CIRCULAR DESIGN

Learning for Innovative Design for Sustainability

With the support of the Erasmus+ Programme of the European Union

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PROJECT A

YOUR THEME

The overall objective of the project is to investigate and identify the ways to increase the reuse of white goods and their components.

Currently, consumers and companies have three main options when they want to get rid of unused appliances. They can sell them through secondary markets such as e-Bay, let them be picked up in connection with the delivery of new appliances, or drive them to collection points at municipal recycling centers (ÅVC) from which they go to materials recycling.

BACKGROUND

In Sweden, there exist some possibilities to reuse and repair used-products e.g. through Myrorna's "Älska Återanvändningsbodar" in Linköping, Alelyckan's ÅVC in Gothenburg and Re: Tuna in Eskilstuna where several ÅVCs deliver products that need to be repaired and sold on site. However, the scope of these systems is limited. The majority of the reuse of end-of-life products takes place in the informal sector.

A test system has been developed and now in use in two ÅVCs in southern Sweden by El-kretsen, Stena Recycling and Tiranius AB. In this system, useful products are picked from the current flow of unwanted white goods and seperated before they become waste. Then these products are sold to consumers. No systematic evaluation of the condition the the products takes place. However, the possibilities of the reuse could have been increased if there existed a systematic selection, testing, repair and component handling, etc. Additionally, only the products that comes via ÅVC were included in this system which means that flows of other end-of-life products from retailers and installers are not tested.
Specific information on active or planned systems is communicated to other recycling centers in Italy, Belgium and Norway through Electrolux AB's participation. Electrolux also has been able to provide data from

similar systems in other countries indicating the potential of a systematic circular system, for example:

- In Flanders, about 2,500 tons of electric waste, of 19,000 tons in total (nearly 13%) handled by their social network refurbishment and has been reused.
- Norsk Ombruk has a similar percentage that is 24%. The difference is beleived to be due to the fact that they are based on different types of product reflux; Ombruk only collects import material from retailers, while Flanders collect from from municipalities.

The costs of collection of the items, the selection process and the quality of the products being recycled are some of the prominent factors that should be taken into account to achieve a successful circular recycling system. There are also some factors that are usually overlooked like energy efficiency for example old products that contain freon have problematic energy performance that counteracts the aim of achieving energy efficiency. Depending on the flow of products from users to ÅVC, there may be legal obstacles that migh prevent the reuse of the products. Sometimes an approval from the previous owner is needed to reuse the end-of-life products, which can lead to inreased administration costs.

YOUR CHALLENGE

The project aims to increase the reuse of end-of-life white goods by creating a circular system based on classifying reusable appliances, including the ones that are returned by users as a result of faulty installations, customer complaints, warranty cases, transport damage, and as well the ones at the ÅVCs before the appliances are formally classified as waste.
Once these appliances are selected, they can be tested and, if necessary, repaired or their appearance can be improved. After this review, the products can be prepared for sale with a certificate proving this review

and probably with a warranty. Then, they can be sold to consumers or companies in the secondary market. This type of reuse is limited today, but it could be possible as long as the products meet legal requirements and users´ expectations of performance.

The project has good opportunities to solve existing envronmental issues:

- The focus of the project is on increasing the life of products and components through a combination of re-use and remanufacturing.
- The project will analyze the effects of existing regulations on the conditions of reuse.
- A systemtic and financially self-sufficient system for reuse of white goods would make circular economy more familiar and accepted both among businesses and in society at large.

The solution is considered to have great news value. There is currently no commercially scalable model to reuse white goods. The existing examples are based on public grants and mainly labor intensive.

GOALS AND DELIVERIES

At stage 1, the project aims to identify and, on a smaller scale, test local reuse models for unwanted appliances. In stage 2, the models will be tested to see if it can be used to create a system that can be commercially sustainable on a regional and national basis without being based on public funding.

Goal of creating the new system:

- Offer a viable alternative to existing recycling system that can decrease the informal activities.
- Another goal is to create new jobs.

The system is expected to lead to several different types of benefits, such as:

- Environmental benefits by extending the life of white goods and reducing waste.
- Social benefits by providin quality-assured second hand appliances
- Business benefits by creating new jobs.

