The Rental Platform of Organic Baby Clothes with Circular Economy

Ginny D.C. Liu [a,1], M.C Chiu.[a]
[a] *Department of Industrial Engineering and Engineering Management, National Tsing Hua University, Taiwan*

Abstract. With the vital issue of environment and human-health, each industry gradually switches the linear economy to a circular economy. Including the clothes industry, the reason for this are the huge financial, social and environmental benefits. Also, this paper presents the disadvantage of current clothes industry and consumption patterns. For solving the problem, the concept of circular economy and rental business are implemented in the new business model. Besides once the global companies shift from one model of economy to another also influence the transformation of supplier. Thus, creating a platform which assemble benchmarking companies to promote the issue together, it's the way to implement the whole clothes industry ecology. Moreover, the operation of platform is all environmental, from using organic cotton to design clothes up to reuse, recycle and redesign to the next customer. The new business model is not only benefit for society but also customer and seller. For customer, since the production of organic cotton does not involve the use of chemicals, it causes fewer allergies, also reduces respiratory problems and smells pleasant, and the online platform can save a lot of time for shopping. Then, parents can make good use of time to take care of baby. For seller, the platform is like an order hub which can meet customer demand flexibly and the net profit also will increase. In this paper, Income software will verify the benefit of new business model.

Keywords. Rental Business, Circular Economy, Clothes Industry

Number of words. 3032 words

1. Introduction

The fashion apparel industry has significantly evolved, particularly over the last 20 years. The changing dynamics of the fashion industry have forced retailers to desire low cost and flexibility in design, quality, and speed to market, key strategies to maintain a profitable position in the increasingly demanding market. However, fast fashion leaves a pollution footprint, with each step of the clothing life cycle generating potential environmental and occupational hazards. With the rise in production in the fashion industry, demand for man-made fibers, especially polyester, has nearly doubled in the last 15 years, issues of environmental health and safety do not apply only to the production of man-made fabrics. Cotton, one of the most popular and versatile fibers used in clothing manufacture, also has a significant environmental footprint. This crop accounts for a quarter of all the pesticides used in the United States, the largest exporter

[1] Corresponding Author: happyrivertw@gmail.com

of cotton in the world. This study contributes to current knowledge of sustainability in textile and clothing production and consumption. When the textile and clothing industry aims to promote sustainability, the main change factors have been linked to eco-materials and ethical issues in production. At present, however, business models are mainly linked with a large volume of sales and production. Although industrial development has moved toward smaller environmental impact. However, making a change is not only in production but also in consumption. The aim of this paper is to open up the discussion on opportunities for radical change in baby clothes industry. The paper presents ways to rethink and redesign business model in the clothing field by offering an online baby clothes rental platform of the concept of circular economy. Furthermore, we combine the concept of circular economy to the business model from design to recycle and advocate to use the organic cotton to be the textile of clothes. In this paper, we explain how services might extend the product life span. And how to use these strategies and approaches to offer the sustainable world and create the new value in clothes industry.

Another purpose of this paper is to discuss the combination of short life span of clothes and rental business, the rental business in general will increase as the business competition and population expand in the economy. A shift in business thinking from selling products to providing service solutions to customer needs is becoming noticeable. It is driven by increasing competition and the need to identify new profit for producers of mature products so that we identify a new product group that could be interesting from the product-service system perspective – baby clothes. The study presents a new business model based on selling the function that baby prams provide through leasing clothes by monthly package. As the society becomes a more function-oriented economy, rental activities are projected to expand. The rental market is suit for products often idle such as garden, equipment, home computer and so on or short-term usage products such as wedding dresses, special occasion dresses and baby equipment. All of them are attractive for rental business and this business is called sharing-economy. Figure 1.has some examples of sharing economy. Different from the circular economy is CE inject the environmental concept from design to end, not only the usage phase. Figure 2. Shows that Circular economy exists in whole product lifetime.

Therefore, the paper presents a new business model which combine the sharing-economy and circular economy creating a website which assemble the organic clothes manufacturer and company who has Green vision to cooperate and create a platform. Changing the consumption patterns of parents and the clothes ecology.

