

# CHALMERS



## Redefinition of transport sharing system for a sustainable future

Challenge Lab 2014: Sustainable Transport and Mobility Solutions

*Master of Science Thesis in the Master Degree Programme,  
Management & Economics of Innovation*

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Gothenburg, Sweden, 2014

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Challenge Lab 2014: Sustainable Mobility and Transport

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Sustainable mobility & transport  
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## **Abstract**

The thesis work is divided to two phases. Phase I focus on Challenge Lab process based on the methodology of backcasting, from an outside in and an inside out approach. The outside in approach is related to knowledge input while the inside out approach is to research oneself. Challenge Lab students use design thinking to combine the learning of both approaches for the purpose to decide the project topic in Phase II.

In the project, a new business model is created to transit the current transport system in Gothenburg and lead to a sustainable future. The main composition of the project are:

- A system consists of a virtual mapping platform and GPS smart lock. The platform gets the signal of the locks and record the moving patterns. An APP is connected to the platform to show real-time vehicle location.
- Co-shared transport (e.g. bike sharing and car sharing) provides private vehicles to the sharing market
- Urban goods are delivered on people's commute way with the support of smart boxes

The project proposes a new way to integrate the existing transport capacity for both personal transport and freight transport in the urban area and a new way to think business model with regard with sustainability.

**Keywords:** Chalmers Challenge Lab, Transport Sharing Systems, Sharing economy, Stakeholders, Business Models, Technical Innovation Systems



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## **Introduction**

*This section gives an overview of entire master thesis conducted in Challenge Lab.*

## **Background**

Challenge Lab for spring 2014 is focused on backcasting from a society with a sustainable mobility and transport. The lab is located in Kuggen at Lindholmen Science Park, Gothenburg, Sweden. The thesis started with educational modules in entrepreneurship, design, leadership and sustainable development to equip us for the work in the Challenge Lab. The lab believes that a student has an ability that goes beyond what any actor in society can do alone and the students are the change agents that can bring about transformative solutions in society. We work in this dynamic environment with other master students, where we connect projects, private sector and public sector initiatives together with academia to find leverage points in the system - to then suggest and initiate solutions to take all sectors in society forward.

## **Aim**

To create a multimodal transport sharing system which focusses towards a sustainable future.

## **Research Questions**

The following research questions will be investigated to provide a basis for fulfilling the purpose of the report.

- How is the current transport system framed in Gothenburg?
- How open are people for transport sharing systems?
- How can the transport sharing system be redefined for a sustainable future?

## **Objectives**

The main objective to create a multimodal transport sharing system is to use the existing resources by which leading a sustainable future. Added to the transport sharing system, is to integrate freight transportation with the urban area.

## **Delimitations**

The main delimitation in the study is that it is limited to Gothenburg urban area. In terms of creating a systemic level change globally, a wider study has to be performed. Adding to this factor, is the time availability. Due to time constraints, the thesis focusses on creating solutions in conceptual level only.

## Outline of thesis

**Phase I** describes Challenge Lab as such in terms of *What is Challenge Lab, How does it proceed* and *the result of Phase I*. The process of Challenge Lab is the main part which introduces how Challenge Lab team applied outside in and inside out approaches, the methods such as backcasting, design thinking, the tools such as the funnel, the compass, dialog, and the theories such as system transition. Phase I also indicates how did we find our Phase II project by going through the processes.

**Phase II** researches the new business model leading to next generation transport sharing system affecting both personal transport and freight transport. The chapter includes background, theories, methods and data analysis.

**Discussion** contains discussions for both Phase I and Phase II with several examples.

The **results** of the thesis consists of the theoretical result which is a new business model and the practical result which plans to be a startup.

**Conclusion** answers the three research questions and **future research** is given in the final chapter.

## Phase 1

*This section explains about the Challenge Lab framework and its methodology.*

### Introduction

Chalmers with a vision statement of “For a sustainable future” strategizes towards with various developments. One such is the development of a matrix organisation called “Areas of Advance”. Chalmers’ strategy of excellence with Areas of Advance is to visualize and focus on research, innovation and education. This matrix organisation of Areas of Advance are driven by key factors, which are sustainable development, innovation and entrepreneurship. This matrix organisation envisions to match the scientific excellence to global challenges and thereby making a difference. It was launched in 2008, with focus on eight areas, comprising Energy, Material Science, Nano Science & Nanotechnology, Production, Transport, Life Science, Information & Communication Technology and Built Environment. The first five areas mentioned have received substantial government funds. Furthermore through the formation of Chalmers Environmental initiative in 1999, this even more empowered Chalmers University of Technology to be seen as sustainable university in global context.

With the Areas of Advance established, system of collaboration and co-creation is deepened by the process of adding glue to the system. This glue is recognized as students who have unique features for becoming powerful change agents and to take on the sustainability challenges within the regional knowledge clusters, using the Science Parks as a base and this student driven transition arena is called “The Challenge Lab”.

