



**CHALLENGE  
LAB**



**CHALMERS**



# A PLACE FOR CHALLENGE DRIVEN COOPERATION FOR IMPLEMENTATION OF TRANSFORMATIVE SOLUTIONS

## THE CHALLENGE LAB AT CHALMERS UNIVERSITY OF TECHNOLOGY

The Challenge Lab is a lab at Chalmers University of Technology, where master students take on our biggest societal challenges. The main challenge is how to make 10 billion people having a good life within our planetary boundaries and the Challenge Lab address this overarching challenge by a backcasting approach – by initiating transformative projects, for a transitions towards a sustainable society.

## WHY CHALLENGE LAB?

The current scenarios of resource shortages, land use and energy is creating many challenges for society. These can be solved by collaboration in complex systems.

The potential of the Challenge Lab in the long term is believed to be large and transformative for how universities, collaborating partners and funding agencies could operate. The transformative powers of Challenge Lab are threefold: its focus on adding students rather than only researchers, to work on common ground rather than on home ground, and to focus on sustainability challenges rather than on technological opportunities or on market needs. There is also a great potential for networking between similar challenge/ social/innovation labs from different regions of the world.

The Challenge Lab is located, administered and founded at Chalmers University of Technology in Gothenburg, Sweden.

## THE AIM WITH THE CHALLENGE LAB

- Become an important hub for the triple helix actors within regional knowledge clusters where all actors can gather around the students, as they all are interested in and care for the students.
- Give the students the opportunity to develop unique skills in working across disciplines and from a challenge driven perspective.
- Build trust within the clusters through students. As they often carry the capacity of simultaneously being unthreatening and at the same time challenging current views and mental lock-ins. They can take the role of being the highly needed change agents to society.

The core in the lab is built around international master students doing their master thesis, but the Challenge Lab also provide a master level course; Leadership for Sustainability Transitions to prepare prospective students for the Challenge Lab Master Thesis. In order for the students to become change agents within the regional knowledge cluster (the system) the students are given some preparation. This preparation is done in a co-creation fashion and is evaluated by the students for continuous development over time.

# GLOBAL CHALLENGES



**INCREASING  
LIVING  
STANDARDS**



**GROWING  
NEED FOR  
RESOURCES**



**LIFESUPPORTING  
RESOURCES ARE RUNNING  
OUT**



# WHERE CHALMERS STUDENTS BECOME CHANGE AGENTS IN COMPLEX SETTINGS

## THE CHALLENGE LAB PROCESS

The preparation consists of two parts: Outside-in, including knowledge, methods and tools to understand and deal with the requirements global sustainability will put on the system. Inside-out, including knowledge, methods and tools to understand and cope with the students own values, strengths and visions as well as to understand and manage the interaction with and between the different stakeholders within the system.

Based on this preparation, the students deal with the regional knowledge cluster in two phases. In the first phase they interact with stakeholders on a strategic level to get an overview and understand the system from different perspectives in order to identify critical leverage points. Based on this understanding the students formulate the questions that will be the theme for the second phase. In the second phase, the students will dig deeper into these questions by interacting with more specific stakeholders in a multi-level design process.

Backcasting is a key process during the whole Challenge lab process. Backcasting from sustainability principles is also the starting point and is helpful to free the mind from today's unsustainable path-depending system and start from a desirable sustainable future.

The Challenge Lab is located in the Kuggen building at Chalmers University of Technology Campus Lindholmen in Göteborg, Sweden. The lab is physically connected to Lindholmen Science Park, serving as a hub and connecting intersection point between the industry, institutes and academia. Additional sites will be built – such as a second lab at Johanneberg Science Park. Here, the lab will tackle challenges connected to Energy and Sustainable Urban Development

## THE CHALLENGE LAB MASTER THESIS

In the Challenge Lab master thesis, students learn to explore, define, and act upon global challenges that face us in the 21st century - that will transform the way we live together on this planet.

The Challenge Lab acknowledges, equips and empowers students to be the change agents for transformative impact in society. The work is being done in transdisciplinary teams of change agents working together – in a dialogue process - with industry clusters, the public sector and academia.

The Challenge Lab teams are working in a dynamic environment where they are in charge – leading in a sustainability transition - to connect projects, companies and public sector initiatives together with academia to find leverage points - hotspots - in the system. The teams are then intervening in these hotspots - to then suggest and initiate sustainable solutions to take society forward. We believe that students have an ability that goes beyond what any actor in society can do alone. In the Challenge Lab 2014 the change agents created a broad range of master thesis projects where they intervened on many levels in the societal system. The challenge was Sustainable Mobility and Transport – resulting in the projects in the following sections. Here you can find three-page summaries of the work done.

# MAKE A DIFFERENCE



**PUT YOURSELF IN CHARGE**



**EXPLORE NEW TOOLS**



**BRING COMPETENCE TOGETHER**



**JOIN THE CHALLENGE LAB**

**FOR A SOCIETY WHERE 10 BILLION HAPPY PEOPLE LIVE WITHIN OUR PLANETARY BOUNDARIES**





# A PLACE FOR CHALLENGE DRIVEN COOPERATION FOR IMPLEMENTATION OF TRANSFORMATIVE SOLUTIONS

## AFTER FINISHING THE C-LAB THESIS - THE SUCCESSFUL STUDENT SHOULD BE ABLE TO

- Describe critical sustainability challenges and reflect upon necessary paradigm shifts.
- Describe how sustainability challenges affect industrial and societal actors and how they are interlinked.
- Reflect on the challenges of policy implementation for sustainable development.
- Apply sustainability criteria for research utilization and innovation processes.
- Reflect upon important “lock-ins” on societal, organizational and individual levels, relevant for sustainability challenges.
- Apply systems perspective to meet sustainability challenges.
- Apply relevant sustainability frameworks (e.g Backcasting etc.).
- Apply practical methods and tools for sustainable product development and design.
- Apply basic theories and tools about transformative leadership in a challenge-driven entrepreneurship process.
- Apply tools to enable and facilitate dialogue with multiple stakeholders.
- Extract and manage new knowledge in a complex context.