INTELLECTUAL PROPERTY

Any potential Intellectual Property rights arising from the Circular Design internship project reside with the client company. As such all information should be treated with confidence unless there is agreement from the client.

PARTNERS

Electrolux
Main partner

Stena Recycling

Tiranius AB

Linköping University

El-kretsen

Neptunia Invest AB

Tricircular AB

El-kretsen has a nation-wide collection and recycling systemwhich is divided into two categories: households and businesses. The household collection is called “elretur” and is administered in co-operation with the municipalities. The collection from businesses is administered jointly with both municipalities and contracted transport carriers.

Tricircular AB helps business leaders manage business opportunities and risks related to Sustainable Development.

Tiranius AB’s knowledge of efficient and profitable recycling sales of white goods and opportunities to increase recycling rates would be beneficial for this project.

Stena Recycling has specialised knowledge on what an intended system needs for services from recycling companies when it comes to handling products and materials.

Electrolux Hemprodukter AB and Electrolux AB is a Swedish multinational home appliance manufacturer, headquartered in Stockholm. Electrolux shapes living for the better by reinventing taste, care and wellbeing experiences, making life more enjoyable and sustainable for millions of people.

Neptunia Invest AB invest in companies within real estate and finance as well as defence and security. The company is committed and have a long-term approach. It seeks sustainable and socially beneficial investments that create value over time.

PROJECT B

SAIBOO – CIRCULAR WORKWEAR

Saiboo has been working on increasing the circularity of its products through several projects, together with universities in Sweden. They have developed their collection tailored to the needs of the people who work in healthcare system. In combination with function, their garments are also high quality. No matter how durable the garments are, they for one reason or another come to the end of their use-life. The reason could either be a stain, damage or simply wear. What could be done with those worn-out garments? Saiboo currently collects them and recycles them but they are looking for creative solutions to increase the repair and reuse of the garments that they manufacture.

This project focuses on exploring workwear for healthcare professionals and closing the material loops while creating functional and high-quality outfits. The aim of the project is to reimagine the workwear and propose alternative solutions with a system perspective considering the needs of healthcare workers.

You are expected to compare to the current situation, assess what is possible and design alternatives and then validate it against the current practice. This is an exploration of what might be possible in the future. The objective is to improve circularity, keep the environmental and economic value of the clothes high as much as possible while creating an aesthetic language that makes it easy to recognise who belongs to the healthcare team.

YOUR CHALLANGE

After being briefed on the current way of operating of Saiboo, and the results of the previous research projects conducted between Saiboo and Swedish knowledge institutions, we challenge you to propose an alternative systemic solution that would close the loop, and design both that system and one or more of its touchpoints or physical representations. This is an exploration of what might be possible in the future. The objective is to improve circularity, as in retain as much of the environmental and economical investments embodied in the clothes, compared to the current situation. You will assess what is possible, by designing an alternative and then validating it against current practice.

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SCHEDULE

There will be a range of masterclasses/seminars on topics like: Visible Repair (Nazlı), Circular Packaging design (Renee), Remanufacturing (Erik), and others. Precise scheduling will be announced later. Tentative Masterclass dates are listed in the schedule.

We are exploring options for an excursion to Stockholm to/with Habermann Design and SVID. Some dates might change.

DATE	TOPIC
Phase 1	
Feb 4th	9:00 Intro & get to know each other and university. Registration & arrival issues
Feb 5th	10:15-12 Lecture & discussion on Circular economy
Feb 6-7	Intro to the hand workshop. Information will follow!
Feb 8	Discussion & analysis of previous L4IDS Internship projects
Feb 11th	Project time (Swedish students may have some lectures)
Feb 12th	Masterclass (LARM company fair)
Feb 13th	Project time (Swedish students may have some lectures)
Feb 14th	Project time (Swedish students may have some lectures)
Feb 15th	Gate 1 (pre-study)
Phase 2	
Feb 18th	Project time (Swedish students may have some lectures)
Feb 19th	Masterclass: Design for remanufacturing by Erik Sundin