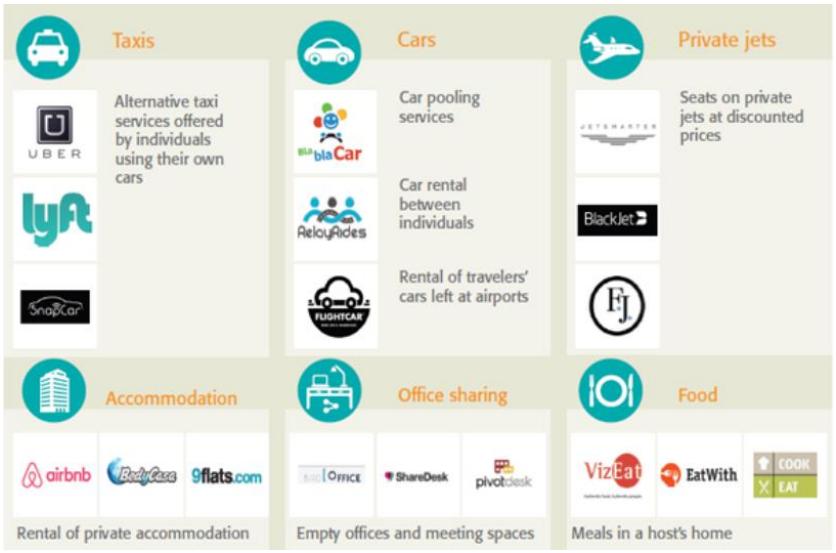


Figure 1. Example of sharing economy

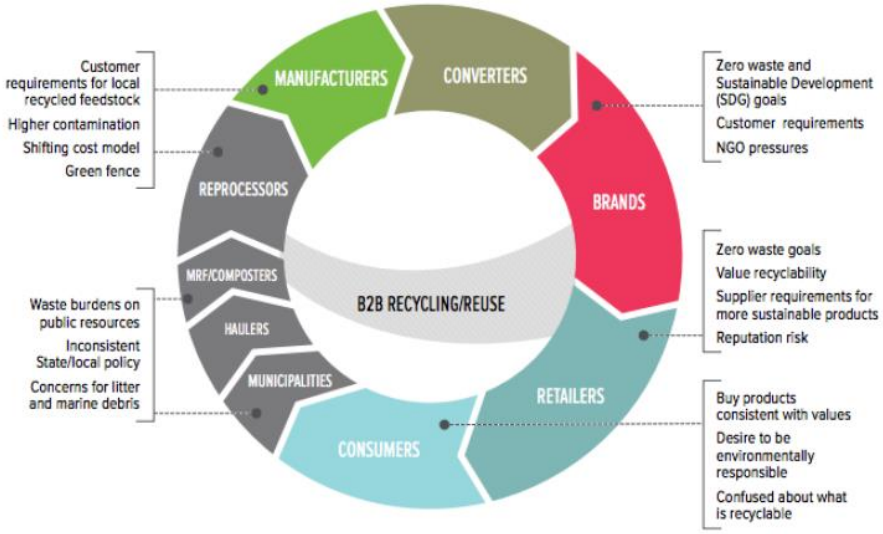


Figure 2. Circular economy in whole product lifetime

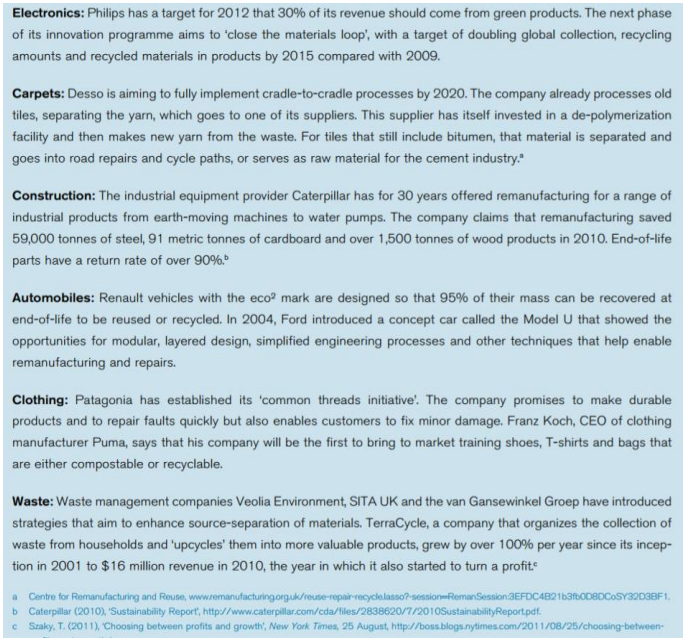
2. Literature review

This section introduces the circular economy and the rental business and manufacture pattern of clothes and impact of cotton clothes

2.1. Circular economy

In the late 1970s, architect Walter Stahel came to the insight that the current linear economic model is not sustainable. The open-ended system 'take-make-dispose' economic model converts to a circular system when the relationship between resource use and waste residuals is considered. This was based on the fact that if people continued to increase their consumption it would lead to major problems in the future. They concluded that the current economic production model was not sustainable due to increasing demand for raw materials and worldwide accumulation of waste. Therefore, the concept of closing the cycles has been studied and further developed in concrete business cases in the years. Eventually, it resulted in the concept of the circular economy.

The circular economy is increasingly attracting the attention of global. It refers to closing material loops and prolonging the lifetime of materials, the core of circular economy is the closed flow of materials and the use of raw materials and energy. Also, 3R principles -reduction, reuse and recycling of materials and energy are often implemented in circular economy. For example, at the end of the product's life these materials would biodegrade or could be easily separated so that they could be reused, which is expected to bring multiple benefits to the environment and the economy. At the global level, a circular economy could help enable developing countries to industrialize and developed countries to increase wellbeing and reduce vulnerability to resource price shocks. However, making a radical change to product design and business models is a big step for any company. There are few examples of companies experimenting with cradle-to-cradle practice. Figure 2 is the companies engaged in cradle-to-cradle activities. If major global companies take a serious step towards cradle-to-cradle approaches that the impact would influence over their supplier and go across the economy.