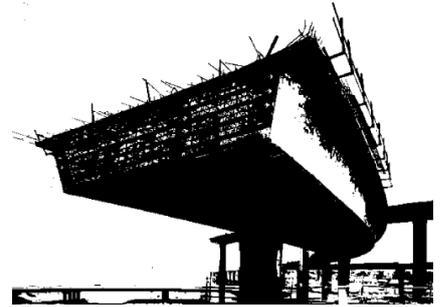
*The Challenge Lab provides a neutral hub for stakeholder dialogue. In this picture, the C-Lab students are engaging in a dialogue with local politicians in the City of Gothenburg.*



*The Challenge Lab merges perspectives, cultures and backgrounds. The students in 2014 were from China, Mexico, Finland, Austria, India, Turkey and Sweden.*

# TRANSFORMATIVE SOLUTIONS CHANGING THE WAY WE

**LIVE**



**ACT**



**PRODUCE**



**CONSUME**

**THINK**



# Design and Implementation of a sharing platform in Gothenburg

## Summary

**This thesis designs a new concept of how a sharing platform could be implemented in the city of Gothenburg. In particular, how this sharing platform could be made accessible and more convenient than other currently applied practices in the city.**

**In order to develop this idea a diverse set of methods was utilised, including the organisation of workshops, the participation in the local hackathon “Gothenburg Startup Hack”, a survey and interviews. Due to the fact that the literature is rather fragmented these more practical methods were required to gather information and data that is applicable for a sharing economy.**

**The major outcome of the thesis was a service utilising an infrastructure of smart boxes to detach the exchange of products from disrupting people’s daily schedule by meetings. Borrower and lender of physical objects can just agree to use a box station in the city located at a frequented place, such as bus stops or cafes. The lender then reserves a box online and places the object in this box. By sharing the access code to the borrower the process of exchanging goods is easy and less time consuming than meeting up in the city.**

**During the process a possible partnership with a project in Gothenburg, called “ElectriCity”, was identified and could be developed further on after the end of this thesis. The idea of the box stations could add further services to public transport and as a result make both public transport and the sharing economy more attractive to the potential users.**

**The main barrier of the sharing economy for reaching a mass-market was found to be trust amongst the individuals using the sharing platform. Several possible solutions to provide a trust-worthy service were identified and are presented in the thesis. These include, amongst others, an insurance pool and a review system.**



The idea behind the smart box solution is to provide a sharing platform together with an infrastructure in the city that allows users to share objects with each other. This means that if people want to share an object, but do not have the time to meet up in person, the owner of the object can drop it of in a box located in a public package station that was agreed upon both individuals. After this drop-off the lender gets a notification that the object is ready to be picked up and what the confirmation code for the box is. The person only has to go to the package station, access a web service on a smartphone and enter the package station number as well as the confirmation code in an online form. If the entered values are correct, the box will open and the lender can get the object and vice versa. The handover of the object is convenient and due to the public location of the package station it is also very accessible.

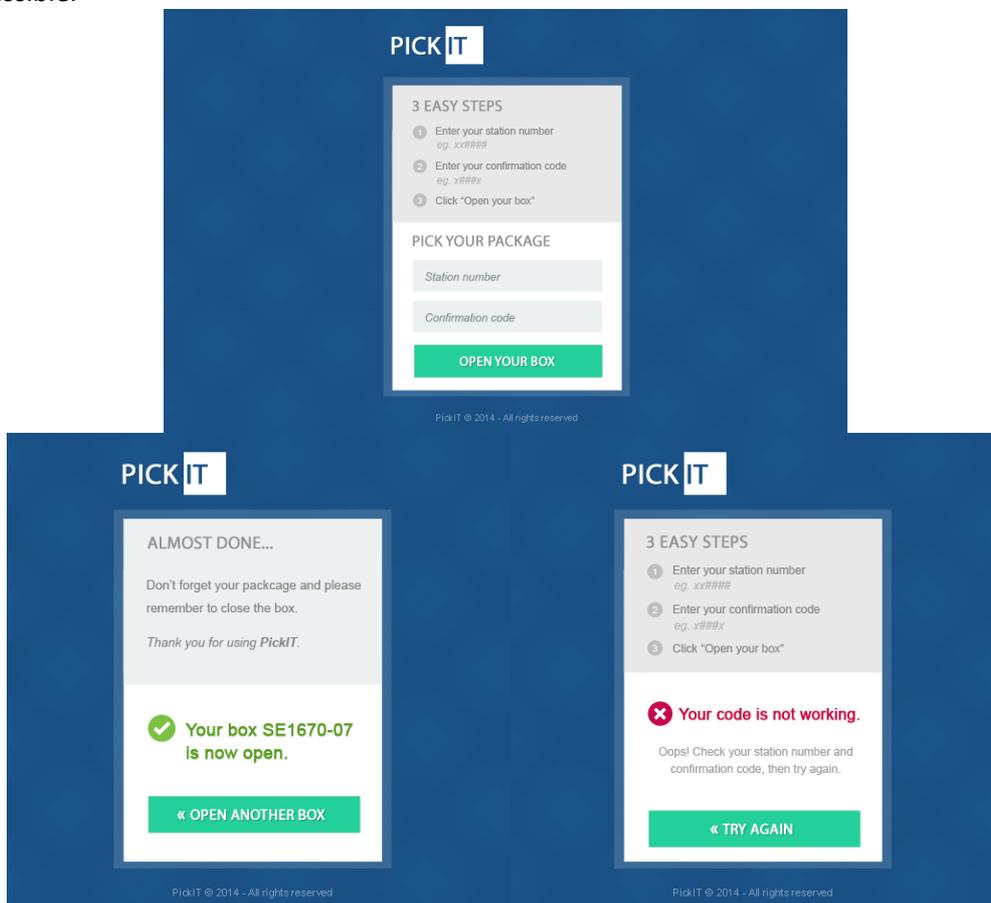


Figure 1:Mock-up of the box station web service

Source: (Bolaño 2014)

This system in general would make it more convenient to exchange objects as the people involved do not have to meet personally, but can rather use the infrastructure to share the items.



The major idea is to offer two services. The first would be offering a sharing platform on which participants can create a pool of resources that can be shared amongst each another. Using the box stations would make this service more convenient as it would become less time and location dependent and provide a bigger flexibility for the participants. The second would be using the smart boxes as a delivery station as e.g. DHL has in other countries today, getting packages delivered to the station in public space. This would result in benefits such as time savings and more flexibility for the customers.