### What is Challenge Lab?

The main mission of the Challenge Lab is to address complex societal challenges by connecting public sector, private sector and academia. The lab believes that a student has an ability that goes beyond what any actor in society can do alone and the students are the change agents that can bring about transformative solutions in society. This is accomplished by students as change agents, contributing to existing projects or new projects with a focus on Challenge driven Innovation.



*Figure 1: Challenge Lab - Change Agents*

The Challenge Lab aims to:

- Strengthen the educational dimension in the knowledge triangle within the Areas of Advance.
- Become an important hub for the triple helix actors within the five regional knowledge clusters where all actors can gather around the students, as they all are interested in and care for the students.
- Build trust within the clusters through students. As they often carry the capacity of simultaneously being unthreatening and challenging, they can take the role of being the highly needed change agents to society.
- Give the students the opportunity to develop unique skills in working across disciplines and from a challenge driven perspective.

The potential of 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 challenge labs from different regions of the world. (Holmberg, 2014)

## **Structure**

The Challenge Lab organization is being headed by the examiner and the project leader. Spring 2014 is the first academic semester for the Challenge Lab. And in the pilot Challenge Lab team, there are 12 change agents (12 master students) doing their master thesis focused with the principles and objectives of the Challenge Lab. The main theme of spring 2014 Challenge Lab projects (master theses) are focused on bringing about Sustainable Transport and Mobility Solutions. Details of key persons are stated in Appendix III.

**Examiner:**  
John Holmberg

**Project Leader:**  
Kamilla Kohn Rådberg

**Project Coordinator:**  
David Andersson

**Change Agents:**

- Prashanth Sekhar
- Olivia Tang
- Andreas Lehner
- Benjamin Lillandt
- Sebastian Ilves
- Cecilia Hult



**Change Agents:**

- Per Bergström
- Daniella Mendoza
- Diana Valadez
- Per Hardfelt
- Johanna Hanson
- Burak Sen

**Key Persons involved**

Örjan Söderberg  
Maria Grahn  
Ulrika Lundqvist  
Björn Sandén  
Mats Lundqvist  
Frances Sprei

Göran Carstedt  
Martin Sande  
Dominic Van Martens  
Mats Rydehell  
Magnus Blinge  
Anna Dubois

Anna Wenstedt  
Sofia Hellberg  
Hans Fogelström  
Axel Edh  
Thomas B.Johansson  
Staffan Truvé

*Figure 2: Organization Cluster*

This team of change agents manage and lead a challenge driven cooperation for identification and initiation of trans-disciplinary and transformative solutions together with the Industry cluster, Chalmers Area of Advance Transport, City of Gothenburg and the Region of Vastra Gotaland. It is a trans-disciplinary team of master students from six different master programs and seven nationalities.

*Table 1: Master Programs and the change agents*

Master Program	Name	Native Country
MSc. Industrial Ecology	Daniella Mendoza	Mexico
MSc. Industrial Ecology	Diana Valadez	Mexico
MSc. Industrial Ecology	Burak Sen	Turkey
MSc. Complex Adaptive Systems	Cecilia Hult	Sweden
MSc. Management & Economics of Innovation	Prashanth Sekhar	India
MSc. Management & Economics of Innovation	Per Bergstrom	Sweden
MSc. Management & Economics of Innovation	Johanna Hanson	Sweden
MSc. Management & Economics of Innovation	Per Hardfelt	Sweden
MSc. Interaction Design & Technologies	Sebastian Ilves	Sweden
MSc. Interaction Design & Technologies	Benjamin Lillandt	Finland
MSc. Supply Chain Management	Zhiyu Olivia Tang	China
MSc. Sustainable Energy Systems	Andreas Lehner	Austria

## Methodology

The Challenge lab theses for students started with various educational modules in entrepreneurship, design, leadership and sustainable development. These modules prepared students to become change agents within the regional knowledge cluster (the system). This preparation consisted of two parts. (Holmberg, 2014)

- *Outside-in Approach*, includes knowledge, methods and tools to understand and deal with the requirements of global sustainability will put on the system
  - Backcasting (to understand the overall process)
  - The Funnel (to understand present unsustainable trends)
  - The Compass (to map the group's sustainability goals)
  - Principles for sustainable development
- *Inside-out Approach*, includes 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.
  - Self-values (to understand your own values, strengths and goals and to build the team with openness and active listening)
  - Self-Leadership (to get inspiration insights about leadership for sustainable development)
  - Dialogue tools (to get tools for interacting and co-creating and tools to "get under the surface" to identify true driving forces)

Change Agents with this preparation gain knowledge to look in for sustainability transition of socio-technical systems by combining them with good interaction with stake holders in a strategic level. And this helps to create a network of interested key areas with ongoing research projects (also in line with sustainability principles). On applying this network of network map to design thinking process helps change agents to formulate their own research questions or projects towards "Sustainable Transport & Mobility Solutions".

This entire process where change agents deal with the regional knowledge cluster is seen as two phases. (Holmberg, 2014)

- *Phase I*: Change Agents 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 change agents formulate the questions that will be the theme for the second phase.
- *Phase II*: Change Agents dig deeper into the formulated questions by interacting with more specific stakeholders in a multi-level design process.

