

# ORIGAMI BASED TECHNOLOGY FOR HANDBAG PRODUCTION

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## Abstract

**Background/importance of research topic:** The way we design, produce and dispose of clothes has a huge impact on the environment.

**Purpose/hypothesis (thesis or statement of problem):** The "fast fashion" of the big world brands offers cheap clothing for short-term use. They, however, emit toxic chemicals and plastic fibers that pollute water during washing. Their production requires toxic chemicals and leads to climate change, and the public in general does not know where and how to recycle them.

**Procedures/Data/Observations** There are organizations that are entirely oriented towards the recycling and reuse of waste generated from the textile industry. High quality garments already exist where all pieces of the garment are mounted together as a puzzle without generating any waste. Conventional cutting of patterns creates about 15% loss of material, even if the model has been optimized by a computer. The origami method is the one of the possible decisions to produce zero waste production.

**Conclusions/Applications:** The designed handbags are easy and fun to make without the use of any specific technology. The creation of the handbags will require a few qualified workers and some specific production equipment. This condition will reduce the price of the products and will make it more accessible to the general public.

**Keywords** - art, sustainability, zero waste, origami, handbag

## 1 THE GREAT INFLUENCE OF FASHION

The thought of the future of the Earth has made a great influence on fashion. Eco fashion is a fairly small segment of the fashion industry at present, but it is among the fastest growing ones. The ethical and eco fashion are fashion trends dealing with the proper allocation of the resources we already have for the sake of protecting the Planet Earth. These trends also seek a more rational method of operation in the fashion industry.

The way we design, produce and dispose of clothes has a huge impact on the environment. Their production requires toxic chemicals and leads to climate change, and the public in general does not know where and how to recycle them.

The "fast fashion" of the big world brands offers cheap clothing for short-term use. They, however, emit toxic chemicals and plastic fibers that pollute water during washing. The latest report by the Wrap Charity Organization activists informs that about 300,000 tons of clothing are sold in the UK each year. The data are current as at 2015, and three years earlier sales amounted to 350,000 tons. Although the figure decreased, clothing production is still the fourth most influential one on the environment after the household, transport and food industries.

235 million pieces of unwanted clothing are dumped within a single year in the UK. The costs for the textile waste depot amount to more than EUR 91 million. On the other hand, clothing consumption is extremely important for the economy of the countries. According to the British Fashion Council, fashion contributes GBP 31 billion to the country's economy, and worldwide it is an industry worth EUR 2.09 trillion.

## 2 THE GREAT INFLUENCE ON FASHION

Eco fashion imposes clothes whose production and distribution takes into account the environment, consumer health and the working conditions of the people engaged in the fashion industry.

This is how sustainable fashion emerged - as a result of the personal (and at the same time commonly professed) philosophy of love for nature through clothes. In reality, however, there are not many

people who are aware of what "sustainable fashion" really means. First of all, it is a huge challenge inspired by the use of organically grown and recycled materials in garment making. It was only in recent years that questions arose in the fashion industry and tailoring factories concerning the origin, the processing of fabrics, their maintenance and their future (or lack of future) once they are out of use.

There are non-profit organizations that are entirely oriented towards the recycling and reuse of waste generated from the textile industry.

Fabscrap is one of those organizations dedicated to the recycling and reuse of textile goods that are not suitable for donation. About 1,350 kilograms of textile waste arrives at the group's large warehouse in Brooklyn daily. The organization has developed partnerships with about 250 brands producing confectionery, and several fashion houses from the high fashion world. The waste it collects is an example of this diversity. Among the piles in its warehouse there is everything - from luxury models of brands such as Oscar de la Renta or Marc Jacobs to mass brands such as J.Crew or the remains from newborn designers' ateliers. Last year Fabscrap collected a total of 68,039 kilograms of textiles. Fabscrap offers its customers annual data on the quantities of their waste that have actually been recycled and reused and calculates how much their carbon footprint has been reduced.

Most of the textile sorting is done by volunteers. For every three hours of work they can take home about 2.5 kilograms of waste and buy more quantities at prices lower than those offered to fashion students, amateur artists and tailors. Small pieces go to the shredders to be used later as housing insulation materials, pillow or cover fillers needed by companies to carry luggage.

