

CASE STUDY

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Re-birthed fashion handbags as a collaborative design project

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Abstract

The term 're-birth' refers to the redesign of stock items originally released through the distribution route for sale to consumers but returned to headquarters as unsold stock. As a sustainable fashion practice, products are analysed and redeveloped by designers for resale as new products. During this 4-month project, a South Korean handbag company partnered with senior apparel design students in Seoul to execute a re-birth collaboration for fashion handbags. This study addresses some of the issues that arose in the process of interpretation and application of this re-birth exercise, including the relationship between the university and company, the roles of the student designer and company design team, characteristics of the product selected, and the communication required to implement the project. The concept of re-birth was introduced to the students, followed by a collaborative design exercise. Finally, 2 of the 50 re-birth designs were selected by company designers and altered for resale.

Keywords: Re-birth design, Sustainable fashion practice, Collaborative design, Stock items

Introduction

Clothing has always reflected the values and aspirations of the wearer, and accessories have contributed as vital indicators of fashion. The life cycle of a fashion product involves the stages of production, sales, usage, collection, and reproduction. However, this life cycle can vary according to the model used, i.e. recycling model, maintenance model, etc. Within the product life cycle, the entire process from production to sales includes the societal distribution route (Lee and DeLong 2016a).

Fashion accessories such as handbags could well be targeted as sustainable items. Handbags are in part determined by their constant functions. For instance, many global brands, i.e. Freitag (Swiss), Sourcedlife (UK), Frombin (Korea), Shutoko (Japan), Vaho (Spain), and Looptwork (USA), have dealt in sustainable concepts by using upcycling materials for their bag designs, such as signboards, tents, seat belts, car seats, truck covers, parachutes, fire hoses, and coffee sacks. In 2009, French luxury brand, Hermès, launched an upcycled brand, 'Petit h', made with one-of-a-kind pieces of jewellery, accessories, toys, and even furniture items crafted from the atelier's cast-off scraps of leather, silk scarves, porcelain, enamel, and hardware (Hermes' up-cycled Petit h concept pops up in Costa Mesa. *Los Angeles Times*, June 12, 2014).

Approaches to sustainable practices are diverse and include emphasis on the environment through reduction, efficiency, and reuse of materials or on an increase in the durability and longevity of fashion products via repair, remaking, and versatility (DeLong et al. 2016). The term 're-birth' refers to the redesign of stock items that were originally released through the distribution route for sale to consumers but were returned to headquarters as unsold stock and redeveloped by designers as new products (Lee and DeLong 2016a). As a sustainable fashion practice, re-birth in the lifetime of such a product creates a shortcut from the production and sales stage because the product upgrade allows it to re-join the rotation of its life cycle (Lee and DeLong 2016a).

In this re-birth design project, a South Korean company partnered with a major fashion school in Seoul to execute a re-birth collaboration with fashion handbags. Bearing in mind the need for sustainability in the fashion industry, the objectives of this research are (1) to understand the process of fashion handbag manufacture and analyse issues pertaining to stock items, (2) to develop re-birth handbag products from the stock of fashion handbags as a sustainable design practice, and (3) to deduce a framework from collaboration between a studio class and the company. This study determined student outcomes based on a collaborative design studio regarding how to succeed in the marketplace and how to obtain industry and customer feedback through a re-birth design project with one brand of fashion handbag.

Literature review

Collaborative design project with sustainable fashion

Shaffer (2007) defined the notion of community of practice to focus on the co-production of design work among instructors and students, as exercised within the studio. It is important to comprehend the ways in which epistemological understanding and design knowledge are constituted through social interactions within the disciplinary and institutional context of the academic design studio. Studio classrooms have many different manifestations, but all share common elements. They involve longer but fewer class sessions with focused, intense, student activity such as an interactive classroom that promotes holistic skills, including thinking, inquiry, creativity, and reflection by students, frequently involving peer review and critiquing. A properly managed studio classroom can provide a quintessential active and cooperative learning environment (Perkins 2005).

Bye (2010) stresses that apparel designers of the future must be strong team members, communicators, and problem solvers—all skills that problem solving enhances. Students locate appropriate information and resources to solve a problem, with the instructor serving in an advisory capacity throughout the process. Students are responsible for selecting the best solution and presenting the findings to support their decision (Torp and Sage 2002; Gam and Banning 2011).

