Application of make/use platform for sustainable fashion design

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Abstract. The article explores the challenges of the clothing industry by focusing more on textile and the clothing industry interactions to reduce industry fabric waste and promote sustainability. The main research focus is to gather and analyze various possibilities for fashion designers to achieve zero waste designs in nowadays context. The introduction gives insights on the problems of the fashion industry and formulates the purpose and tasks of the research work, identifies and unpacks problems and also justifying the relevance of this study. Attention is drawn to the analysis of pre-consumer waste generation in the clothing production processes and the ways to drive the industry towards sustainability. The rich source of zero waste design ideas can be found in the ethnographic costumes’ solutions. Integrating historical experience with the methods and approaches defined by the 21st century designers can significantly reduce or even avoid fabric pre-consumer waste. The paper will reflect the collected principles of achieving zero waste fashion by using Make/Use platform, an open source system for zero waste user, modifiable fashion practice. The methods of Make /Use platform are described, and its practical application is illustrated through the zero-waste coat design. Premeditate changes are based on the fashion designer's thinking encouraging minimizing the waste in the early stages of the costume idea development, providing a sensible use of the fabric with its silhouette and design specificity.

1. Introduction

Although most consumers are aware of the amount of waste that they generate themselves, relatively few are aware of the waste generated in the course of producing the goods that they consume. Fashion is one of the most resource-intensive industries in the world, which is complex and takes a leading role in world economics. Michael F. Ashby describes the last two centuries as being an era of material abundance, pointing out our ability to locate, mind, refine and use materials increased and, with it, material availability and affordability. Claiming the dominant business model, in material terms, was one of take–make–use–dispose, focusing more on economic growth resulting in increasing consumption [1]. This system has created sustainability issues including fabric waste at the pre and post-consumer stage, it is in this part of the process where industry has the opportunity to take more responsibility.

- The fashion and textile industry is one of the largest environmental pollutant on earth [2];
- Garment waste is a growing problem in the clothing industry; in pre- and post-consumer stage;
- In traditional clothing cut-sew production system, at least 15% of the cut off fabric is thrown away; [3] it is a waste of energy from invested resources, which could be used more rationally to not generate environmental pollution;
- One of the most preferred steps in the waste management hierarchy when it comes to sustainable
fashion is prevention [4];

- There is a growing interest in zero waste fashion to obtain sustainability in the textile and clothing industry [5];

- Industry is looking for solutions to discover applicable zero waste possibilities and for designers to understand and develop how to incorporate such techniques and methods into production.

There are different strategies and direction to reduce waste in production stage. One of them - zero waste pattern making, involving designer, patternmaker and their integration or close collaboration. As an example, the rich source of zero waste design ideas can be found in the ethnographic costumes’ solutions. Integrating historical experience with the methods and approaches defined by the 21st century designers can significantly reduce or even avoid fabric pre-consumer waste [6].

This study is a result of collected examples of ways to eliminate pre-consumer waste and it will question if in practice an engagement with Make/Use platform methods can lead the industry towards sustainability.

As well as Make/Use platform which is focused on user modifiable zero waste fashion to consumer to be aware of waste, will be tested in its application and relationship with user. Identifying this kind of methods allows designers to transform the way how to look at pattern making not only to minimize waste but also to develop new ideas to a sensible use of the fabric with its silhouette and design specificity.

2. Materials and methods – Make/Use platform application

Make/Use is freely available online platform developed by designer and researcher Holly McQuillana and her team. [7] Patterns are made considering the width and length of fabric, as well as fixed areas of it. Holly McQuillan emphasizes that the purpose of her designed patterns is not to reduce the consumption of fabric, but to eliminate the concept of waste [7]. The Make/Use system is simplified and accessible to different level skilled users, offering more sophisticated changes what can be made for experts.

The system features seven ready-made garments patterns, templates, fabric prints. There are available cut-out blocks, which gives modification options for users, and other tools and tips to help the user to change design (Figure 1) [7]. It states on the platform that the tools and concepts have been embraced by a diverse range of users, from retail clothing consumers and makers, to large international brands, including sustainability pioneers Patagonia and fast-fashion giant H&M [7][8].

In Figure 2 shows seven garment collections and their patterns of Make/Use platform: crop T-shirt, long T-shirt, long coat, tube dress, wrap dress, wrap skirt, spiral trousers.

![Figure 1. Make/Use platform templates](image-url)
Figure 2. Make/Use platform seven garment collection: 1 – crop T-shirt; 2 – long T-shirt; 3 long coat; 4 - tube dress; 5 – wrap dress; 6 – wrap skirt; 7 – spiral trousers [7].

The key concept of the system patterns is to create volume by joining two edges of a piece of fabric to make a tube shape where is space for the body to pass through – as a wrap or two conjoined tubes. One of the main principles of Make/Use is to let the user understand how the modifications can be done, allowing the designer to find new solutions. There are offered four types of modifications:

- manipulation of the tubular volumes’ structures;
- rotation of parts affecting the silhouette of the garment; rotation is achieved by cutting the tubular constructions with a curved line and rotating fabric 180 degrees. It can improve the fit and freedom of movement;
- changing and swapping parts to places that make asymmetric shapes in clothing;
- resetting fabric parts – removing them off and resetting back to its original place [7].

3. Results and discussion

The Make/Use open-source was tested by making coat prototype to understand how user experiences is relative. Based on the practical application and analysis of results, challenges were perceived and introduced to design, new insights, knowledge were gained and ideas for further development were then formulated.