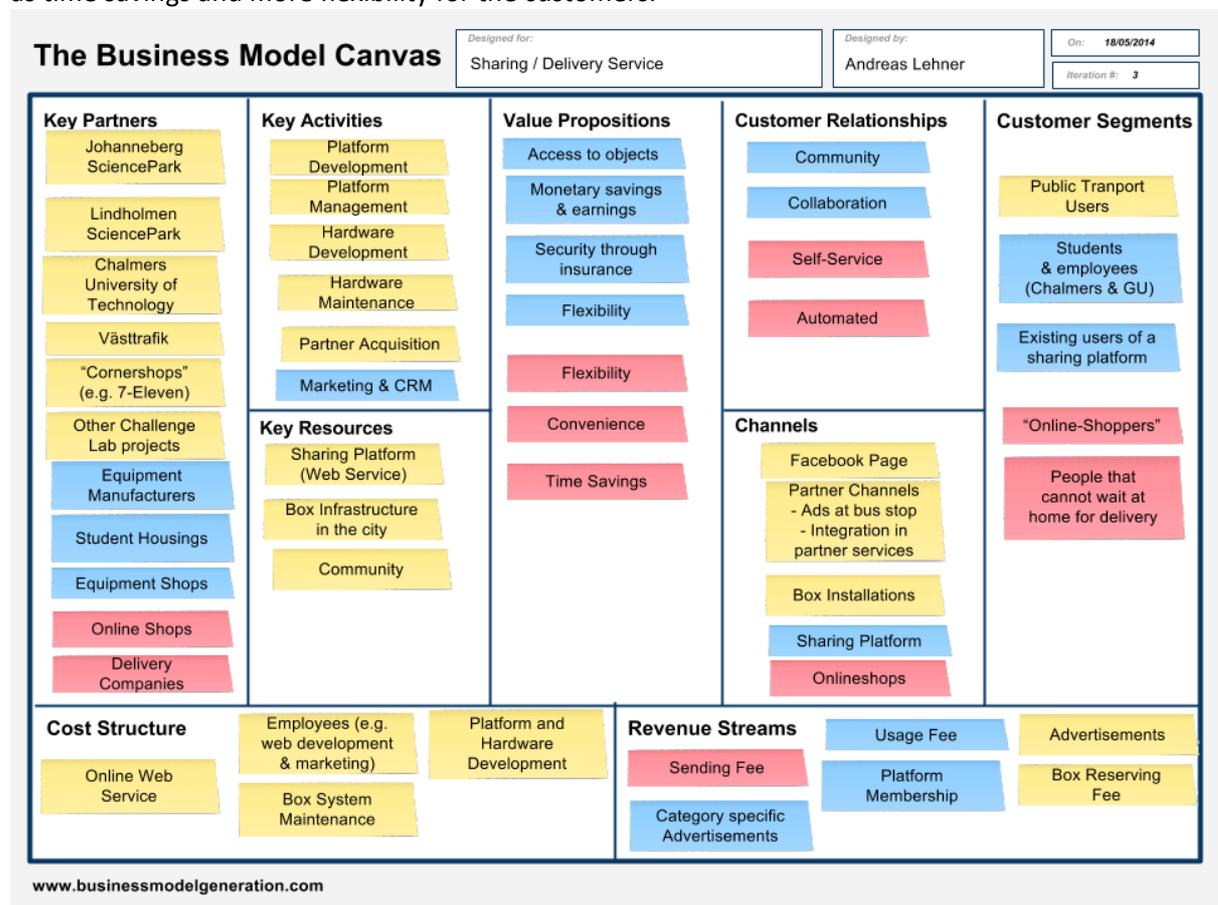
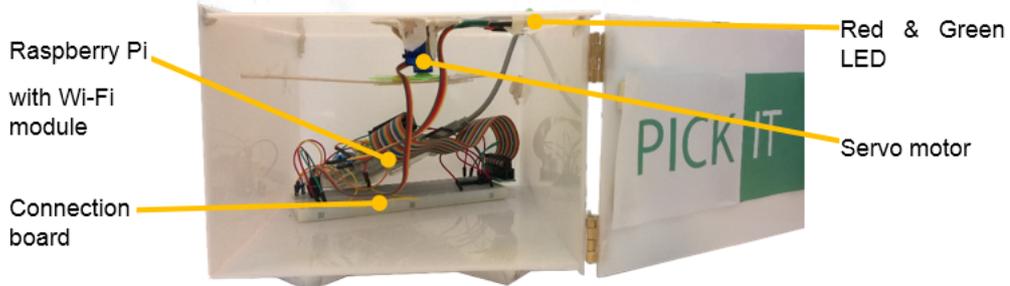


Figure 2: Box station business model canvas

Yellow – General Service | Blue – Sharing Service | Red – Delivery Service

During my time at the Challenge Lab I participated in several events, such as the Gothenburg Startup Hack. There we developed a physical prototype of the box system with a working back-end that opened the box with a servo motor if the right credentials were entered in the online platform (pickit.ga).



In order to develop this I gathered a diverse team:

| Team member      | Field                                       | Country of Origin |
|------------------|---|-------------------|
| Andreas Lehner   | Sustainable Energy Systems                  | Austria           |
| Eric Chui        | Industrial Design and Environmental Science | USA               |
| Salman Babar     | Product Design                              | Sweden            |
| Guillermo Guridi | Computer Science and Mathematics            | Spain             |
| Gina Bolaño      | Web Design Specialist at WePlann            | Columbia          |





### **Author**

Personally, since I started to study I wanted to contribute with my knowledge to a change in our society towards a more sustainable future. Therefore I was in some sort a change agent in mind for some time already.

I believe that the topic “Sustainable Transport and Mobility” is one of the major problems we have to solve in order to move the society towards a more sustainable state. We have to find solutions that provide the same service while reducing the environmental impact.

My fascination for renewable energies and other possibilities to face climate change started already in high school. For a project concerning climate change I discovered Al Gore’s amazing documentary “An Inconvenient Truth”. From that moment on I knew that I wanted to contribute against climate change.

I think several things are essential in order to avoid a higher impact of climate change: a greater share of renewable energies, electric cars that mainly use electricity from renewable energy sources and the provision of services with a lower environmental footprint while having the same level as current options.

I personally also thought in a more entrepreneurial way and my experience in the Challenge Lab helped me to foster this thinking. In particular the open approach for a thesis and the exchange with the other participants let me strive for more challenging ideas. For example would I have never participated in the Gothenburg Startup Hack if it would not have been for colleagues such as Per Bergström, who inspired and motivated me to do so.

Although I am currently (September 2014) not working on the idea I developed in the Challenge Lab, I took a lot of the experience with me and am now trying to develop a crowdfunding platform for solar projects in do-good locations, such as hospitals or schools in developing countries in the Chalmers Innovation Startup Bootcamp. You can have a look at our landing page on [csolar.se](http://csolar.se).

Overall I have to say that I highly recommend the Challenge Lab master thesis project, as it will develop you as a person and let you get to know a different side of yourself. It challenges you with quite some uncertainty, but it is totally worth it.