Feb 20-21	Project time (Swedish students may have some lectures) Individual / sub-group instructions on workshops and machinery
Feb 22th	Masterclass: Behaviour Change
Feb 25th	Project time (Swedish students may have some lectures)
Feb 26th	Project time (Swedish students may have some lectures)
Feb 27th	Trial presentations for gate 2
Feb 28th	Project time (Swedish students may have some lectures)
Mar 1st	Gate 2 (Planning)
Phase 3	
Mar 4th	Project time (Swedish students may have some lectures)
Mar 5th	Project time (Swedish students may have some lectures)
Mar 6th	Masterclass: Fixing our relationships with things through repair and kintsugi workshop by Nazlı Özkan
Mar 7th	Project time (Swedish students may have some lectures)
Mar 8th	Project time (Swedish students may have some lectures)
Mar 11th	Project time (Swedish students may have some lectures)
Mar 12 or 13	Masterclass: Design thinking by Juan Ruiz
Mar 12 - 15	Project time: Preparing for the Gate 3: Concept development
Mar 18th	Masterclass: Reviewing circular examples and discussing legislation, user participation, trust, and business models by Renee Wever
Mar 19 - 22	Project time (Swedish students may have some lectures)

Project time on all following dates if no other informations is given

Mar 27th	Trial gate presentation
Mar 29th	Gate 3 (Concept)

Phase 4	
Apr 1st	Stockholm Trip Konstfack: University of arts, crafts and design in Stockholm, Houdini: Swedish sustainable sportswear company and Inrego: Reusing IT equipment
Apr 8 -12	Renee and Nazlı are in Ireland for project meeting. Project time: Detailing and finalising the projects
Apr 19th	Good Friday (holiday)
Apr 22th	Easter Monday (holiday)
Apr 24th	Trial gate presentation
Apr 26th	Gate 4 (Final presentation)

EXPECTED OUTCOMES

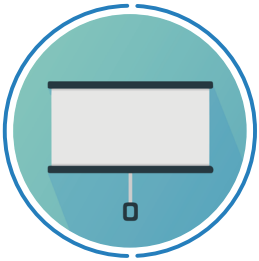
During this project, you will be asked to develop, within your group, a process book, which will document your entire design process, from research, ideation and initial concepts, to your final concept and its development. This document will take the format of printed A3 paper as well as a PDF version which you will hand us over at the end of the internship. It will also feature the logo of your partner, of the Linköping University and of the Circular design project. Those will have to be at least 3 cm large.

For the final presentation and exhibition of your project, you will be asked to create posters and/or a brochure to present your project next to your prototype(s). These will be the synthesis of your research, ideation and creation process. It will show your design process from your initial research up to your final project. The format of the posters/brochure will be decided during the internship. It will also feature the logos as previously indicated.

During the project, it will be expected that you develop one or more mock-ups to represent your initial ideas. To build those, you will have access to the university workshop. Those mock-ups can be physical ones as well as slide shows, video, interface, etc., or any medium that best represents your ideas. You will then present your mock-up(s) and initial ideas to your project partner(s).

Prototype : At the end of your internship, you are expected to have built a prototype of your design solution. The specifications of your prototype will change according to your design solution, and the purpose you have for it with regards to testing, presentation and portfolio development.

For each phase of the project, you will be presenting the advancement of your project to your partner, the LiU team or external professional experts. The presentation medium is yours to choose (slide shows, videos, etc.) The only obligation you have is to feature the logo of your partner, the logo of the Linköping University and the logo of the Circular design project. Your names should also be visible. You should also make sure your presentation's file is as small as possible.



A FEW RECOMMENDATIONS FOR YOUR PRESENTATION

-Don't use more than **6 lines of text**, the less text the better

-Use **sans serif fonts**, you can still use a creative font for a slide title but avoid using it for body text

-Maintain a **strong contrast** between text and background.

-Use no more than **5 colors**, you can use a tool like **Adobe's Kuler** to help you choose the colors.

-Use no font size smaller than **18 point** (24 is preferred) and you can go up to 35-45 points for title.

-Don't forget to integrate the **logo of your partner,** of the Linköping University and of the Circular design project.

- **Test your slide-show** beforehand to adjust the colors, font sizes and bugs.