Electronics: Philips has a target for 2012 that 30% of its revenue should come from green products. The next phase of its innovation programme aims to 'close the materials loop', with a target of doubling global collection, recycling amounts and recycled materials in products by 2015 compared with 2009.

Carpets: Desso is aiming to fully implement cradle-to-cradle processes by 2020. The company already processes old tiles, separating the yarn, which goes to one of its suppliers. This supplier has itself invested in a de-polymerization facility and then makes new yarn from the waste. For tiles that still include bitumen, that material is separated and goes into road repairs and cycle paths, or serves as raw material for the cement industry.[a]

Construction: The industrial equipment provider Caterpillar has for 30 years offered remanufacturing for a range of industrial products from earth-moving machines to water pumps. The company claims that remanufacturing saved 59,000 tonnes of steel, 91 metric tonnes of cardboard and over 1,500 tonnes of wood products in 2010. End-of-life parts have a return rate of over 90%.[b]

Automobiles: Renault vehicles with the eco² mark are designed so that 95% of their mass can be recovered at end-of-life to be reused or recycled. In 2004, Ford introduced a concept car called the Model U that showed the opportunities for modular, layered design, simplified engineering processes and other techniques that help enable remanufacturing and repairs.

Clothing: Patagonia has established its 'common threads initiative'. The company promises to make durable products and to repair faults quickly but also enables customers to fix minor damage. Franz Koch, CEO of clothing manufacturer Puma, says that his company will be the first to bring to market training shoes, T-shirts and bags that are either compostable or recyclable.