# Backcasting approach to Sustainable Transport and Mobility in Gothenburg

**Stakeholders' Perspectives on Challenges, Barriers, and Opportunities for Sustainability Transition – Challenge Lab spring 2014**

*Burak Şen, Diana Valadez García*

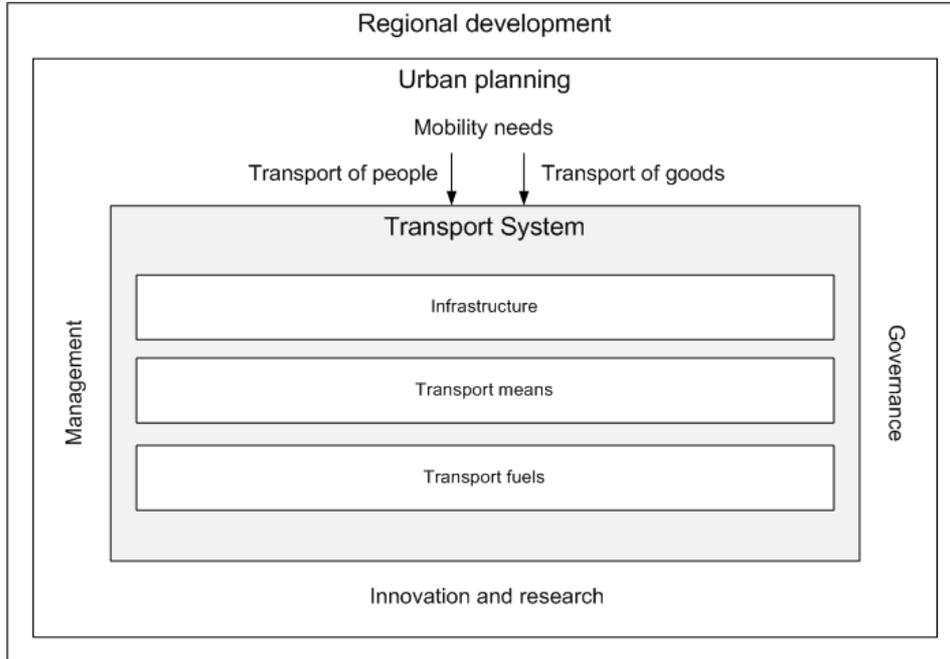
Our project dealt with challenges, barriers, and opportunities to understand what may prevent or enable the sustainability transition of the transport system to become a reality in Gothenburg from the views of the stakeholders from academy, industry, and the government.

The objectives of our study included:

- Building a conceptual model that contains the elements of the transport system,
- Identifying the views of different stakeholders, including academy, industry, and government, on challenges, barriers, and opportunities for achieving a sustainable transport system in Gothenburg,
- Identifying where these challenges, barriers, and opportunities are located on the transport system.

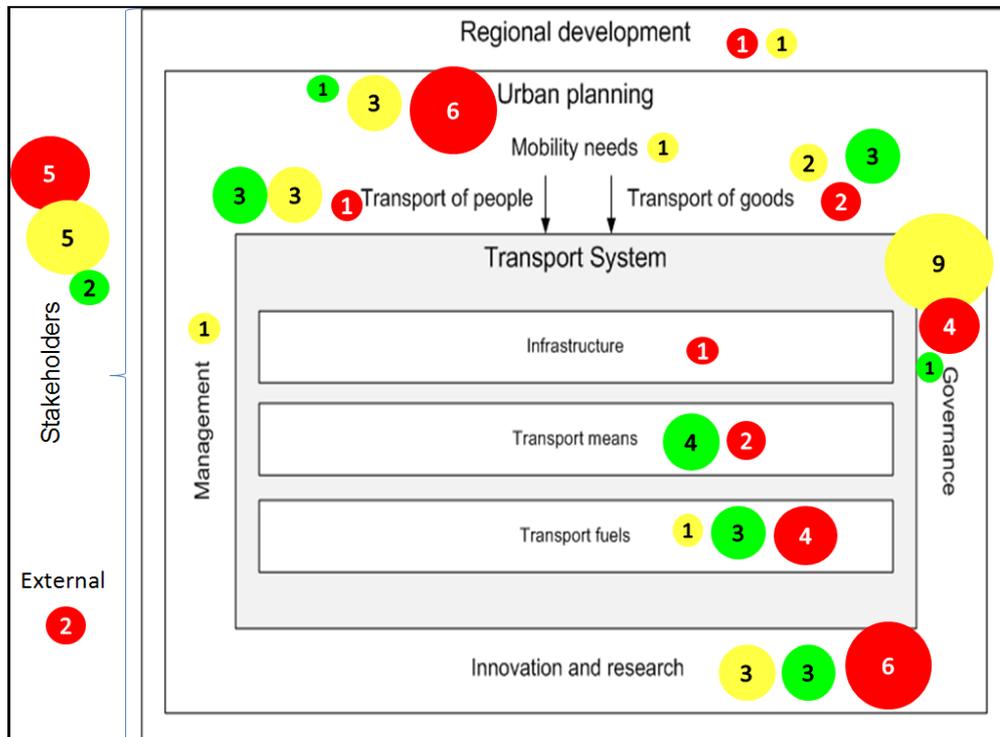
The identification of the challenges, barriers, and opportunities helps better understand the present situation of the transport system, which corresponds to the second step of the back-casting methodology used in the Challenge lab. This can help create solutions for a sustainable transport system in Gothenburg.





*Transport system model*

The model initially comprised the transport needs for people and goods, as well as the needed infrastructure, means and fuels. Respectively, the urban planning, governance, management, and innovation and research were added according to the feedback received. The urban planning category refers to the activities about the physical development of the city, while the governance to the policies and regulations shaping the transport system; the management category considers the daily administration of resources (human, economic, technical, natural, etc.); innovation and research one includes the emerging projects related with transport, new business models, academic research, etc. The regional development level was the last element to be added in order to consider a category for external projects (in the regional level) influencing the entire system. This model was the base for the classification of the 29 challenges, 33 barriers and 20 opportunities identified during the interviews; we transcribed, coded and synthesized the information in order to obtain their location and then, identify the main (or most repeated) ones among the stakeholders.



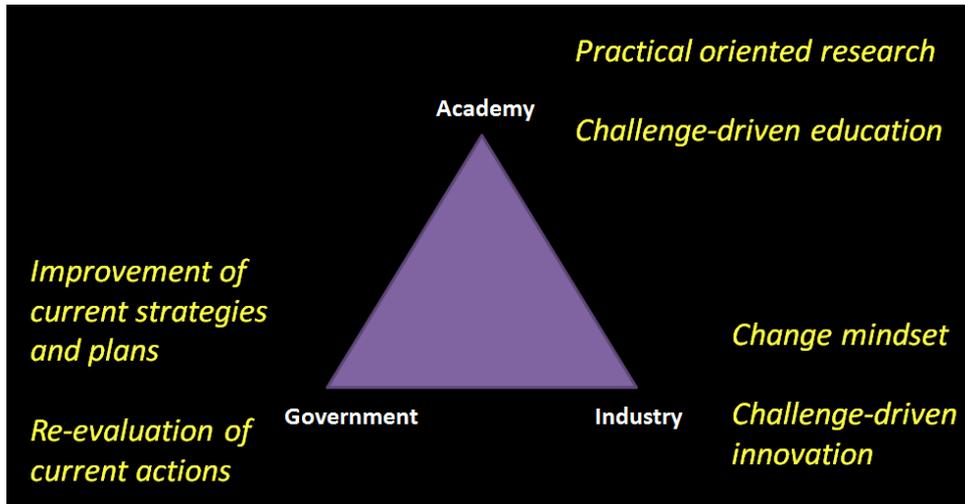
Location of the 29 challenges (in yellow) 33 barriers (in red) and 20 opportunities (in green)