Educational modules on project management helped students to carry on these phases in limited time effectively.

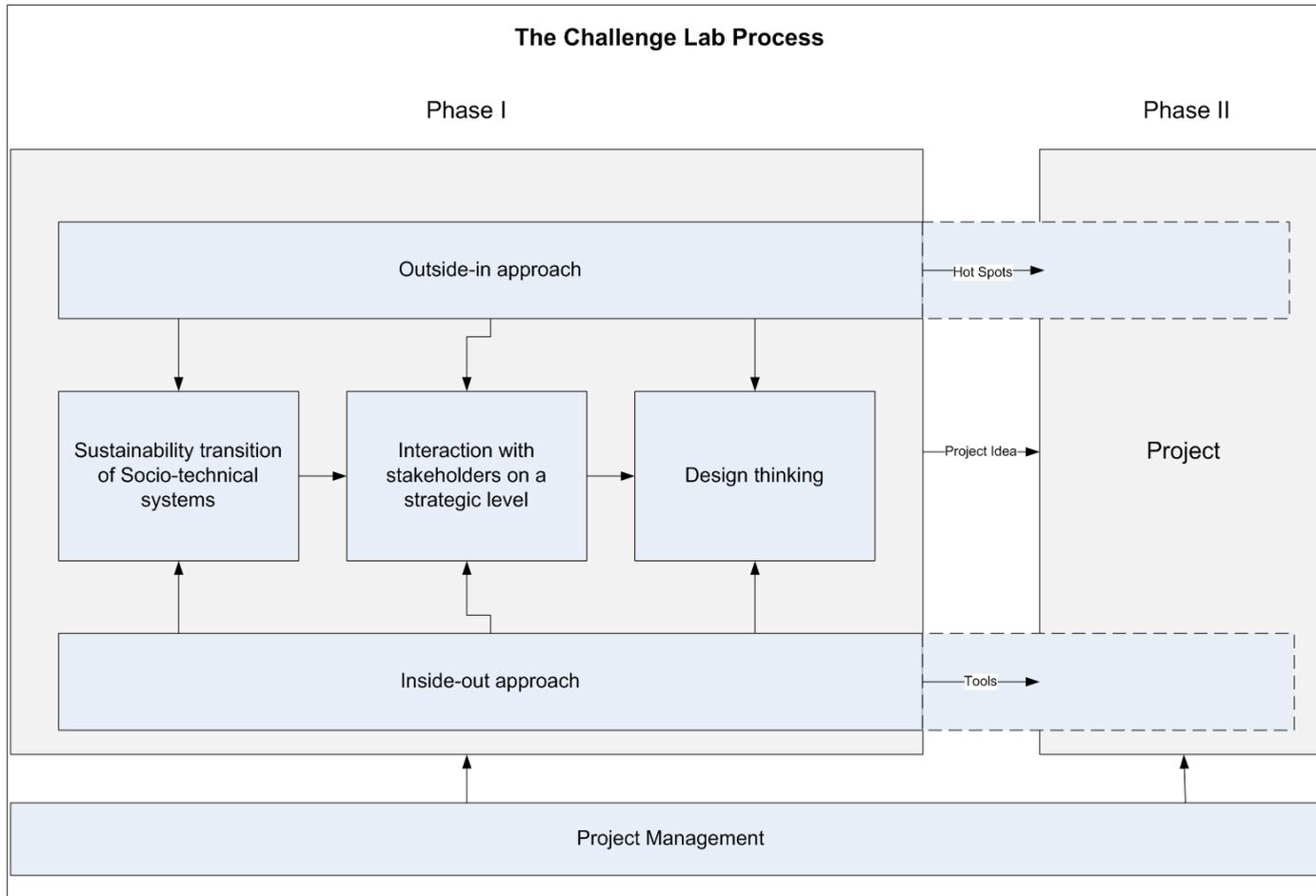


Figure 3: Challenge Lab Process Diagram

## Outside-In Approach

### Backcasting

Backcasting (Holmberg & Robèrt, 2000) is “a method in which the future desired conditions are envisioned and steps are then defined to attain those conditions, rather than taking steps that are merely a continuation of present methods extrapolated into the future” (p. 294). It is a reverse-forecasting technique which starts with a specific future outcome and then works backwards to the present conditions. Backcasting stands out as an alternative to traditional forecast (Robinson 2003).

As stated by Dreborg (1996), Backcasting is particularly useful when:

- The problem to be studied is complex.
- There is a need for major change.
- Dominant trends are part of the problem.
- The problem to a great extent is a matter of externalities.
- The scope is wide enough and the time horizon long enough to leave considerable room for deliberate choice.