Waste: Waste management companies Veolia Environment, SITA UK and the van Gansewinkel Groep have introduced strategies that aim to enhance source-separation of materials. TerraCycle, a company that organizes the collection of waste from households and 'upcycles' them into more valuable products, grew by over 100% per year since its inception in 2001 to $16 million revenue in 2010, the year in which it also started to turn a profit.[c]

a Centre for Remanufacturing and Reuse, www.remanufacturing.org.uk/reuse-repair-recycle.lasso?-session=RemanSession:3EFDC4B21b3fb0D8DCoSY32D3BF1.
b Caterpillar (2010), 'Sustainability Report', http://www.caterpillar.com/cda/files/2838620/7/2010SustainabilityReport.pdf.
c Szaky, T. (2011), 'Choosing between profits and growth', *New York Times*, 25 August, http://boss.blogs.nytimes.com/2011/08/25/choosing-between-

Figure 3. Companies and products engaged in cradle-to-cradle activities

2.2. Rental business

Rental business is a new business paradigm that generates revenue by charging fee to the consumers for the use of the products. As expressed, there are construction examples of rental business such as Airbnb, San Francisco based startup companies such as KWIPPED, getable and Yard club connect businesses and organizations which need to rent equipment with those that have equipment available to rent. Besides, rental business is apt to short-term product like Wi-fi when traveling on abroad, warehouse, fast fashion and so on.

Life cycle thinking is an approach to study products and services which integrates the whole range and cycle of impacts, instead of limiting the study only to one most obvious impact. Figure 4s the product life cycle. It takes into account the impacts from beginning to the end, from extraction of raw materials to the disposal or recycling of the product or service. For example, limiting the impact of a car only to the gasoline burned when the car is driven. Life cycle thinking has been applied to several frameworks when optimizing impacts of the whole life cycle instead of optimizing one stage at the cost of another. Applications are used in environmental, economic and social fields. At the beginning of a product life cycle, the raw materials are designed and manufactured. Next, it is delivered to customer. After the usage phase, products are generally rented to next customer where a new usage phase begins. For prolong the usage phase, manufacturing companies are changing their production philosophies from a traditional focus on the manufacturing of the physical product towards a focus on the life-cycle of the physical product. As a result, more focus is now put on the use and end-of-life phases, including improving quality, designing ease to disassemble product and using recycled raw materials. It is an important aspect of environmentally manufacturing because it extends life of product to reduce waste on new products.

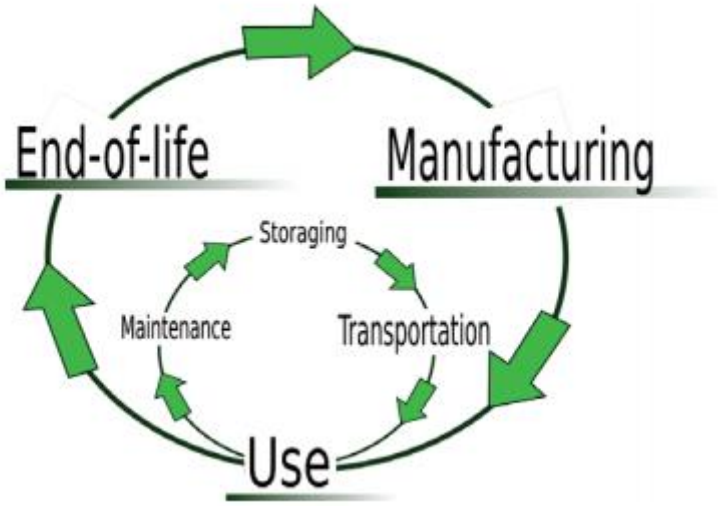


Figure 4. Product life cycle

2.3. Manufacture pattern of clothes

The present system in the textile and clothing industry is based on fast cycles of fashion trends that aim to continuously produce new consumer needs and products. Product life cycles are shortening, and companies want to substitute their products at an increasing pace. A study by Procter and Gamble shows how the life cycle of consumer products dropped by 50% between 1992 and 2002 (Vaitheeswaran, 2007).