Our findings showed that *collaboration between the stakeholders and integration of transport into the city planning* are among the main challenges towards a sustainable transport system, but could become opportunities, if addressed. Main barriers identified were the *limited space in the city* and the *politician's fear of loss* when proposing and implementing sustainable strategies. On the other hand, we found that, in the opinion of our interviewees, transition towards a sustainable transport system can be better achieved by *increasing dialogue among stakeholders* and by having a *systems thinking perspective* when planning the future of the transport system in the city.

We believe the main use for our master thesis would be to stimulate dialogue between the stakeholders of the transport system in Gothenburg. The results can be incorporated into the discussions about improving the circumstances, both for carrying out actions, strategies, and accomplishing goals regarding the transport system, and for improving the existing decisions in this regard. We note that the diversity found between the perspectives of different stakeholders could present the opportunity to develop and implement more robust strategies towards sustainability. Moreover, our work can also serve as a source of inspiration, for example, for entrepreneurs and companies to incorporate new sustainable solutions into the system to deal with the current challenges (i.e. challenge-driven innovation) and barriers. This inspiration can also



reach the academy and help new ideas for challenge-driven education and practice-oriented research to emerge.



*Use of our results*

We come from two developing countries - Mexico (Diana) and Turkey (Burak) and decided to take on the challenge of bringing sustainability to our countries of origin, embracing the paradox: *think globally, act locally*. Therefore, we both chose to study Erasmus Mundus M Sc. Industrial Ecology (MIND) in Europe, where sustainability practice has been taking place in the society at both individual and institutional level. Before starting the studies in the MIND program, Diana studied Industrial and Systems Engineering and worked for 4,5 years as a Business Process Analyst and Consultant in Mexico, helping organizations, both from the private and public sector, to improve their performance, design and implement strategies for organizational change; Burak had working experiences as an Environmental Consultant Engineer, both in Spain and Turkey in both private and public sectors for more than 1,5 years, dealing with environmental management, control and protection.



We shared the same mobility scheme of the study, studying at Karl-Franzens-Universität in Graz, Austria in the first year (2012 – 2013) and Chalmers University of Technology in the second year (2013 – 2014).



## REDEFINITION OF TRANSPORT SHARING SYSTEM FOR A SUSTAINABLE FUTURE

Gothenburg has a unique geographic location in Scandinavia, which makes Gothenburg a transport hub for both personal transport and freight transport. There are several important industrial clusters in Gothenburg and surrounding cities. Gothenburg cannot be seen as a separate city from its surrounding cities since there are a lot of people who commute between the cities.

The new infrastructure will encourage other modes of transport such as cycling, train and boat for both personal transport and freight transport. Gothenburg region is preparing the transition of transport mode. It is necessary to discuss a way to utilize the existing transport facilities as much as possible to achieve a sustainable future in terms of mobility and transport without compromising well-being and economic development.

Horizon 2020 (European Commission Decision C, 2013) has been one of the most instructive documents for us when thinking about the project. It is a work program 2014–2015 showing EU's proposals in the area of transport. The document showed a series of hot spots in EU's work. Some of the points fit our interest and led to our project. Those inspiring parts are (ibid.)

- *Common communication and navigation platforms for pan European logistics applications (MG.6.3-2015.)*
- *Connectivity and information sharing for intelligent mobility (MG.7.1-2014.)*
- *Towards seamless mobility addressing fragmentation in ITS deployment in Europe (MG.7.2-2014).*

When it comes to using the existing transport facilities, the openness towards transport sharing systems among the people living Gothenburg is very important. On survey conducted, 45% people are open for bike sharing and 55% people are open for car sharing. This percent is quite high when compared to other cities where transport sharing systems are not operated full-fledged. On gender basis, females are more open for bike sharing and males are for car sharing, which could be well related to behavioural economics.

In a city with high openness towards transport sharing system and not fully influenced by the same, a redefinition of the



transport sharing system for a sustainable future is highly favourable. Sekhi, is a platform based on virtual mapping of system entities into a cloud platform of transport systems. Entities are all modes of transport like cars, bikes and other vehicles. The virtual mapping is enabled by locks with GPS or GPS plugin hardware devices in system entities. Once every transport entity is mapped virtually, patterns are observed and based on the patterns a sharing system is enabled. Thus Sekhi enables a sharing system to be developed with the existing transport facilities.

Freight transport can also benefit from the virtual mapping platform. The main idea is to facilitate people to deliver goods on their commute way by crowdsourcing. The platform identifies the patterns of transport entities and the users can search and share demand and supply information through mobile APP which is to create a social network style communication for all the users. The users can provide the delivery service or consume the service. The service is defined as person-to-person.

The results of the survey show that people would be willing to deliver goods on their way depending on several benefits such as economic incentives, low price for long-distance delivery, urgent delivery or other personalized delivery. The main concerns of this type of delivery focus on security of the goods and adaptation of the local regulations. The countermeasure includes but not limit to strict personal information censor for user registration including ID number, credit card and so forth. In addition, a mandatory process includes signing agreements. The process of making agreements is simplified by the APP without compromising the legal function so that the users can use it smoothly. The business model shows a possibility to make the delivery more flexible and thus make people's life more convenient.

Meanwhile this business model can lead to positive impact on sustainable development. Through the data we have collected, many new construction projects have been planned or being implemented for transportation in Göteborg such as new infrastructures. Furthermore, the trend of sharing economy motivate more people to share the idling resources in terms of both service and products, which could reduce the production of new products but increase the transportation of the existing goods. In the thesis, the combination of personal transport and freight transport is regarded as one way to increase the utilization rate of the available transport capacity. That people carry goods is a natural way to move the goods without creating extra traffic, which also meets the trend of sharing economy.



The traditional business model canvas in this case is not completed. Taking all stakeholders into account and creating value for all the stakeholders are the key to make the business successful and meaningful. The value for sustainability is emphasized. Taking into the considerations of needs, we have constructed a new business model canvas for societal entrepreunering firms or projects and that frames our theoretical result of our thesis work.

Sekhi, from being a concept project has been developed into a company incorporated with funding from an innovation office. Updates on Sekhi can be found in the following sources.