### **3 THE ZERO WASTE**

The Zero Waste concept is based on the idea that waste shall not only be disposed of separately and spheres of design but is also spread in areas such as nutrition and event organization. For example, in her article Lux & Luxe – Functional and artistic design of home lighting fixtures, Sofia Angelova gives an example of a smart use of an outdated colander that has been turned into a kitchen lighting fixture.[1]

In the system we live in, reaching zero waste is quite difficult. However, consumers have a strong influence on business, choosing whether or not to buy a certain product or service. And this can lead to a change in the system itself.

At the heart of Zero Waste is above all the responsible and conscious shopping. By buying only what we need, replacing disposable products such as plastic bags, cups, utensils, etc. with multiple-use recycled, but no waste be generated at all. Zero Waste movement is the most popular one in all ones, devoting just a little time in separated disposal of what is still left, we can reduce much of our waste.

There are 5 steps to reduce waste:

Refuse – Reduce – Reuse – Recycle – Rot

In more detail - refuse what you do not need, reduce what you need, reuse what you already have, recycle or compost (rot) what would otherwise go to the landfill.

Tailored high quality garments already exist where all pieces of the garment are mounted together as a puzzle without generating any waste. Conventional cutting of patterns creates about 15% loss of material, even if the model has been optimized by a computer.

One of the problems associated with the zero waste design is that it is very difficult to create. It requires the violation of all the rules of conventional modeling and the creation of new techniques based on advanced mathematics. This requires that a qualified designer imagines the garment as a 3D element and a flat pattern at the same time, while trying to fit the pieces together like a mosaic. It is easier to create such design objects in the field of industrial design, for instance. The Torch of Knowledge project was made of stainless steel plate quadrangles, optimally located on the sheet. The article pays attention on the use of parametric CAD product in designing and cutting. Thanks to this, the residue is close to zero, but this residue is not waste. The steel pieces go back to the furnaces and steel with the same properties is produced, ready for reuse. [2]

Another problem in the zero waste fashion lies in the field of sales. The cost of a garment increases due to the materials used and the higher paid labor of qualified staff.

On the surface as a shaping factor Emilia Ochkova-Dimitrova mentions that the shaping process is a stage of the designer design which defines the characteristics of the material shape of the object. By looking at the main properties of the shape, the behavior of the plane upon external interference is examined, which in fact means folding, cutting, punching, etc. Origami is a technique that converts planes into three-dimensional objects. [3]

#### 4 THE POSSIBLE DECISION

This article will present offers for the production of zero waste handbags using the origami technique. Origami is an ancient Japanese art that literally means folded paper. What is typical of it is the use of a sheet that is folded to produce shapes without the use of any glue or scissors. As early as the late 1960s, a number of higher education architecture and design institutions introduced into their teaching methods tasks of structuring and transforming of a plane. Through them the students develop their skills for tracking and analyzing a shape, starting from the plane through the relief (as a structure) and heading towards the dynamics of the three-dimensional shape.

All handbags meet the same requirements:

- To be made of a single square piece of material. It shall be as wide as the factory width of the textile material. (Fig. 1)

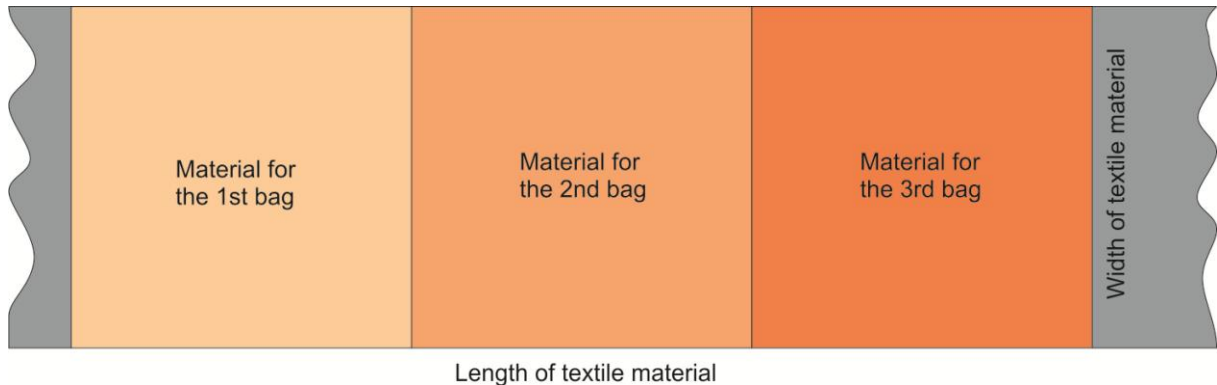


Fig. 1 Examples of location of the details

- If additional elements such as straps and handles are required for the handbag, the size of the square must be proportionally reduced and the remainder of the width of the textile material shall be used, as shown in Fig. 2