While the supply side of the textile and clothing industry focuses on achieving low prices and effective manufacturing, other opportunities for new value creation through sustainability have not been mapped. A rethinking of fundamentals has to take place within the company, and the focus should be on the outcome the user wants to accomplish with the offering. The key is then to design the most sustainable way of producing that outcome for the user. Manufacturers could shift the focus of their operations from exchange value to use value, which offers new opportunities to increase the intrinsic product quality and durability. As the life span of the product as well as the quality of textiles and garments are difficult to evaluate at the point of purchasing, producers could offer consumers information about the intended lifetime of the product. While maintenance quality is critical to longevity in clothing, manufacturers could also provide information on laundry process and the clothes still look good. The manufacture pattern transforms from fast fashion to slow design which aims to prolong the lifetime of product and to deepen product satisfaction. Slow fashion is designed to be used over a long time period, and it is made with high quality and high ethical values; it is durable and made of sustainable materials. The design lasts over time as styles and colors are classical, and the materials age well. This affects esthetic longevity. (Fletcher, 2008)

2.4. Impact of cotton clothes

Cotton is the most widespread profitable non-food crop in the world. Its production provides income for more than 250 million people worldwide and employs almost 7% of all labor in developing countries. Approximately half of all textiles are made of cotton, it is also the most common natural fiber used to make clothing, accounting for about 33 percent of all fibers found in textiles. Cotton is also a very thirsty crop, requiring 2,700 liters of water—what one person drinks in two-and-a-half years—to make one cotton shirt. Also, Cotton is the most pesticide intensive crop in the world, these chemicals typically remain in the fabric after finishing, and are released during the lifetime of the garments, what's more, the pesticides injure and kill many people every year. It also takes up a large proportion of agricultural land, much of which is needed by local people to grow their own food. In some areas, they have already facing water stress and human health problem, cotton production can be particularly damaging. (Lakshmi, 2017)

3. Methodology

Nowadays, Traditional clothes consumption pattern have shown two major problems. The first one is making too much unnecessary waste. The second one is out of stock is always the problem of any industry including clothes industry. So the new way is instilling the concept of circular economy and integration system into online platform to

solve these two major problems. And I will use INCOME software to verify the new business model. Furthermore, I will show the environmental impact of a T-shirt to explain why the circular economy is so important. Figure 5-8 are the INCOME software including as-is and to-be behavior and simulation. Figure 9 is the environmental impact of a T-shirt.