The platform application in this research was tested with in online accessible pattern for a free silhouette long coat with the shawl lapel (Figure 3). The coat consists of two tubular constructions; horizontal tube is for the sleeves and shoulders, vertical for the torso; the coat opening is at the front that transforms into a collar neckline, in the back forming a back detail - a rectangular opening. The pattern can be adjusted to different lengths and widths depending of the used fabric.

Figure 3. Make/Use platform long coat grid and pattern [7].

The coat was made taking in account all considerations and recommendations found on the platform
as well as fabric specifics and design ideas. The final look of garment was influenced by a lot of factors such as designer’s choice of details for joining edges, the drape of the cloth. Used material: 100% wool fabric, which was steamed, ironed, cut off not even edges of fabric bought in shop.

Pattern was printed according to instructions on website; transferred on to the fabric. Before cutting the fabric, considering the possibility of inaccuracy the pattern was checked with the base grid available in the system. The length of the coat was increased taking in account fabric length.

The fabric was cut in the indicated lines: in the central part vertically, the collar mark, the horizontal line which separates sleeves from torso part. The joining edges of the collar’s back was sewn together, to form a shawl lapel and reveal a rectangular opening in the back of the coat and is seen as design detail. The cut edges were joined in the back vertical seam, horizontal back seam which forms sleeves. It was decided to reduce the size of the sleeves by folding cuff, thereby creating bigger volume on elbow part of sleeve.

Cut edges were joined in creative way, examples of stiches are shown in Figure 4. Needle felting, hand stitching as the insertion stitch, machine stitch has been given as example in platform.

**Figure 4.** Examples of cut edges joining’s. From the left: needle felting technique; needle felting technique with large stroke stitches; the selvedge stitched with straight hand stitches; diagonal hand stitches over needled felt; straight stitch; the insertion stitch.

In traditional fashion system exist 3 main evaluation criteria: appearance, fit and cost. [9] Usually these elements are viewed together as they depend on each other. To evaluate zero – waste design Timo Rissanen and Holly McQuillana have developed five primary criteria that should be taken into account when designing zero-waste patterns: appearance, fit, costs that can compete with traditional fashion cost, additionally should be valued fabric waste and sustainability criteria, as well as the criteria for manufacturability. The weight of these criteria depends on the imposed privileged preferences.

It was detected that for non-experienced user achieving well-constructed garment could be problematic without guide of expert who understands how to get garment flat to form, even thou all instructions are given. Problems was detected on printing the given pattern in home environment, but solution was found by given possibility to recheck the pattern with the base grid available in the system. The available grid was helpful to understand how to adjust the pattern for specific fabric length and width for using all the fabric as was tested in prototype creation.

As one of main platform missions is to provide zero waist patterns, this is achievable if the fabric edges are accurate straight. During the creation of the prototype the only left-waste were pieces of the fabric what end up from the edges of the fabric, when not cut straight when the fabric was brought directly for the wholesaler. What is shown is the waste that was created due to the way fabric is sold to the consumer (Figure 5(2)).

Different practical solutions were made to join cut edges, the aim was to understand and valuate how many possibilities in this particular case can exist. The conclusions were that the design has the potential for future development and variability by adding design value such as functional details. As well as fabric manipulating possibilities were detected to the design of the original prototype; as in upgraded prototype was customized sleeves to match desirable silhouette. Also, the edges of the savage are
integrated as a design component, not hidden or cut out.

Figure 5. 1 Long coat from Make/Use platform on female (front, back and side view) and male figures (front, back and side view); 2 – The waste from the edges of the fabric.

Many criteria were considered to evaluate zero waste coat prototype result that includes appearance, design, fitting, sustainability and future possibility for production, zero waste approach. This can be seen in the table 1. All criteria were found approached and future possibilities have been observed.

After analysing the coat, observations show that the coat’s appearance and fit are good, appearance can be considered as unisex, equally well suited to both genders (Figure 5(1)), its loose fit allows the garment to cover large range of sizes and it’s easily adaptable to different body shapes.

**Table 1. Characteristics of the coat.**

| Product description | Black 100% wool one-size unisex loose-form wrap coat with a shawl lapel, different design solutions can be found in the seams; sleeve size decreases in the wrist making fabric fold detail; opening is located on the front of the coat; a rectangular opening and split in the seam is in the back of the coat. Disadvantages: no functional details (pockets, clasps, snaps etc.); integration possibilities exist. |
| Fit | Balanced silhouette; loose fitting; freedom of movement is not restricted; comfortable to wear; the silhouette does not distort the wearer's figure. |
| Sustainability | No fabric waste in creating coat; design is sustainable because the silhouette is classic, addressing to a wide range of wearers. Disadvantages: the durability of seams should be increased to make sure that the joints are mechanically resistant; missing functional parts that can be integrated in further study. |
| Production possibilities | It is possible to produce a model or modified model in industrial production; possible problems may be due to the need for straight edges of the layout, to have the exact alignment of the joining edges. From the economic side, the production of such coats could be economically advantageous. Cutting requires less time for separating edges. |
| Conclusions | Pattern and design possibilities has potential of the future application for zero waste design development and production. |

4. Conclusions

1. Zero waste design is a new way of thinking about the possibilities of the fashion design industry, it offers new opportunities to develop design ideas.
2. Make/Use Platform allows to discover, approach and successfully presents patterns for
interested users. It’s a good source to get familiar to zero waste clothing pattern making.

3. The practical part of research - the coat prototype - uncovered a lot of positive qualities and reached objectives, for example zero waste result.

4. Understanding Make/Use platform application can help understand how to incorporate such techniques and methods into production that drives industry closer to the aim of the prevention of waste. Further studies should be made.

Acknowledgements
The authors gratefully acknowledge the funding by Riga Technical university grant, Latvia, PVS ID 3926.

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