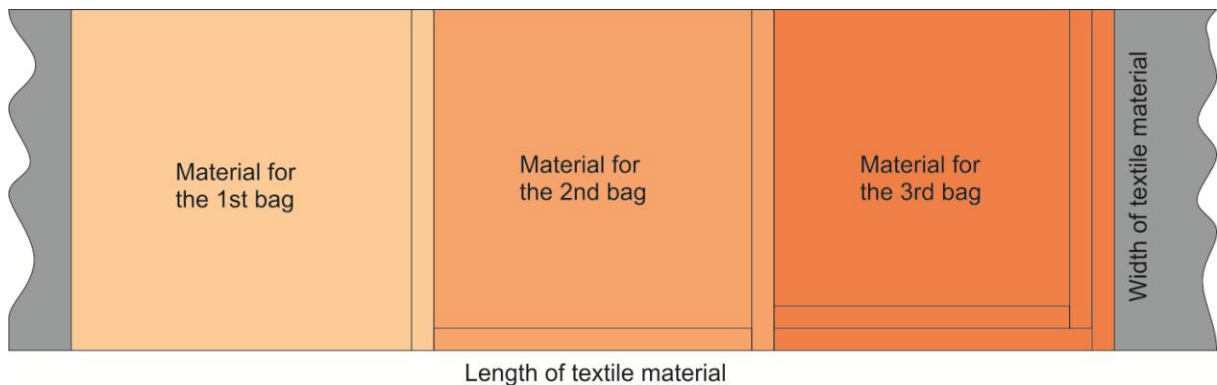


Fig. 2 Examples of specific location of additional elements.

- When cutting the required quantity of material, it shall remain with a clean end in a straight line perpendicular to the production line (if any).
- For the manufacture of smaller sized handbags, the size of the squares shall be proportional to the width of the textile material, with more than one number to be made in order to comply with previous condition. (Fig. 3)



Fig. 3 Examples of specific location for the manufacture of smaller sized handbags

- Designs shall only be developed by folding the material.
  - It is allowed to sew the necessary places in order to preserve the shape of the textile material as it has different characteristics from the paper traditionally used in origami.
- Below are examples the traditional origami techniques which seem like handbags. (Fig. 4) They are quite simple, with a traditional look without any specific accents. However, they meet all of the above-mentioned production conditions.

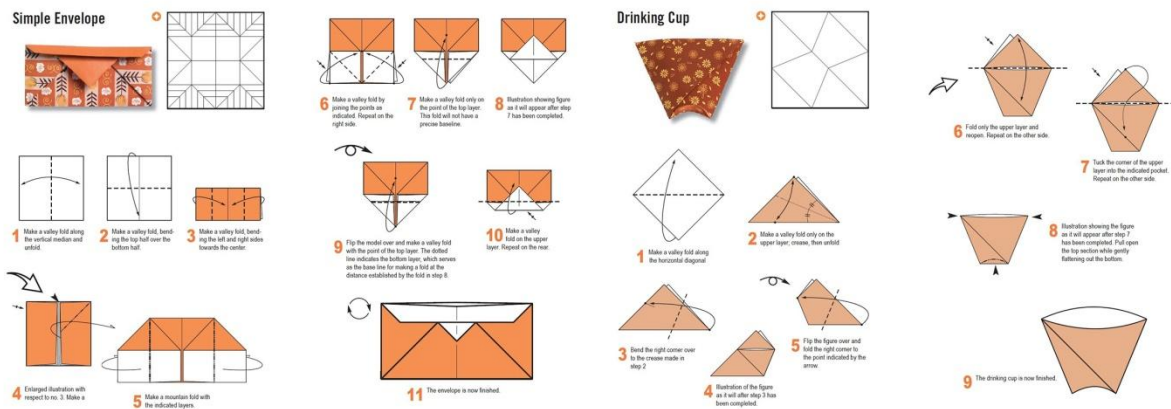


Fig. 4 Traditional origami techniques

Finnel's designs are far more unconventional and courageous, but they do not meet the conditions of the Zero Waste concept, although they are produced by much less details. (Fig. 5)



Fig.5 Finnell's handbags (photo from official site)

## 5 THREE PROTOTYPES

After examining various examples of existing origami designs of handbags and various origami figures, three prototype handbags were designed. The first one is a variation of the traditional and well-known origami, and the other two simply follow the idea of origami. Paper weighing 150g/m<sup>2</sup> was used for the design of the handbags.