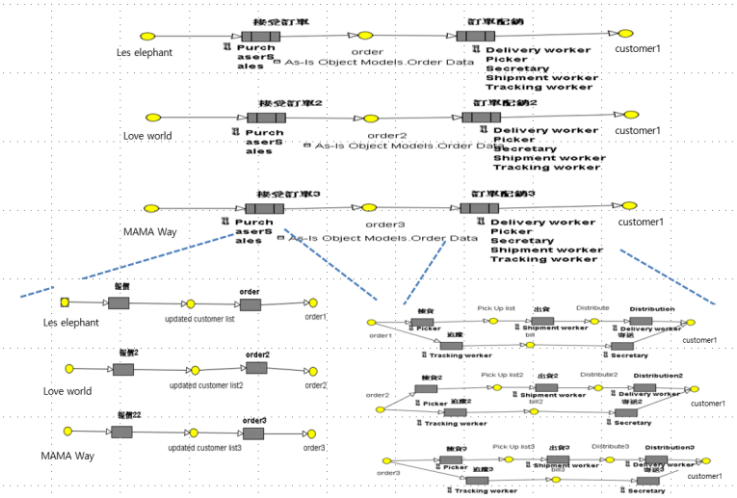


Figure 5. As-is behavior model

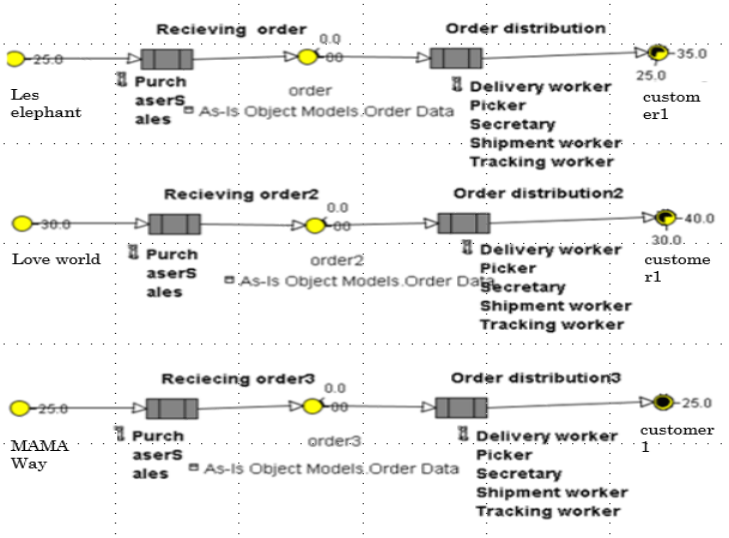


Figure 6. As-is behavior model simulation

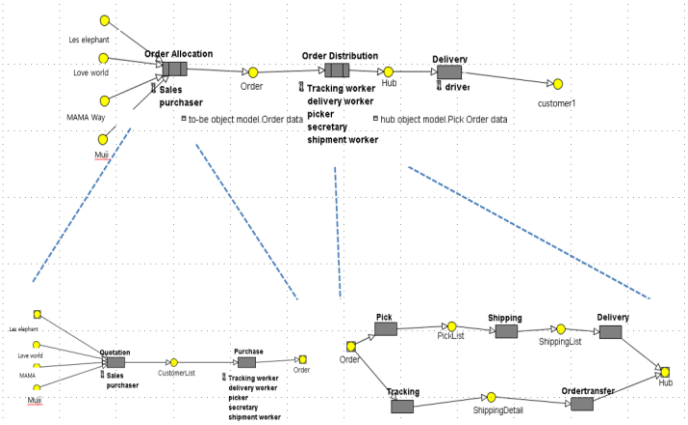


Figure 7. As-is behavior model

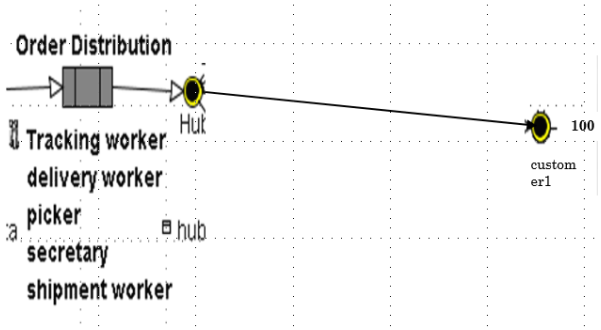


Figure 8. As-is behavior model simulation

As the figure 5 and figure 7 shows that the different is the hub, and its function is integrating orders and allocate to customer. And the figure 6 and figure 8 show the existence of hub will create what benefits to customer, if implementing as-is model, the customer's need might not be meet cause the seller doesn't have enough capacity then the problem of out of stock occurs. Otherwise, if implementing to-be model, customer's need will be meet cause all sellers just like a family, they can help each other fix up the problem of out of stock.