To overcome the limits of present technology and theories as well as the fact that upcoming – possibly dominant - trends are not predictable, backcasting from the ultimate situation to develop what is currently possible is a good way to begin. (Holmberg and Robèrt, 2000)

When applied in planning towards sustainability, backcasting can increase the likelihood of handling the ecologically complex issues in a systematic and coordinated way, and also to foresee certain changes, even from a self-beneficial point of view, of the market and increase the chances of a relatively strong economic performance. (Holmberg and Robèrt, 2000)

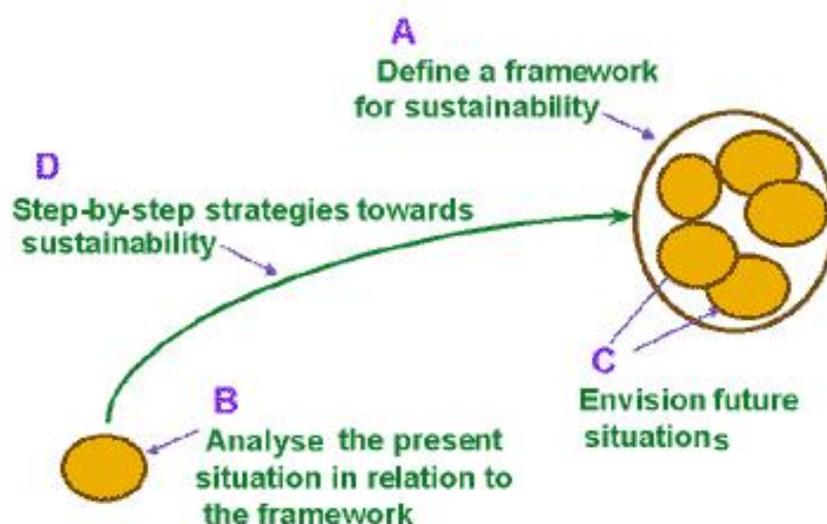


Figure 4: Backcasting (Holmberg, 1998)

John Holmberg describes four system conditions for a sustainable society. These principles provide guidance for an individual or any organization moving towards sustainable development. (Holmberg, 1995)

Table 2: System Conditions & Sustainability Principles Source: (Holmberg 1995)

	<b>The Four System Conditions...</b>	<b>... reworded as The Four Sustainability Principles</b>
	<b>In a sustainable society, nature is not subject to systematically increasing:</b>	<b>To become a sustainable society we must eliminate our contributions to...</b>
1	Concentrations of substances extracted from the earth's crust	The <i>systematic increase</i> of concentrations of substances extracted from the Earth's crust (for example, heavy metals and fossil fuels)
2	Concentrations of substances produced by society	The <i>systematic increase</i> of concentrations of substances produced by society (for example, plastics, dioxins, PCBs and DDT)
3	Degradation by physical means	The <i>systematic</i> physical degradation of nature and natural processes (for example, over harvesting forests, destroying habitat and overfishing); and...
4	And, in that society, people are not subject to conditions that <i>systemically</i> undermine their capacity to meet their needs	Conditions that <i>systematically</i> undermine people's capacity to meet their basic human needs (for example, unsafe working conditions and not enough pay to live on).

*“For a society to focus on strategic sustainable development, it relies on backcasting from the sustainability principles. And to achieve a sustainable society, we know we have to not violate those principles – we don’t know exactly what that society will look like, but we can define success on a principle level. In this way, backcasting from principles is more like chess – we don’t know exactly what the board will look like when we get to checkmate, but we know the principles of checkmate – and we go about playing the game in strategic ways, always keeping that vision of future success in mind.”* (Robért et al, 2002)

As in the Challenge Lab, to focus on the complex societal challenge, we fixed a compelling vision for the same.

“

A **sustainable future** where the population (≈10 billion people) is able to **meet their own needs**, within the **planetary boundaries**, **without compromising** the ability of **future generations** to meet their own.

”

## The Funnel

As our demand increases and the capacity to meet this demand declines, society moves into a narrower portion of the funnel. Every one of us lives and works in this funnel: through innovation and creativity we can evolve toward sustainability and begin to open up the walls of the funnel. By looking forward, organizations can position themselves smartly to avoid the squeeze of the funnel and invest toward opening the walls and creating a truly thriving and rewarding future.

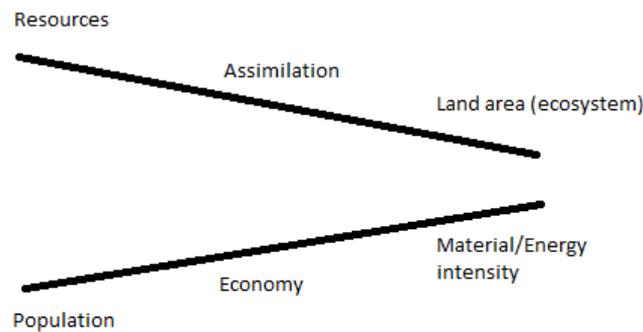


Figure 5: The resource funnel (adapted from Holmberg, 1998)

Holmberg (1998) defines the impact of nature through four anthropic factors.

$$I = i \times m \times u \times P$$

Where

- I = impact of nature,
- i = I/M (impact/energy and material flow)
- m = M/U (material and energy flow/ utility and service)
- u = U/P (utility or service/population)
- P = Population

The downward line shows the diminishing available resources in the ecosystem which considers resources, assimilation and land area. The upward line shows the increasing social demand of the natural resources in the system. The factors include population, economy and material or energy intensity. All the trends related to the six factors in the funnel will be introduced in this section.