Fig. 6 shows a lady's handbag of the clutch type. The small figure shows a variation of which known origami figure it is. The handbag is asymmetrical. A square with a 700 mm side was used to make it. There is just a single detail needed to create the model, since traditionally this type of handbags does not have a handle. The handbag has several adjacent pockets of small capacity. The resulting size after folding is 165/325/80 mm.

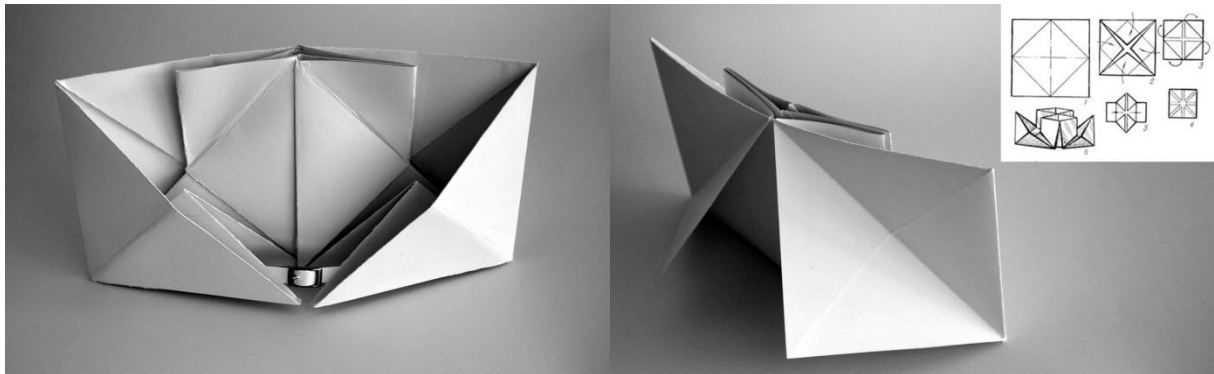


Fig. 6 Handbag of the clutch type

Fig. 7 shows the unfolded square, fold places (black lines) and stitch places (red lines).

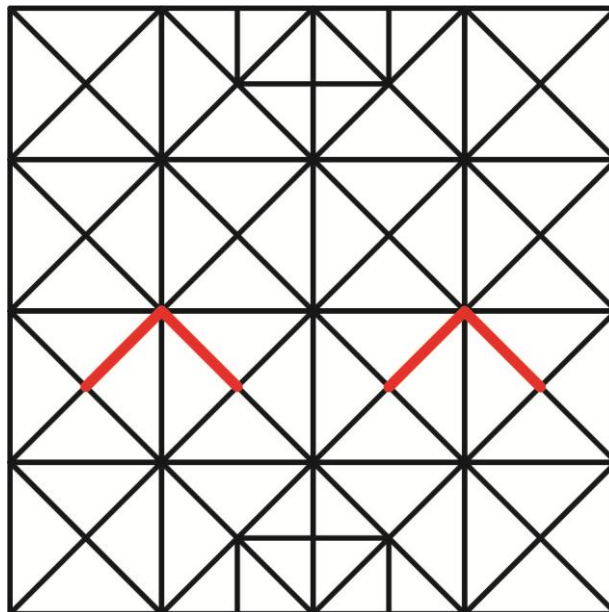


Fig. 7 Unfolded clutch

Fig. 8 shows a lady's shoulder handbag. The handbag does not imitate the shape of any known origami figure, but is complied with the principle. A square with a 650 mm side and two stripes of 650/50 mm and 700/50 mm were used to make it. The handbag is symmetrical, with the folds on both sides entirely decorative. The corners of the square were used to attach the handles and to fasten. The handbag has one pocket of average capacity of about 5 liters and four small pockets, two on each side. The resulting size after folding is 360/250/125 mm.



Fig. 8 Lady's shoulder bag

Fig. 9 shows the unfolded square with the fold places (black lines) and the stitch places (red lines).