The sustainability story of one leading manufacturer of industrial packaging systems illustrates the importance of business model innovation. Their sustainability agenda has become central to the company's overall business operations and strategy, and top management pays attention to sustainability. A key agenda item is to approach sustainability as a collaboration that identifies new business opportunities connected with reconditioning and extending the life of a major product line—steel and plastic drums (Kiron

et al. 2013). However, to accomplish this, participants must be willing to cooperate with one another so that an optimal collaborative effort is provided for sustainable building projects (Bynum et al. 2012). When sustainability-oriented collaboration takes place, a change occurs in the business model, and the combination is strongly correlated with sustainability-based profits (Kiron et al. 2013).

The collaborative nature of the design studio was considered important for developing a productive working environment and for team building. This included emphasis on social development and a low stress, fun environment (de los Angeles Constantino-Gonzalez et al. 2016).

Development of the process for re-birth

Re-birth design has been much used in the apparel industry. Lee and DeLong (2016a) analysed successful reverse design at the manufacturing level with an apparel company willing to collaborate using their unsold stock. Five levels of re-birth design were outlined in the process of redesigning products from a company's inventory. Re-birth level 1 involved changes in subsidiary materials or the addition or removal of embellishments. The main reason for poor sales determined in level 1 products may be weak brand image or the absence of details that differentiate an existing product from other brands, details that may increase the attractiveness of a product when worn. At level 2, changes in pattern or material characteristics were applied to the relevant stock item to enhance its practicality or functionality. At level 3, part of an existing design was combined with a different material to create a new design, simultaneously enhancing both its practicality and brand image. Level 4 involved taking the product apart completely and recreating it into a new design, thereby recreating stock from different brands using recombined designs to fit the new design concept. For example, men's suits became long vests for women; jackets were made from tent materials and creative uses were found using the back pockets of denim jeans. Thus, designs remained up to date despite their origin and, in fact, became one-of-a-kind items. Finally, re-birth level 5 was the category in which products were taken apart to become the raw material for fashion items other than clothes, i.e. a jacket becomes a purse, a padded jacket, or a bag. With each level, the degree of transformation increased, along with the skills needed in the redesign process. To be successful, the key point discovered in this re-birth project was to enhance the brand's concept and image, and increase the practicality of products that fit the release period, product sales period, and consumer needs (Lee and DeLong 2016a).

One re-birth design study by Lee and DeLong (2016c), conducted as collaborative design work between a fashion school and fashion company, applied a design process model (Lee and DeLong 2016b), involving (1) pre-design, (2) design development, and (3) design evaluation for re-birth design development. The model was applied over 15 weeks. After learning the proper methods for examining resources and the rudiments of collaborative product design with the company, students individually researched re-birth design opportunities. They participated in the re-birth design process involving collaborative design work between the company and the studio class. In the re-birth design project, Lee and DeLong (2016c) have suggested that students participated in the re-birth design process by developing creative ideas and designing development models for sustainable design in their actual design classes. This helped design students to

understand consumer needs and the concepts and distribution process of the relevant brands through collaborative work with the fashion companies.

Re-birth fashion bags as a collaborative recreation in a sustainable innovation concept

Historically, the fashion handbag has partly been determined by its function, with some features remaining constant, such as a place for money, cosmetics, keys, handkerchief, diary, note pad, pencil, and even printed literature such as a novel or commercial pocket book. Riding in a car in the early 20th century, a passenger could be wrapped in a blanket wearing a cap or veil, and sheltered under thick goggles; often, the fashionable passenger held a flat Morocco leather bag in her arms. Its simple form, in varying sizes, stored readily available items: gloves, stole, vials. This was the prelude to the handbag and fashion bag, which flourished in the 20th and 21st centuries (Louis Vuitton 2017). After World War I, women needed handbags for utility purposes because they increasingly occupied jobs outside the home. In the 20th century, the fashion bag took on both utility and fashion; utilitarian and fashionable bags became known worldwide. In the 1930s, the clutch bag was very popular and during and after World War II, a shoulder bag was functional, first as part of the military, and later gaining widespread popularity. In the 1970s, a trend of the hippy style was to incorporate various fabric patches and twisted thread bags; in the 1980s, sports bags were popular; and by the 1990s, the fashion handbag was being designed to consider both ergonomics and function (Jeon 2005).