We use a funnel as a metaphor to help visualize the growing economic, social and environmental pressures that are acting on society. The way most human societies work now, as we move through time, these pressures continue to increase, giving us less and less room to operate, until we run out of room altogether.

## Population

The world population has reached 7.16 billion persons according to the United States Census Bureau (USCB) (2014). The United Nations Population Division has an estimation of the world population based on three scenarios, range from 7.4 billion to 10.6 billion by the year 2050 (United Nations, 2004) (Figure 6)

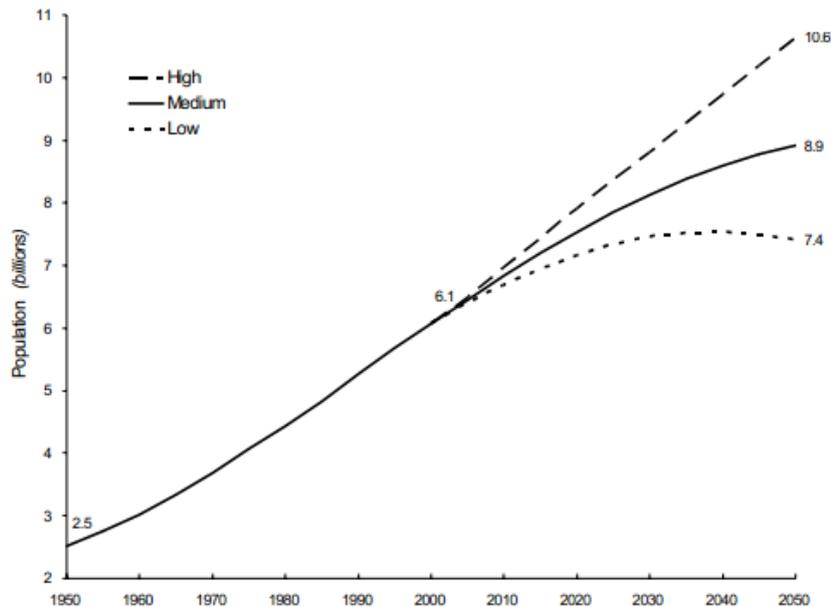


Figure 6: Estimated world population, 1950-2000, and projections: 2000-2050 – Source: United Nations (2004)

The analysis in this thesis is based on the assumption that world population would reach 10 million by 2050, which is close to the high scenario in the UN's estimation.

World fertility has gone through a major transformation in the last decades of the twentieth century (United Nations, 2014). The average number of children a woman would bear fell from 4.4 children per woman in 1970-1975 to 2.5 children per woman in 2005-2010. The replacement fertility is 2.1 children per woman, which means the population level could keep the same if the fertility kept with the replacement fertility. Developed countries, including most in Europe, Northern America, have had below-replacement fertility for two or three decades. Fertility has fallen since the 1970s not only in developed countries, but also in less developed countries in Asia, Latin America and the Caribbean, Oceania and Africa. World fertility is expected to continue to decline to 2.4 children per woman in 2025-2030. Europe is projected to have a modest increase in fertility from 1.5 children per woman in 2005-2010 to 1.7 in 2025-2030. Declining fertility rates imply that the population growth will slow down in the next 20-30 years (Mauro Guillén and Emilio Ontiveros, 2012). The developed regions show slight decline of the population level mainly due to the increasing number of international migrants.

At the same period of time, people are also living longer in almost all countries of the world. The global share of old people (older than 60-year-old) increased from 9.2 per cent in 1990 to 11.7 per cent in 2013 (United Nations, 2013). The old people as a proportion of world population

will continue to grow and reach 21.1 per cent by 2050, which means the number will be doubled in 2050. The population ageing results in the low old-age support ratios (number of working-age adults per older person in the population) in developed countries and some developing countries. The situation of population ageing is expected to continue to fall, which will lay fiscal pressure on the social security systems. Compared to developed countries, many developing countries have experienced high and increasing economic support ratios for years or decades to come and thus benefit from the “demographic dividend”. The demographic dividend allows these developing countries to provide a cheap labour market for production with a large number of working-age people.