- Website: [www.sekhi.com](http://www.sekhi.com)
- Facebook: [www.facebook.com/thesekhi](http://www.facebook.com/thesekhi)
- Twitter: [www.twitter.com/thesekhi](http://www.twitter.com/thesekhi)

## ABOUT US

**Prashanth Sekhar**, has a masters in Management & Economics of Innovation and a bachelors in Mechanical Engineering. Is a dreamer and a value creator & connector. Challenge Lab has enabled him to understand, enhance, visualize the importance of sustainable development and evolve with wisdom, joy and fraternity of the same. With self and societal values, he challenges ahead with visions for a sustainable future.



**Zhiyu Olivia Tang**, coming from Shanghai, China, feels happy to see the economy boost while sad to feel the environmental deterioration. She believes that there is a way to get economic benefits and keep the natural environment at the same time. She has a masters in Supply Chain Management. She believes that more and more people start to work in business focussing on sustainable development in some way or the other.





# *BIODIESEL IN SWEDEN*

## *Drivers, barriers, networks and key stakeholders*

*Our thesis focuses on a specific challenge related to sustainable mobility and transport in Sweden. The transportation sector heavily relies on oil; and if it continues to do so, the most serious threats include oil scarcity, economic and geopolitical instability and negative environmental impacts such as climate change. One of the major sustainability challenges at the moment is climate change almost entirely caused by anthropogenic greenhouse gas (GHG) emissions. In Sweden, a massive 2/3 of the GHG-emissions come from road transport. No single technology will be able to replace fossil fuels used for vehicles within a significant period of time. Therefore there are many alternative technologies that will be pushed for.*

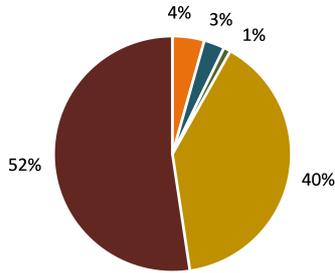
*In Sweden, biodiesel fuels are the biofuel type with the biggest market share, 53.4% based on energy content; however biodiesels hold a small market share out of the total diesel fuels, 4.3% based on energy content. The objective is to identify barriers to the growth of biodiesel fuels in Sweden and the key stakeholders with the potential to overcome the barriers.*

*The barriers and drivers were identified with the methodology of Functions of Innovation Systems (FIS). Barriers are: i) high production costs of biodiesels compared to conventional diesels, ii) limited state aid (mainly tax exemption) that lacks future oriented vision, iii) low visibility of biodiesels, iv) weak market for biodiesel fuels in a medium and high blended form, v) environmental concerns associated with biofuels, vi) feedstock limitations and vii) lack of strong advocacy coalitions.*

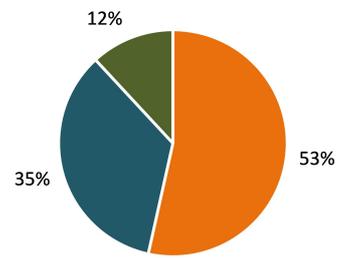
*The powerful stakeholders were identified through Social Network Analysis (SNA) and interviews, article authorship connections and conference participation. Key stakeholders in the Swedish biodiesel market are the Volvo group, Preem and policy makers on national, regional and local levels.*