The handbags designed and manufactured by the company collaborators are both functional and fashionable. The materials used are leather, canvas, sheepskin, tiger skin, crocodile skin, alligator skin, rabbit hair, and so on. They have provided many types of stocked handbags such as clutch bag, wristlet bag, baguette bag, flap bag, tote bag, envelope bag, fringe bag, shoulder bag, doctor bag, convertible bag, barrel bag, canteen bag, bucket bag, hobo bag, satchel bag, back bag, and so on. This collaborative handbag brand as re-creation in sustainable innovation is one of the prestige fashion bags in South Korea and pursues simplicity, timeless chic, and exquisite colour in its aesthetic concept as a modern, luxurious, and new class.

A handbag design slated for re-birth can follow a similar collaboration process and the entire life cycle of the product is vital in both instances (Lee and DeLong 2016c, 2018). However, there are some important differences from the apparel previously slated for re-birth. For example, the materials of the fashion handbag are harder to redesign because they are more rigid in structure and sometimes less resilient and thus more difficult to reuse. Fashion handbags going through re-birth design are one type of bag used for upcycling. Wang (2014) characterised the types of waste materials used in upcycling for various types of bags: (1) textiles such as truck covers, placards, signboards, remnants of cloth, clothes, military uniforms, blankets, tents, parachutes, fire hoses, seat belts, car sheets, plane seats, and coffee sacks; (2) plastic including doggie bags and plastic bags; (3) leather such as old leather garments, remnants of leather shoes, a belt, car sheets, waste furniture, and gymnastic gear; (4) paper such as magazines, catalogues, and coated newspapers; (5) tires such as inner tubes that are developed into glossy high quality leather-like fabrics (Wang 2014).

Methods

Collaborative design project

The concept of re-birth design began in 2014 at K company, a fashion company with 21 brands in Seoul, South Korea. In this project, the company partnered with a major university to execute a re-birth collaboration, for which design students created re-birthed fashion handbags. In this re-birth project with fashion handbags from one of the brands of K company, the participants comprised four senior fashion design students from a major fashion school in Seoul who participated in the project from September to December 2015 (see Fig. 1).

The methodology was as follows: the concept of re-birth was introduced to the students, followed by a collaborative design exercise in which the students selected stock items and as a team developed the re-birth designs. The fashion company provided 24 styles of stock item from one fashion accessories brand and students selected 7 of the 24 designs. From these styles, each student as part of the team selected six stock items: four items for women and two items for men. Each stock item was then developed into three to five different re-birth designs; thus, students developed 24 re-birth designs in total. The brand designers selected 2 of the 24 re-birth designs and as a result these two re-birth fashion handbags were ultimately reborn. Finally, two of the re-birth designs were selected by brand designers and produced for sale.

Project procedure

The procedure comprised understanding how consumers think about the stocked products and what they are willing to pay for the connection between the re-birth product and sustainable products or services. It was also necessary to collaborate more with individuals, consumers, businesses, and groups beyond the boundaries of the brands.