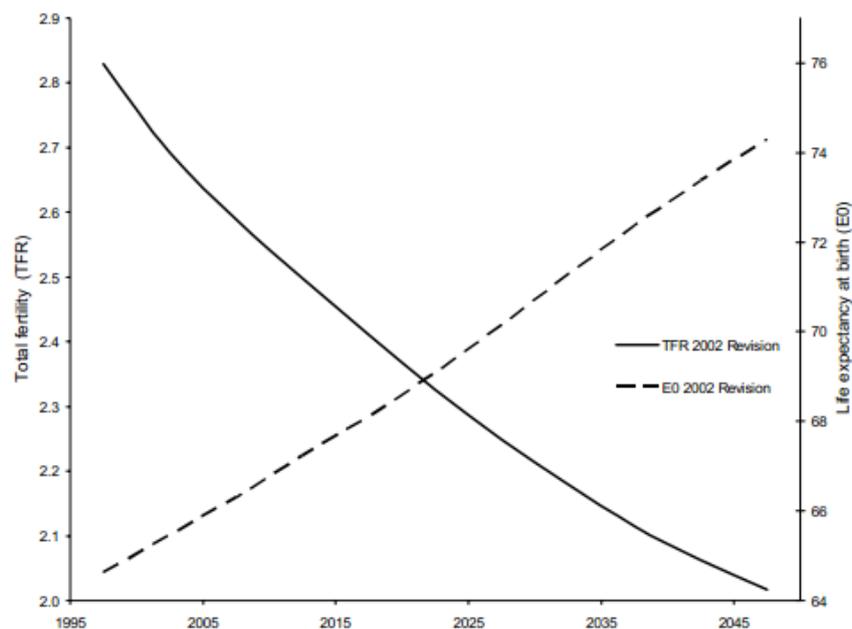


Figure 7: World total fertility and life expectancy at birth: 1995-2050 (United Nations, 2004)

Due to the decreasing fertility and mortality, the growth rate of the world population has declined but the number of the population is still increasing. Asia accounts for the biggest part of the world population while the population in Africa is growing faster than all the rest of the world. Europe, North America and Oceania will have slightly growth of population considering migration (United Nations, 2004).

The world is also experiencing unprecedented rate of urbanization. Urbanization reflects a settlement patterns that increasing number of people accumulate in urban areas. The population living in urban areas grew from 29 per cent in 1950 to 50 per cent in 2010 and 69 per cent of the global population are expected to live in urban area by 2050 (United Nations, 2011). The populations in developed countries are already over 70 per cent while the developing countries in Africa and Asia have a proportion urban of 40 per cent and 42 per cent, respectively. The average annual rate of urbanization rate in developing regions (2.4 per cent) is more than three times that of the developed regions (0.7 per cent).

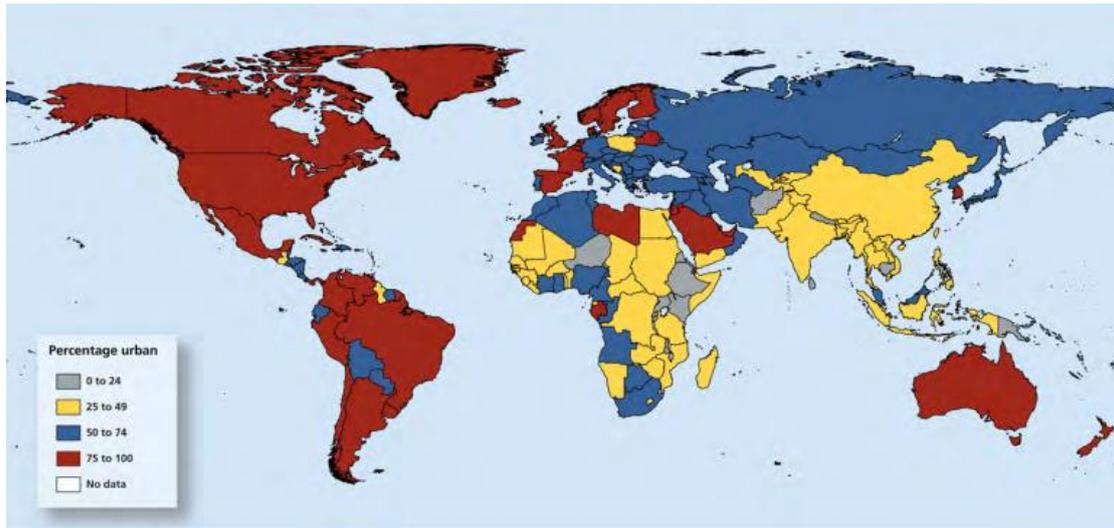


Figure 8: Urban population as percentage of the total population, 2010 (United Nations, 2011)

### Economy

The world has experienced a severe financial crisis in 2008 and still in the aftermath of the crisis in 2013, with economy growth of only 2.1 per cent (United Nations, 2014). Many emerging economies has slowdown their growth and encountered domestic and international headwinds. However, the euro area has just come out of the recession and started to grow again. The United States of America is under recovery. Some emerging economies such as China have stopped a further slowdown. The global economic growth is expected to improve in 2014-2015 (see Figure 9).