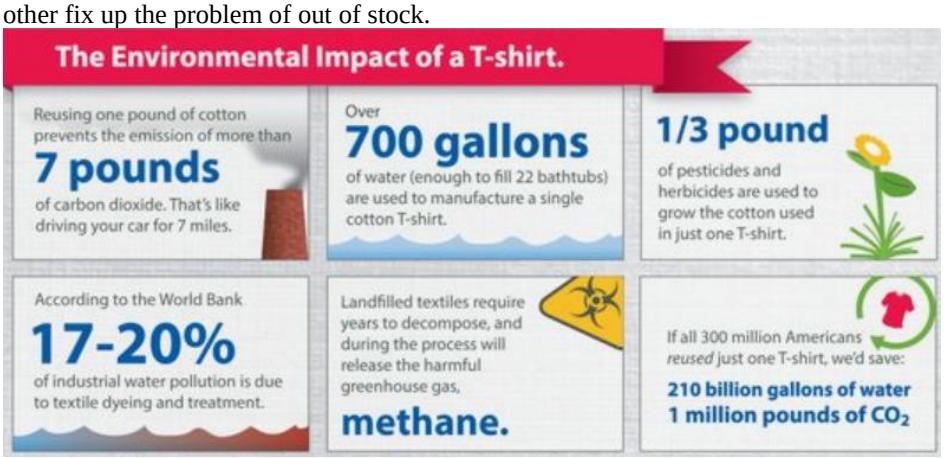


Figure 9. Environmental impact of a T-shirt

3.1. The operation of online rental platform of organic baby clothes

For solving two major problems above, I create an online platform which instilled the concept of circular economy and add the integration function. The first one is operation of platform follows the concept, I will introduce it in the next section. The other one is using MySql database which can store user information including area and product detail. I can use the information of area to set the warehouse so that to reduce logistics distance and enhance regional development, improve user density. And, the information of product detail can be analyzed to know the preference of customer, then it would be the useful data for seller. Figure 10 is the database of the orders.

id	user_uid	user_address	detail	user_phone	time	date
6	ginny	Taipei	8 packs package	0912345657	MUJI仁愛店	2017-12-29

Figure 10. Database of the orders

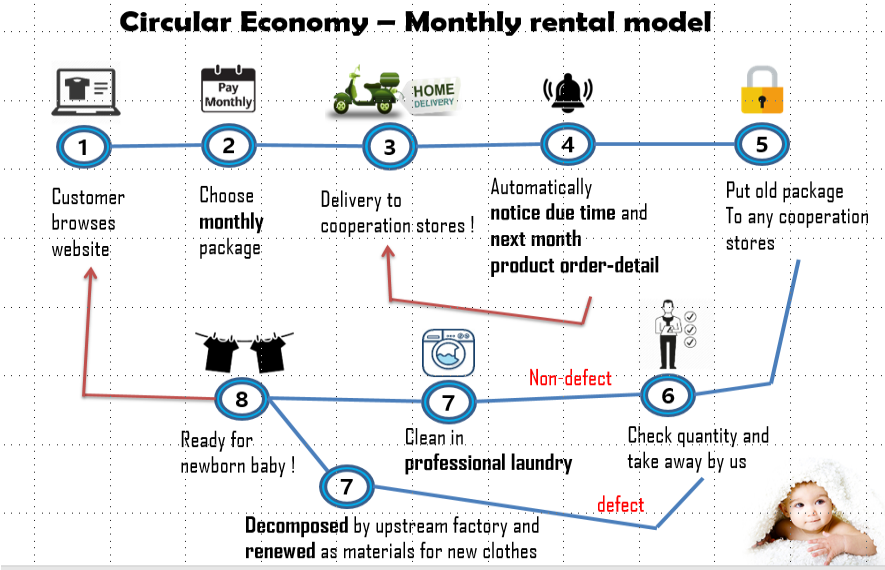


Figure 11 The operation process of online platform.

Figure 11 is the database of the orders. Customer will browse the online website first, and all of products in website are made by organic cotton. If they want to rent the monthly package, they have to register to be a new member first. And we will deliver goods to cooperation stores which can be chosen by customer. When close to the due time, we will send E-mail to notify customer and send the next month product detail at same time. If customer doesn't cancel the subscribe, we will send the product to store. The only thing customer has to do is put old package from store and pick new one to home. Then we will take it away and check quality and quantity. If there is no defect, we outsource professional laundry to deal with these baby clothes. And these clothes can be ready for new baby. Otherwise, if there is defect on clothes, the clothes will be decomposed by upstream factory and renewed as new material for next clothes. Then, the clothes can back to the circular economy. Here will detail introduce the operation of platform.

① Choose monthly package you want, all of products made by organic cotton.
② Delivery to the cooperation stores, you can choose the store nearby you!
③ Do not worry about exceed the deadline, we will notice you about the due time and inquire whether continue subscribing for next month product.
④ Just put old package to cooperation store , we will take it away.
⑤ Check quality.
⑥ No defect, clean clothes in professional way.
⑦Defect, decomposed by upstream factory and renewed as new material for next clothes
⑧ Ready for new baby !