FACILITIES

WORKSHOP

The wood, metal and 3D printing workshops will be available to you. They are located in the C corridor on the ground floor in A huset. Here you will be assisted by Jonas Wallinder and Tomas Larsson. The workshops are usually open from **8.30 to 17.** The technicians in the workshop can assist if you need work done on more serious machinery for wood, metal or plastic processing, such a watercutting or welding. You will have access to the following machines:

- Pillar drills
- Disc hand sander
- 3D printers (3x)[2]
- CNC machines[1]
- Sewing machine
- Laser cutter[2]
- Thermoforming machine[1]
- Paper guillotine
- Painting booth
- HTC Vive (4x)
- Band saw[1]
- Hand tools
- Desktop milling machine[1]

1. Requires the supervision of workshop personnel
2. Requires licence, which you will get

THE PEOPLE

Jonas Wallinder
Metal workshop boss

Tomas Larsson
Wood workshop boss

David Beuger
Laser cutter expert & 3D CAD pro

ABOUT LINKÖPING

We are delighted to welcome you to the Linköping University for the CIRCULAR DESIGN: Learning for Innovative Design for Sustainability. Below is some useful information

LINKÖPING

Linköping is one of Sweden's fastest growing cities. The population is constantly increasing and we are now 157 000 inhabitants. We are currently Sweden's fifth largest city and a part of the expansive East Sweden Business Region.

For decades the city has been characterized by world-class high technology in the fields of aviation, IT and the environment. A third of the city's workforce are engaged in areas related to aviation and the region leads the way in cleantech with a well developed industry focused on recycling and renewable fuels.

Education and innovation

In Linköping there is a strong force of innovation especially in Science Park Mjärdevi, which is one of Europe's leading technology parks with 6 000 employees in 300 companies. The focus areas in the park are visualization, modeling and simulation, connectivity and mobile broadband, vehicle safety and security systems.

University

Our highly ranked university is situated next to Science Park Mjärdevi and holds more than 27 000 students. We also have a university hospital with highly specialized medical treatment and research.

Linköping is supported by good transportation including two airports. Furthermore the city is characterized by a lively commerce and holds one of the nation's largest shopping areas. In addition there are a number of conferences and events throughout the year which attract visitors from all over the world.

Heritage and culture

Proud ancestors from the Middle Ages hover over the city. Our history lives on in the form of the well-preserved city centre, where shops, cafés and restaurants share space with the cathedral and other historic buildings. Around us we enjoy the beautiful nature. We have unique oak woodlands with a fascinating wildlife and vegetation. We can also offer swimming och boating along Kinda Canal and Göta Canal as well as many nearby beautiful lakes.

Linköping is a rich city. History, nature and development meet here. We can proudly state that we are a city of the future – the city where ideas come to life!

ADDITIONAL HELPFUL INFORMATION

Credit Cards

Credit cards are widely used in Sweden and all leading credit cards are accepted.

Currency

The currency in Sweden is Swedish krona (SEK). Bills (notes) come in denominations of 20, 50, 100, 200, 500 and 1000 kronor. There are coins in the values of 1, 2,5 and 10 kronor. However, most students use credit cards or mobile payment.

Emergency Numbers

Police, Fire, Ambulance: Telephone: 112
The fire, ambulance and police services in Sweden are all contactable via the above number. When calling emergency services you will be asked to provide:

- The exact address of the incident or emergency and/or any noticeable landmarks nearby
- Directions to the scene of the emergency
- The telephone number you are calling from

- Details on the incident itself, the number of persons involved, the description of any visible injuries and knowledge of any pre-existing medical conditions Try and stay calm and listen to the call taker's instructions. It is also important to keep your own phone on as the emergency service may need to contact you for further information.

Shopping

Shops are generally open Monday to Saturday from 9.00am to 18.00 with late night shopping until 20.00 or 22.00 at many of the larger stores. On Sunday, many supermarkets and some of the bigger shops will open from midday until 18.00.

Low-cost: Willys, Netto
Mid-range: ICA, Coop, Hemköp

Smoking

Smoking is prohibited in the general workplace, enclosed public places, restaurants, bars, cafes, education facilities, healthcare facilities and public transport. It is legal to smoke outdoors.