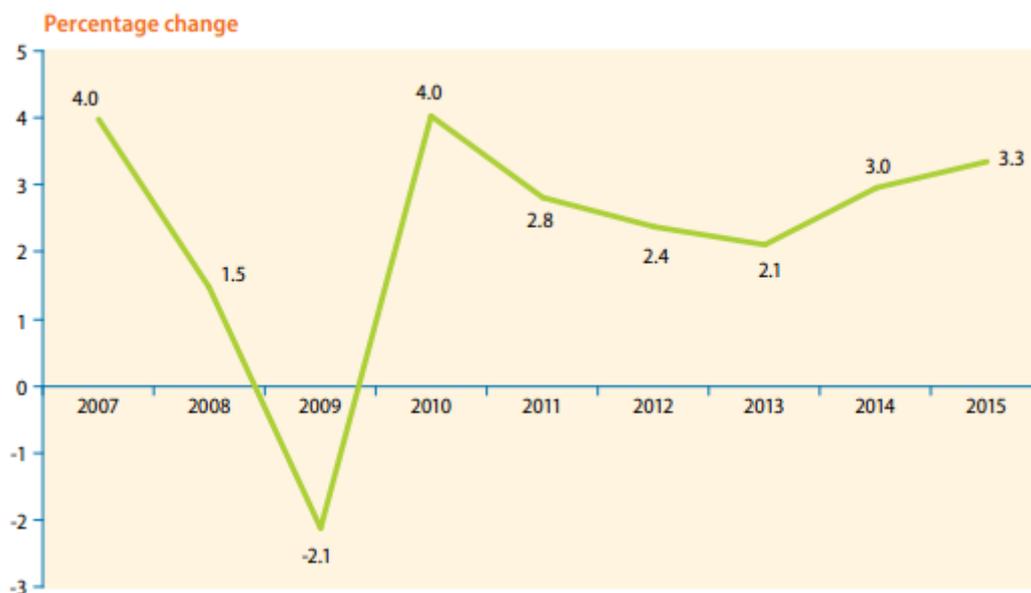


Figure 9: Growth of world gross product, 2006-2015 (United Nations, 2014)

The international trade flows are also stagnated (United Nations, 2014). The ratio between the growth of the world trade and the growth of global output is the lowest in the history. Emerging countries still lead the world merchandise trade growth while the trade growth in developed countries are lagging behind the world average. Transport is crucial in economy to facilitate the international trade as well as outsourcing. Deloitte (2012)'s survey showed that 70 per cent of the respondents have operations more than one geographical location and 60 per cent regard outsourcing a standard practice, which indicates that outsourcing has been a mainstream in the industry.

Gross domestic product (GDP) is regarded as the benchmark to measure the economic performance of the countries worldwide. However, Figure 10 shows a close link between the GDP and CO<sub>2</sub> concentrations in the atmosphere (Simple Climate, 2012). The CO<sub>2</sub>-world GDP link make it hard for the countries to increase GDP and reduce the greenhouse gas emissions at the same time, which is not positive for fighting global warming.

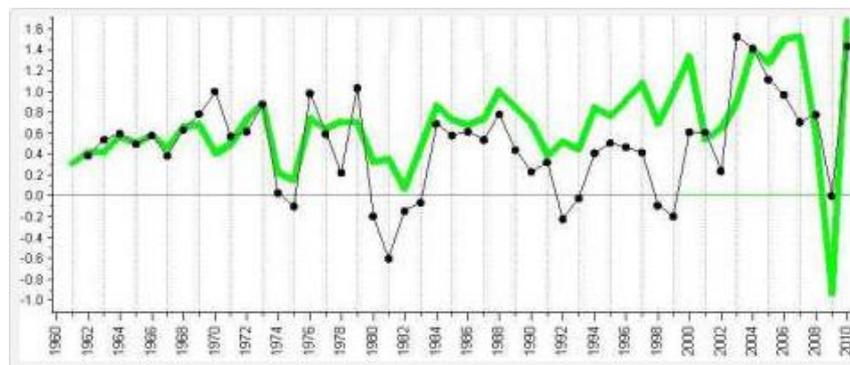


Figure 10: Annual growth of the world economic output (green line, trillions of 2000 US dollars) and annual change of estimated CO<sub>2</sub> emissions (billions of tonnes, black dots) – Source: Simple Climate (2012)

Although the world economy is not strong in the recent period, the global household wealth rose by 112 per cent between end-2000 and mid-2013 and wealth per adult climbed 68 per cent (Credit Suisse, 2013). Figure 11 shows that the global household wealth dropped between the year 2007-2008 due to the global financial crisis and followed by a recovery to a level in 2011 similar to the 2007 peak. The wealth held in North America top the regional hierarchy with 32.8 per cent of global wealth.

Europe holds 31.6 per cent and Asia-Pacific holds 20 per cent, respectively. The rest of the world, representing 60 per cent of the adult population, owns the remaining 16 per cent of the household wealth, which shows a big gap between the rich and the poor. Parallel with the global economic growth, the region of China and Asia-Pacific has stronger growth than the western economies in terms of the wealth distribution. In the same criteria there is also disparities seen within the country in wealth distribution.