Use of fuels in Sweden, 2012



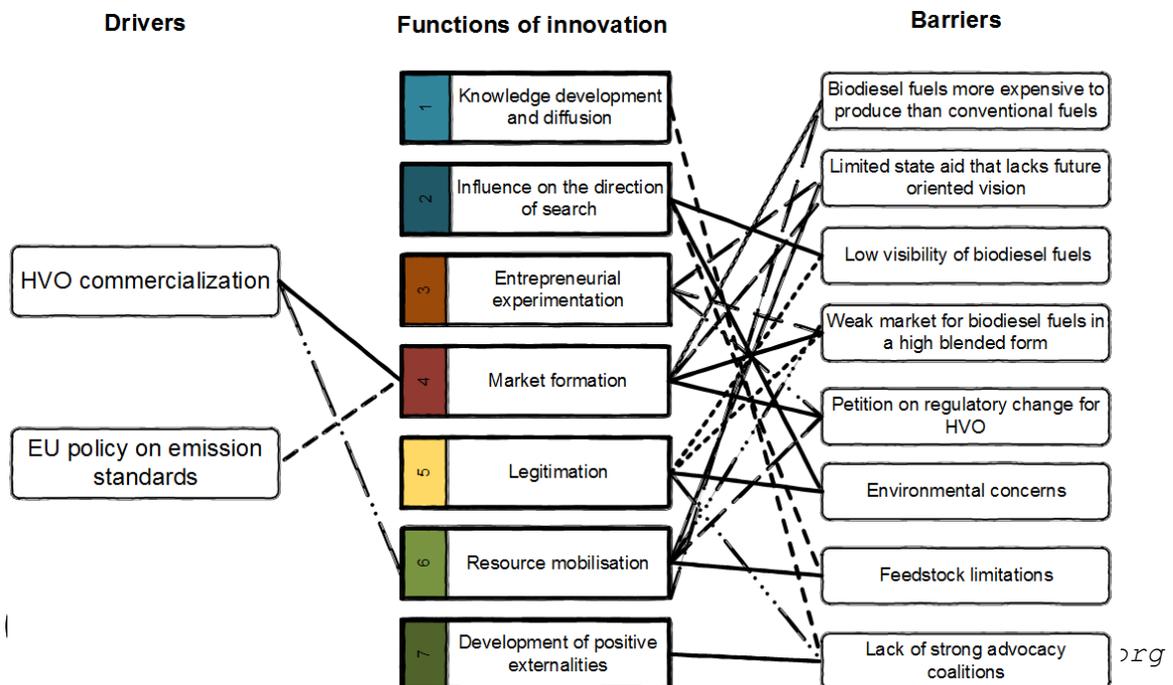
Use of biofuels in Sweden, 2012



■ Biodiesel fuels  
 ■ Bioethanol fuels  
 ■ Biogas  
 ■ Gasoline  
 ■ Diesel  
     
 ■ Biodiesel fuels  
 ■ Bioethanol fuels  
 ■ Biogas

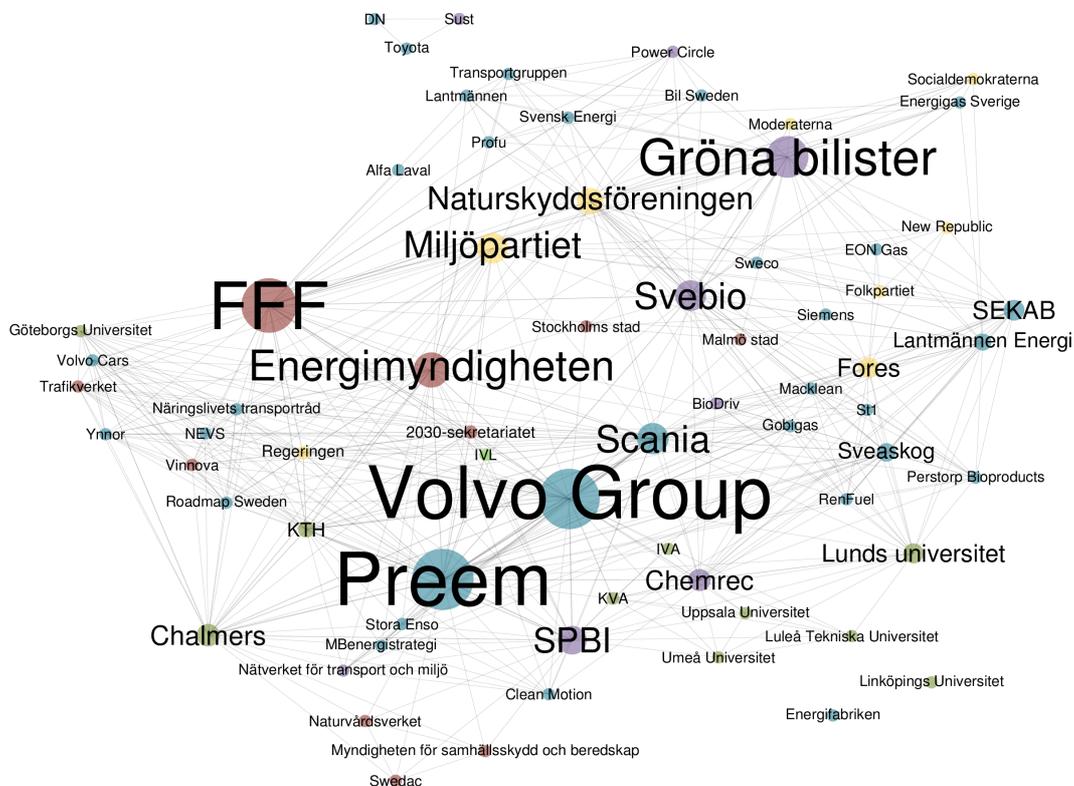
Biodiesel fuels is a common name for mainly three diesel fuels: FAME, HVO and DME. Together, they are the largest biofuel for vehicles in Sweden but still get less attention than ethanol or biogas. We wanted to change this and investigate what could boost biodiesel to diffuse and develop. By drawing attention to renewable biofuels, the GHG impact from road transport could be significantly lowered.

We identified the following barriers and drivers for biodiesel and how they relate to the seven functions of innovation. The main drivers are the commercialisation of HVO, a second generation biodiesel with high compatibility with conventional diesel engines, and EU regulations on emissions that drive research and development of biofuels.





We also made several maps of which actors that work with biodiesel. The network above is based on all participants in conferences on biodiesel or topics that touched upon biodiesel such as biofuels and sustainable transport in general. Volvo Group and Preem are two important stakeholders, as well as the governmental investigation of a fossil free fleet by 2050 (FFF).



## ABOUT US

**Cecilia Hult** is an Engineering physics student from Gothenburg, who wants to combine her studies in Complex Adaptive Systems with her passion for sustainability. The Challenge Lab provided an opportunity to do so and also to get great friends from all over the world.



**Daniella Mendoza** is international student from Mexico. Her bachelor is in Biotechnology Engineering and master in Industrial Ecology. The study of bio-diesel fuels in Sweden was therefore a good way to combine her previous studies with her passion towards sustainability.





## **A PRE-STUDY OF A POTENTIAL DIFFUSION OF SMALL ELECTRIC VEHICLE IN THE GOTHENBURG AREA**

By being part of C-Lab we achieved a comprehensive understanding of the transport system and the challenges it faces on both a global and local, Gothenburg, level. With both a growing population and growing cities as well as constantly increasing needs for transportation in a globalized world it is clear that the current system is not sustainable. However, it is also clear that the change needed is held back and there is no easy solution to such a complex issue as solving the needs for transportation in a sustainable way. One big problem is that most means of transportation is dependent on fossil fuels that contributes to emissions locally as well as adding to the green house effect.

With an academic background as master students in the Management and Economics of Innovation program at Chalmers we have come across a lot of theory on how to induce change and promote innovation both on a societal and an organizational level. With that in mind we wanted to further investigate the problems but also the potentials that new fuel technologies faces when trying to take place in the transportation system and also investigate how to intervene in order to speeding up that process. The Västra Götaland Region was the natural choice to use as example since we already had some knowledge of the current situation but also had access to external knowledge within the region. We decided to use a start-up company, Clean Motion, as an example of a new type of vehicle, a so called small electrical vehicle (SEV), with potential to be a more sustainable alternative to the fossil fueled car in an urban environment.

Our research questions were finally formulated as:

- What possibilities and barriers are linked to the diffusion of SEV within the Gothenburg area?
- How could the chances of a successful diffusion and the speed of adoption be increased?

To investigate these two questions a case study was conducted on Clean Motion and its product Zbee. The reason was that from the socio-technical system theory it was stated that disruptive technology often has its origin in the niche and not the main stream market. We also complemented the findings from the case study with a





literature study focusing on the socio-technical system theory, diffusion theory and business model theory. Additionally, we conducted interviews with experts in the area as well as a survey in order to map attitudes of the people living the Gothenburg area regarding alternative modes of transportation. Some of the findings from our research are presented below.

- Behavioral aspects and values are often a higher barrier than technological aspects when it comes to the systems adaption of an innovation. Cognitive lock-ins limits the possibilities available.
- The Zbee is a vehicle that not only represents a different technology but also in many aspects addresses a new market segment, which implies higher barrier than for a "normal" EV.
- The relative advantage is crucial to whether a product diffuse or not. In the Gothenburg area are the issues connected to transportation not as big as in bigger cities such as Dehli or Paris and the relative advantage is thus lower in Gothenburg.
- The relative advantage is subjective though the relative advantage could in fact be higher for the Zbee in some cases objectively, it is the perceived relative advantage that is relevant. For some customers segments are for example environmental aspects value adding.
- For innovations it is important to identify a niche market in which it can grow and develop. In Gothenburg are there potentially niche markets where an SEV could be suitable. To succeed it is crucial to have the correct fit between the niche segments needs and the business model.
- Alternative business models within transportation are expected to emerge within the transportation system. For example is it suggested that mixed vehicle fleets will be shared in an urban setting where the SEV could be a complement to other vehicles.
- It is also suggested that communication is crucial to diffusion where interpersonal communication are an important tool to share experiences and change the values.