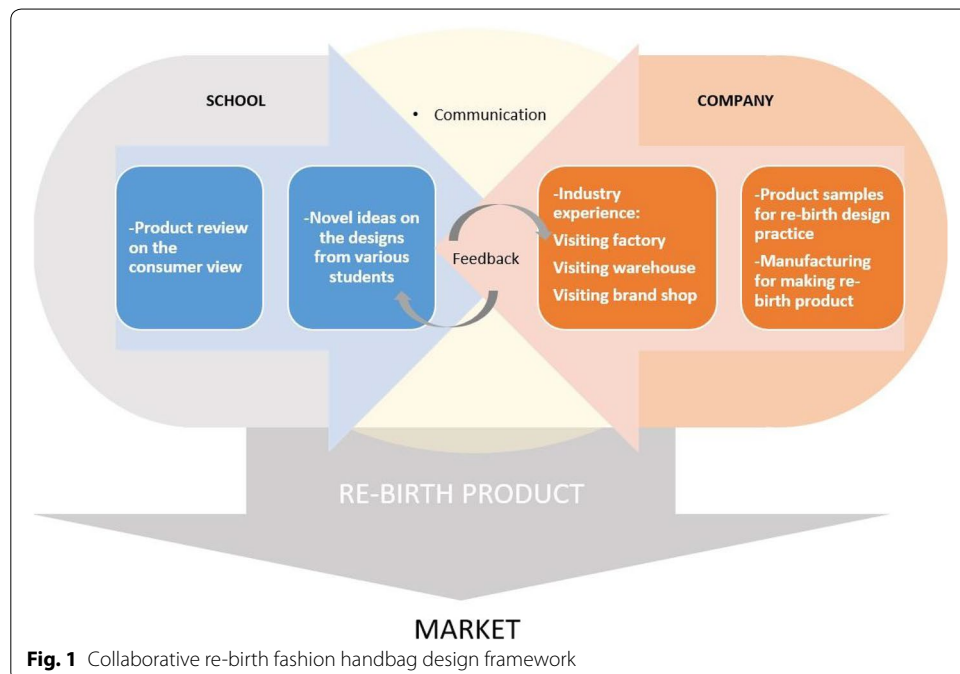


Fig. 1 Collaborative re-birth fashion handbag design framework

Many companies are forming outside advisory groups to help frame their sustainability agenda. This process can be an opportunity to get closer to consumers, who in turn can be a useful resource for identifying other appropriate members (winter MIT Sloan).

The participating students analysed the 24 selected stock items through consumer interviews and peer discussion (see Table 1). As if they were the user, they tried to hold the bags and put items into them. By ascertaining why some bags were not selected by consumers on the market, information can be gleaned regarding how to improve the bags as a re-birth design. Each of seven stock bags were analysed by student designers together with consumers who then drew up resolutions for their redesign as re-birth bags.

Results and discussion

Re-birth design development

In this project, company designers selected two re-birth designs for production out of 24 re-birth designs that were developed. The two re-birth designs were at the lowest re-birth level. The student designers developed most of the re-birth handbag designs at re-birth design level 2. Only 4 of the 24 re-birth designs were at re-birth design level 1 (see Table 2). This shows that handbags need more attentiveness and knowledge of the manufacturing process, since a reproduction of the re-birth product incurs higher costs than a new product. Thus, the company designers must consider cost recovery in their selection to produce the lowest re-birth level design. This result supports a former study by Lee and DeLong (2016a, 2018) of successful cases of re-birth design that reused existing resources, reduced energy consumption, and increased environmental and economic efficiency by recreating products for resale.

Re-birth fashion handbag design outcomes

During the collaborative re-birth fashion handbag project, seven stock items were developed into 24 re-birth designs in total. Two of 24 re-birth designs were selected by brand designers and ultimately were reborn for sale (see Table 3). Two successful re-birth designs were developed based on communication with manufacturers and consumers. Through the analysis of stock items, the student designers were able to understand users' product evaluations and the brands' inveterate issues, which were then reflected in the re-birth designs. This helped design students to understand consumer needs and the concepts and distribution process of the relevant brands through collaborative work with fashion companies. For instance, student designers presented ideas to solve the handle problems of the bag indicated by consumers in re-birth design 1. As for re-birth design 2, students redesigned the size and outfit of the bag, with a focus on the bag's end use, because the shape of this bag was indicated by consumers to be a problem.

This research, comprising collaborative work between a design college and apparel companies, will play a role in enhancing the aptitude of future designers in their talent for creating sustainable designs.