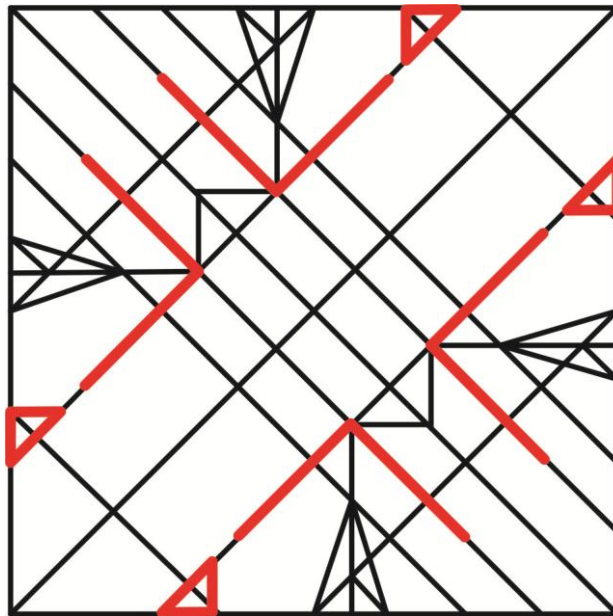


Fig. 9 The unfolded square of lady's shoulder bag.

Fig. 10 illustrates a lady's handbag of larger capacity. The handbag has decorative folds over the entire surface. Only some of them were used for the construction. A square with a 650 mm side and two stripes of 650/50 mm and 700/50 mm were used to make it. The handbag is symmetrical and the folds have both decorative and functional applications. The corners of the square were used to attach the handles and to fasten. The handbag has one pocket of capacity of about 7 liters and four smaller funnel-shaped pockets of capacity of 0.5 l. The resulting size after folding is 320/330/200 mm.



Fig. 10 Lady's handbag of larger capacity

Fig. 11 shows the unfolded square with the fold places (black lines) and stitch places (red lines).

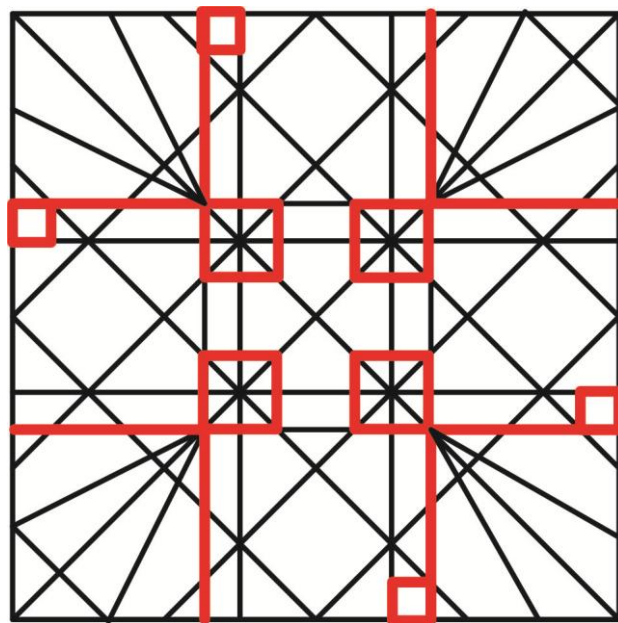


Fig. 11 The unfolded square of handbag of larger capacity

Metal clasps and buttons taken from old handbags were used to make the prototypes of the handbags in the spirit of zero waste movement.

It would be appropriate to use recyclable textile materials and fasteners when making the products. All three prototypes can be made from felt, since it has the necessary hardness and will maintain the created shape. Felt does not need a lining and the fact that it will be made of only one layer of material will not make the product heavier. The fasteners may again be metal, but folded out of metal wire. This

will ensure zero waste or at least approximately equal to zero. 3D printed fasteners and decorations can also be designed, which are also recyclable and free of residue.

## 6 THE BENEFITS

The designed handbags are easy and fun to make without the use of any specific technology. Drawing tools and scissors are only required to provide the material for work. For the folding, no specific tools are required, except an iron (where necessary). The minimum number of stitches requires the use of only a sewing machine that sews straight line stitches. If felt is used, it is not necessary to clean the edges of the fabric. The creation of the handbags will require a few qualified workers and some specific production equipment.

Experiments with fabrics of different characteristics such as density, color, texture and others will be made and identical designs made of different materials will be compared in future developments on the topic.

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