-63. <https://doi.org/10.33407/itlt.v68i6.2224>
- [2] M. Abner, F. Baytar. Apps to increase student engagement: a case of textiles and apparel sustainability education, *International Journal of Fashion Design, Technology and Education* 12 (2019) 56–64. <https://doi.org/10.1080/17543266.2018.1477996>
- [3] I.S.H. Wai, S.S.Y. Ng, D.K. Chiu, K.K. Ho, P. Lo. Exploring undergraduate students' usage pattern of mobile apps for education, *Journal of Librarianship and Information Science* 50 (2018) 34-47. <https://doi.org/10.1177/0961000616662699>
- [4] J. Abdurrahman, M. Beer, P. Crowther. Pedagogical requirements for mobile learning : a review on MOBIlearn Task Model, *Journal of Interactive Media in Education* 1 (2015) art. 12. <http://doi.org/10.5334/jime.ap>
- [5] T. Page. Application-based mobile devices in design education, *International Journal of Mobile Learning and Organisation* 8 (2014) 96-111. <https://doi.org/10.1504/IJMLO.2014.062347>

- [6] K. Shin. *Patternmaking for underwear design* 2nd Ed. Createspace Independent Publishing Platform, 2015.
- [7] A. Peterson. Exploratory study on breast volume and bra cup design, *Journal of Textile and Apparel, Technology and Management* 11(1) (2019) 1-13.
- [8] Z. Li. Bra in the New Era: A Study from the Perspective of Feminism. *Proc. 2021 Int. Conf. Social Development and Media Communication (SDMC 2021)* 367-371.
<https://doi.org/10.2991/assehr.k.220105.069>
- [9] T. Zhylenko, A. Kudryavtsev, O. Zakharkevich. Mobile Application to Calculate the Parameters of Top Wear Basic Design, *Science and Innovation* 15 (2019) 24-34.
<https://doi.org/10.15407/scin15.03.024>
- [10] O. Zakharkevich, J. Koshevko, S. Kuleshova, S. Tkachuk, A. Dombrovskyi. Development of the mobile applications for using in apparel and shoes design, *Vlakna a Textil* 28 (2021) 105-122.
- [11] O. Zakharkevich, I. Poluchovich, S. Kuleshova, J. Koshevko, G. Shvets, A. Shvets. “cloStyler” – Mobile application to calculate the parameters of clothing blocks. *IOP Conference Series: Materials Science and Engineering* 1031 (2021) art. 012031.
<https://doi.org/10.1088/1757-899X/1031/1/012031>
- [12] S. Kuleshova, O. Zakharkevich, J. Koshevko, O. Ditkovska. Development of expert system based on Kansei Engineering to support clothing design process, *Vlakna a Textil* 3 (2017) 30-41.
- [13] F. Rosell-Aguilar. State of the app: A taxonomy and framework for evaluating language learning mobile applications. *CALICO Journal* 34 (2017) 243–258.
<https://doi.org/10.1558/cj.27623>
- [14] C.H. Pereira, R. Terra. A mobile app for teaching formal languages and automata. *Computer Applications in Engineering Education* 26 (2018) 1742-1752. <https://doi.org/10.1002/cae.21944>
- [15] R. Thomas, M. Fellowes. Effectiveness of mobile apps in teaching field-based identification skills. *Journal of Biological Education*, 51 (2017) 136-143.
<https://doi.org/10.1080/00219266.2016.1177573>
- [16] N. Dik. Udoskonalennya protsesiv proektuvannya zhinochoyi bilyzny v khudozhniy systemi «Ansambli» z urakhuvannyam stratehiyi rozvytku asortymentu. M.Sc. thesis, Khmelnytskyi National University, 2020.