Collaborative framework for re-birth fashion handbag design

This study addresses some of the issues that arose in the process of interpretation and application of this re-birth, such as the relationship of the fashion school to the company, the roles of the student designers and company design team, the product selected,

Table 1 Analysis of the products






Style no. Stock images	Problem analysis of the product Consumer review Suggestions
<p>1_ D1</p> 	<p><Problem analysis of the product> It has an inconvenient clasp It is too heavy The front cover is too long and the inside cover panel is too high The fabric and colour are not gorgeous enough for the price</p> <p><Consumer review_26-year-old woman> The clasp is not gorgeous and is inconvenient The fabric is ugly and does not fit with the brand concept The colour is awful Having just one way to open it is not good The inside packing area should be divided The size of the bag is unuseful</p> <p><Suggestions> Add an opening zipper instead of a button for easy opening Modify the bag type to a tote bag or clutch because of the heavy fabric</p>
<p>2_ D2</p> 	<p><Problem analysis of the product> The fabric is rare The handle length is unuseful The inside lining is tacky and there is no inside pocket What is the end use of this bag?</p> <p><Consumer review_28-year-old woman> It looks like a fruit case and ice box, not a bag The fabric is so strange The size of the bag is such an embarrassment The shape of the bag is so funny</p> <p><Suggestion> Remove the handles and modify the bag type, as, for example, a clutch or key holder Modify to the new shape of the bag design</p>
<p>3_ D3</p> 	<p><Problem analysis of the product> The handles are tacky The details are not gorgeous</p> <p><Consumer review_27-year-old woman> It is good for a daily bag but the colour is problematic The Inside needs a partition</p> <p><Consumer review_25-year-old woman> It seems the handles are weak The handles are unpopular and not strong</p> <p><Suggestion> Fix the square shape of the bag Add gorgeous details and change the handle design</p>
<p>4_ D4</p> 	<p><Problem analysis of the product> Imbalance between handle and bag Pattern of the cover and black colour do not match Pattern motifs on the bag cover are not luxurious Shoulder strap is rare and does not match the body of the bag</p> <p><Consumer review_27-year-old woman> The fabric textile pattern motifs on the cover are too strong The details do not match one another The bag is too fancy for young girls</p> <p><Suggestion> Remove the cover and modify the bag type to a new design Add gorgeous details</p>

Table 1 (continued)

Style no. Stock images	Problem analysis of the product Consumer review Suggestions
5_ D5 	<p><Problem analysis of the product> Unconvinced about the opening button Body fabric is so tacky and out of fashion Lack of detail Need to design an upgrade for consumers as a men's bag Weak top handle</p> <p><Consumer review_40-year-old man> Looks like a woman's backpack Too expensive Not good quality The size of the bag is ambiguous The design has no attractive points</p> <p><Suggestion> Need to change to a woman's tote bag design Modify the size for new item Reinterpret the target age and gender for the design</p>
6_ D6 	<p><Problem analysis of the product> The target age-groups of the bag are ambiguous Shoulder straps are very weak and uncomfortable Opening parts are uncomfortable and impractical Inside partition should be added Inside space is not useful</p> <p><Consumer review_40-year-old woman> The zipper on the opening is uncomfortable Too heavy as a backpack Inside space of the bag is too practical and needs a partition for notebook space The colour is rare Is it for men or women?</p> <p><Suggestion> It needs a specific target age Change the opening zipper to a button-type detail</p>
7_ D7 	<p><Problem analysis of the product> Hand grip and shoulder string are rare and do not match the body This design is out of fashion</p> <p><Consumer review_45-year-old woman> Shoulder strap is rare Fabric is too weak and easy to tear It does not match with the brand image and is not gorgeous The colour and fabric are awful</p> <p><Suggestion> Such a light fabric bag will be well matched to a sports bag Modify the design with a focus on the specific fabric</p>

and the communication required to carry out the project (see Fig. 2). Designing re-birth products through collaboration with companies and students in a studio class allowed students to experience an industrial design procedure and relate it to sustainable design practice. Through the analysis of stock items, we were able to understand users' product evaluations and the brands' inveterate issues, which were then reflected in the re-birth designs. This helped design students to understand consumer needs and the concepts and distribution process of the relevant brands through collaborative work with fashion companies. The most important point is as follows: re-birth design should consider the user perspective more than the designer's unique trial. Most of the stock items had

Table 2 Eight out of 24 re-birth designs

Style no.	Re-birth level	Designs
1. D2_RB1	Level 2	
2. D2_RB2	Level 2	
3. D2_RB3	Level 2	<p>• Using stock's back and top parts</p>

Table 2 (continued)

Style no.	Re-birth level	Designs
4. D2_RB4 (Produced)	Level 1	
5. D3_RB1	Level 2	
6. D3_RB2	Level 1	