3.2. Expected Result and Future Work

(1) Increase the usage of clothes.
(2) Improve the quality of clothes.
(3) Reduce the harmful to environment.
(4) Collaborate with whole supply chain to create a green future.

Practically, there are a few things that we can improve in the future, such as finding other textile is more beneficial than organic cotton to environment and looking for a new logistic way to reduce carbon footprints.

4. Conclusions

The environment issues are always mentioned by everyone, but few people will conduct an active action in reality. Maybe, the reason is everybody is too busy to dedicated ourselves to act. Therefore, if we make environment blend into our daily life and one day everyone will get used to the habit of life. They can just go online shopping as usual and what they have to do is choosing a monthly package and this package contains a lot of meaningful concept about farmer, land, society, environment and so on. This online platform provides people for spending less time and doing much more meaningful thing. Besides, the platform offers a hub which can integrate orders and meet the customer's demand flexibly. In briefly, the new business model with rental and circular economy can create triple wins for customers, sellers and earth. However, there is a problem of price of products, the organic cotton is known as rare raw material. Once the model becomes mature, the price of organic cotton will gradually be accepted by all customers, so changing from the customer is pretty important for this new business model, then the whole supply chain has to change without no choice. By other way, we can try to find cheap but also helpful for environment material to be the new textile for clothes. Changing the world cannot just be a slogan, actions are more than words.

5. Acknowledgement

This study is the final report of E-Enterprise Integration and supported by Professor Chiu M.C.

References

Lakshmi Challa.(2017).Impact Of Textiles And Clothing Industry On Environment: Approach Towards Eco-FriendlyTextileshttp://www.fibre2fashion.com/industry-article/1709/impact-of-textiles-and-clothing-industry-on-environment?page=2

Hagerty, J. R. (2015). Startup Matches Heavy Equipment Owners and Renters. Wall Street Journal. [Online]. Available at: http://www.wsj.com/articles/startup-matches-heavy-equipment-ownersand-renters-1432805583 [Accessed: 11 June 2015].

Grayson, W. (2015). Caterpillar invests in, adds dealer inventory to Yard Club, an online contractor-to-contractor equipment rental service. Equipment World Magazine. [Online]. Available at: http://www.equipmentworld.com/caterpillar-invests-in-adds-dealer-inventory-to59 yard-club-an-online-contractor-to-contractor-equipment-rental-service/ [Accessed: 11 June 2015].

Vandenbroucke, D., Van Hyfte, A. and Francx, L. (2010). Study in View of the Revision of Directive 97/68/EC on Non-Road Mobile Machinery (NRMM) Final Report: Module 1 - An Emissions Inventory. [Online]. Available at: http://ec.europa.eu/enterprise/sectors/mechanical/files/nrmm/finrep-mod1_en.pdf [Accessed: 28 January 2015].

Mäkelä, K., Tuominen, A. and Rusila, K. (2000). TYKO 1999. Työkoneiden päästömalli [TYKO 1999. Emission calculation model for work machines in Finland]. Contractor report, Technical Research Centre of Finland: Communities and Infrastructure. [Online]. Available at: http://lipasto.vtt.fi/tyko/tyko1999raportti_b.pdf [Accessed: 22 June 2015].

Vaitheeswaran, V., 2007. Revving Up. The Economist. October 11

Fletcher, K., 2008. Sustainable Fashion and Textiles: Design Journeys. Earthscan, London

Riina Antikainen , David LazarevicJyri Seppälä (2017). Circular Economy: Origins and Future Orientations https://link.springer.com/chapter/10.1007/978-3-319-50079-9_7

Antti Kuronen (2015) Sustainability of Construction Equipment Rental: Comparison to Owning https://aaltodoc.aalto.fi/bitstream/handle/123456789/18620/master_Kuronen_Antti_2015.pdf?sequence=1&isAllowed=y

Oksana Monta, Carl Dalhammara, Nicholas Jacobsson(2006). Journal of Cleaner Production Volume 14, Issue 17, 2006, Pages 1509-1518 A new business model for baby prams based on leasing and product remanufacturing http://www.sciencedirect.com/science/article/pii/S0959652606000825