Our findings points at the need for initiatives like C-Lab as many of the factors that could enable or hinder the diffusion of a potentially more sustainable alternative to the fossil fueled car





are connected to inter-personal contacts, culture, values and awareness. The technology is a pre-requisite but for true change to happen it is important that the norms and values of the society is in line with the change. Students taking the role as change agents could be one way of influencing the norms of the society and C-Lab is a potential platform for such change.

In the specific case of the SEV, chances of challenging the fossil fueled car dominance in the transport system are considered rather low in the Gothenburg region right now. However, to make a more valid estimation of the SEV's future possibilities it is suggested that a larger number of similar solutions to the Zbee are investigated. It is also necessary to gain deeper knowledge of the potential customer segments and analysis of the business model more in detail.

## ABOUT US



**Johanna Hanson**, has a masters in Management and Economics of Innovation and a bachelor in Industrial Engineering and Management. Always tries to see things from a broader perspective and like problem solving. Most interesting aspect of taking part in C-Lab was how it challenged my previous view on the area of sustainability and my own role in it as part of the solution.



**Per Härdfeldt**, has a master's degree in Management and Economics of Innovation and a bachelor's degree in Industrial Engineering and Management. Always had a very curious mind and eager to understand how things work and if they could be done in a better more efficient way. C-Lab has opened up his eyes to the importance of achieving a sustainable transition of our society and the great complexity in doing so. C-Lab has further resulted in knowledge that can be used in order to overcome this complexity.



# A mobile application for public transport - How can gamification be used to promote the use of electric buses for a sustainable future?

## Summary

The public transport area covers a wide range of actors within the industry, academia and public sector. Targeting a competence area of public importance does not only change transportation practices, it also utilises IT solutions for mobile devices that supports sustainable innovation areas of a near future. The ever-growing need to think creatively about sustainable development is something that is needed globally. Creating a sustainable transport situation in Gothenburg is no easy task, but if you act locally, more will follow and inspire others to act.

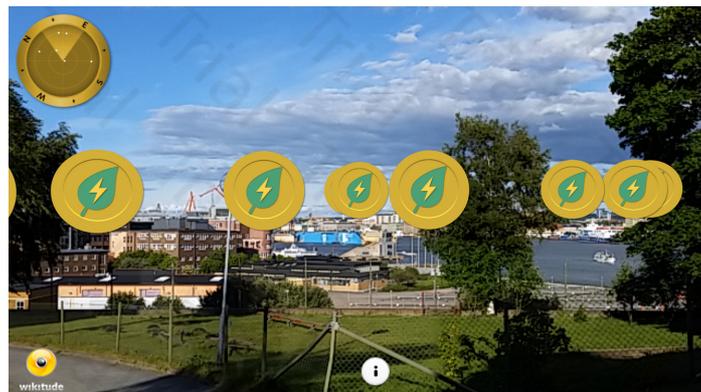
We chose to act locally with information technology, knowing that the need of the everyday traveler changes, so does the need for information technology in society. Our approach is targeting the public transport sector with sustainable gamification practices, combining this with analysing user studies, evaluating design concepts and finalising an app prototype which will result in the design of a new product-service system.

That's how we came about to choose the ElectriCity project, which focuses on how to get commercial actors together with open innovation, to generate a sustainable future for public transport and bring it up to another level.

We also noticed that sustainable gamification practices can change behavior. One particular example of this is Recyclebank, where 97% of the participants were more likely to take green actions because of the in game challenges, while raising their knowledge about the environment.

Now we just had to explore this area further to see if a digital gamification service could actually increase environmental awareness as well as get users travelling more often with the electric bus.

The niche area came to be a bus app that is meant to limit the use of normal bus cards, meaning that bus card manufacturing would decrease and there would be no need to buy new bus cards monthly from refill shops. Including to this the app should also be user-friendly, fun to use and create a "buzz" on the bus stops.



## Bio

Coming from an Interaction Designer background, the gamification project work done during our master thesis, represent a very traditional way of creating interactivity within our design field, but the ideation and research phase of C-Lab has changed our perspective on what sustainability is. We have been influenced by C-Lab by seeing the different layers in sustainability and how closely related this is to design as well.

Most people only see the tip of the iceberg when they look above the surface of sustainability behaviours. They do not recognize the other layers below the surface, such as the purpose of the contribution and service sectors, the identities of local and global issues, the beliefs in making a difference and what the core human values and capabilities are.

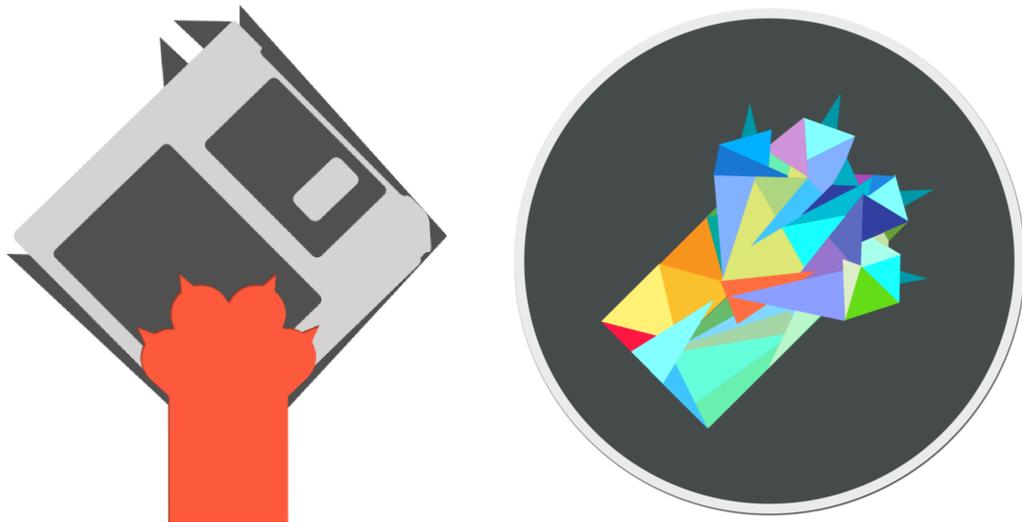
In design it is the same thing. People only see the tip of the iceberg, which is the visual design, but there are more layers to consider, such as wireframes, screenflow, site maps, scope of requirements, content, concepts, implementation and user research etc.

Therefore implementing AR technology, with gamification practices, we believe it can be a new recipe for success to cross new borders for a wide variety of sustainable public transport applications. By creating an app for sustainable public transport, which follows gamification practices could very well form a new shift and go beyond the current paradigm of apps.

We have continued our work by founding our own company in the hope of making this service available for the new electric bus line that commences in 2015.

Check us out on [devkittens.com](http://devkittens.com) for updates and news.

Don't argue with a Floppy Disc Bird instead get in touch with a Devkitten!



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