Table 2 (continued)

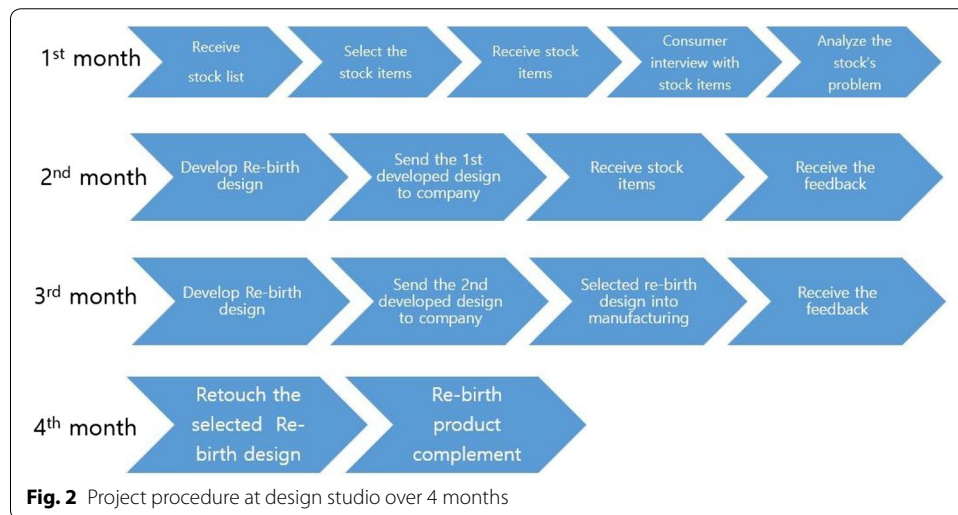
Style no.	Re-birth level	Designs
7. D3_RB3	Level 1	
8. D3_RB4	Level 1	<p>Revision direction</p> <ol style="list-style-type: none"> 1. Switch to tube handle and add zipper on the top part 2. Insert D-ring for using shoulder bag

problems with the practical aspects of their use. This happens when misunderstandings occur regarding the users' perspective and/or different viewpoints between designers and consumers.

In this re-birth project, fashion handbags proved much more difficult to redesign than garments due to the rigid structure and delicate materials associated with handbags, such as the weight, size, function, and quality of the material. In general, fashion

Table 3 Final re-birth handbag products

	Stocked products	Re-birth bags
Re-birth design 1		
Re-birth design 2		



handbags are more expensive than garments and each user has a limited number of items to store in their handbags. Thus, consumers want bags with a practical value. During the project, we had to overcome several issues regarding communication with the brand design team for re-birth product development to conclude with a successful outcome. Creating a re-birth fashion handbag design in such a collaborative project comprises, among other things, the art of communicating an idea to solve a specific problem. Communication is therefore a key issue throughout the whole re-birth design process.

Student designers had to communicate with company staff, including brand designers and manufacturers. It was crucial that students understand the manufacturing process and used materials to reuse with consumers' needs in the re-birth design.

Conclusion

This study has addressed some of the issues that arose in the process of interpretation and application of this re-birth, such as the relationship of the university to the company, the roles of the student designers and company design team, the product selected, and the communication required to implement the project. For example, fashion handbags in this re-birth project were much more difficult to redesign than garments due to the rigid structure and delicate materials associated with handbags. During the project, several issues had to be overcome regarding communication with the brand design team for re-birth product development to achieve a successful outcome.

Through the analysis of stock items, we were able to understand users' product evaluations and the brands' inveterate issues, which were then reflected in the re-birth designs. This helped design students to understand consumer needs and the concepts and distribution process of the relevant brands through collaborative work with fashion companies. For instance, re-birth design should consider the user perspective more than the designer's unique concept. Most of the stock items had problems with the practical aspects of their use. This happens when misunderstandings occur regarding the users' perspective and/or different viewpoints between designers and consumers. In this re-birth project, student designers presented ideas to solve the problems of the stock bags indicated by consumers in re-birth design such as the weight, size, function, quality of the material and outfit of the bag, with a focus on the bag's end use.

This study supported Lee and DeLong (2016a, c, 2018): lowest cost recovery is a significant factor in re-birth design production because re-birth products do not sell at a lower price and, for this reason, a requirement of re-birth designs is to have attractive design features to increase customers' interest and attraction to the product through small design changes.

The result of the analysis of re-birth design demonstrated that the most common reason for products' non-selection in the marketplace was an un-noteworthy design in terms of it being too general or not distinct from other similar items. In such cases, consumers can replace these basic designs with the products of cheaper brands. In addition, re-birth fashion handbags have a practical use in respect to functionality, quality, reasonable size, and weight sensation. Thus, re-birth fashion handbag designs were given unique and utility design features that consumers could recognise as related to brand identity.

Authors' contributions

YKL carried out the collaboration with industry partner and supervised students. YKL and MD analyzed data, wrote the manuscript. Both authors read and approved the final manuscript.

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Competing interests

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Ethics approval and consent to participate

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References

- Bye, E. (2010). A direction for clothing and textile design research. *Clothing and Textiles Research Journal*, 28, 205–217.
- Bynum, P., Issa, R. R., & Olbina, S. (2012). Building information modeling in support of sustainable design and construction. *Journal of Construction Engineering and Management*, 139(1), 24–34.
- DeLong, M., Casto, M. A., Min, S., & Lee, Y. K. (2016). Education for apparel sustainability from perspectives of design students from differing cultural contexts. *International Journal of Fashion Design, Technology and Education*, 9(3), 248–260.
- de los Angeles Constantino-Gonzalez, M., Suthers, D. D., & de los Santos, J. G. E. (2003). Coaching web-based collaborative learning based on problem solution differences and participation. *International Journal of Artificial Intelligence in Education*, 13(2–4), 263–299.
- Gam, H. J., & Banning, J. (2011). Addressing sustainable apparel design challenges with problem-based learning. *Clothing and Textiles Research Journal*, 29(3), 202–215.
- Hermes' up-cycled Petit h concept pops up in Costa Mesa (June 12, 2014). *Los Angeles Times*. Retrieved from <http://www.latimes.com/fashion/alltherage/la-ar-hermes-upcycled-petit-h-pop-south-coast-plaza-20140612-story.html>.
- Jeon, G. H. (2005). *A study of the bag design*. Unpublished master's thesis, Hong Ik University, Seoul.
- Kiron, D., Kruschwitz, N., Reeves, M., & Goh, E. (2013). The benefits of sustainability-driven innovation. *MIT Sloan Management Review*, 54(2), 69.
- Lee, Y. K., & DeLong, M. (2016a). Re-birth design type analysis for developing sustainable fashion products. *Journal of the Korean Society of Clothing and Textiles*, 40(3), 566–573.
- Lee, Y. K., & DeLong, M. (2016b). Improving creative design skills: The effects of past experience on apparel design education. *Journal of the Korean Society of Clothing and Textiles*, 40(2), 397–408.
- Lee, Y. K., & DeLong, M. (2016c, November 8–11). *Re-birth product development for sustainable apparel design practice in a design studio class*. 2016 Conference of the International of Textiles and Apparel Association, Vancouver, British Columbia, Canada.
- Lee, Y. K., & DeLong, M. (2018). Re-birth product development for sustainable apparel design practice in a design studio class. *Fashion Practice*, 1–19. <https://doi.org/10.1080/17569370.2017.1413797>
- Louis Vuitton (June 8–August 27, 2017). *Volez Voguez Voyagez*. Exhibition, Seoul: DDP.
- Perkins, D. (2005). The case for a cooperative studio classroom: Teaching petrology in a different way. *Journal of Geoscience Education*, 53(1), 101–109.
- Shaffer, D. W. (2007). *Learning in design. Foundations for the future: The need for new mathematical understandings & abilities in the 21st century*. Hillsdale: Lawrence Erlbaum Associates.
- Torp, L., & Sage, S. (2002). *Problems as possibilities: Problem-based learning for k-12 education* (2nd ed.). Alexandria: Association for Supervision and Curriculum Development.
- Wang, K. H. (2014). A study on characteristics of material types in upcycling bag. *The Journal of Korean Society of Design Culture*, 20(2), 337–351.