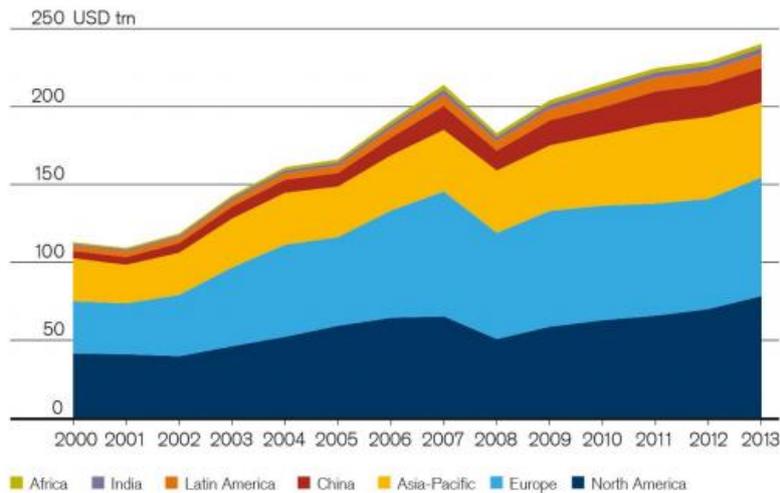


Figure 11: Total global wealth 2000-13, by region – Source: Credit Suisse (2013)

The increase of the household wealth and urbanization bring the vehicle ownership expansion especially in emerging markets and developing countries (Dargay, Gately and Sommer, 2007). The current motor vehicles in use is showed in Figure 12, 81 out of 1000 people use vehicles including passenger cars, trucks, buses and minibuses, compared to 789 out of 1000 in Northern America (United Nations, 2011). Dargay, Gately and Sommer (2007)’s project showed an expectation that China’s vehicle stock will increase nearly twenty-fold in 2030 and surpass the U.S. to be the country with most vehicles. Even though the expectation should be thought over since it took place before the global financial crisis, it is certain that the potential of vehicle ownership expansion is big, especially in China and other developing countries. More households in developing countries are going to own their first car and more households in developed countries will own a second or third car. The expansion also implies rapid growth in oil demand.

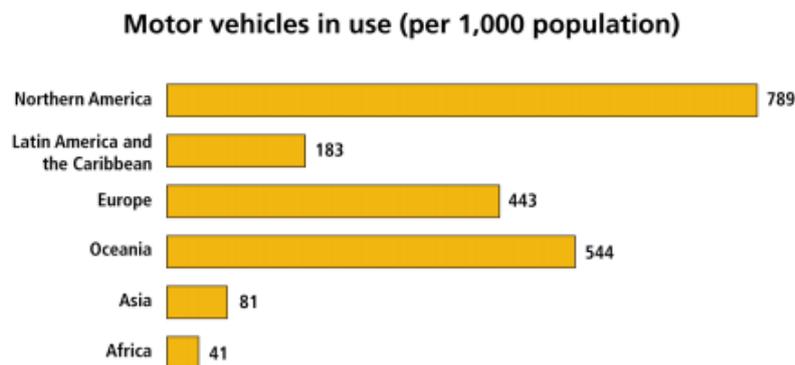


Figure 12: Motor vehicles in use (per 1000 population) Source: The World Bank, World Development Indicators Database, available online at <http://data.worldbank.org>

The prices of commodities have a vivid increase entering the 21 century while they tend to stabilize in the recent years (see Figure 13) (United Nations, 2014). The prices are expected to stabilize but subject to changes in supply side. Such factors as weather conditions (for agricultural commodities) and geopolitical tensions (for oil) should be taken in to account. The prices are thus closely related to both the demand and supply.

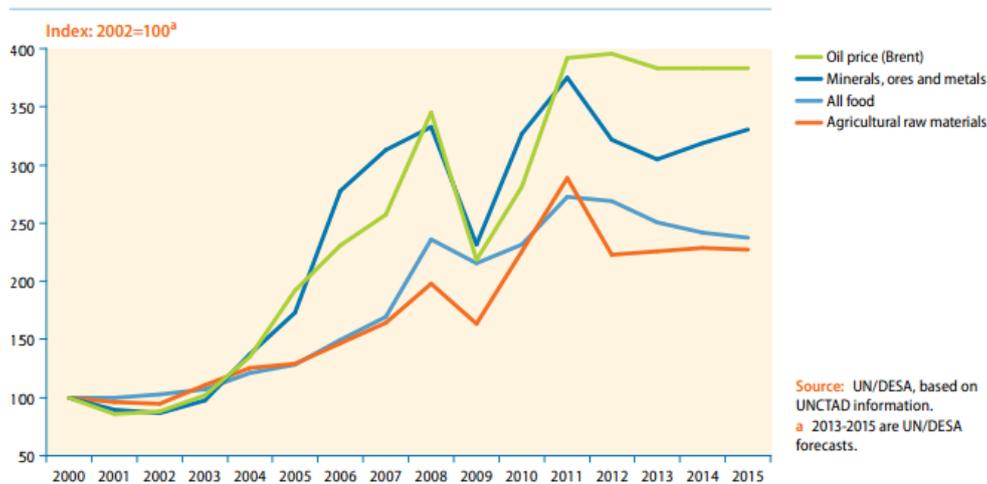


Figure 13: Price indices of commodities- Source: United Nations (2014)

Another trend to be mentioned is the tertiarisation of the industry as a structural change in the world economy. According to Memedovic and Lapadre (2010), the service sector had already been dominant in 1970, accounting 52 per cent of world production and 68 per cent in 2005. The respective shares of agriculture and industry were 10 to 3.6 per cent and 38 to 29 per cent from 1970 to 2005 (see Figure 14).

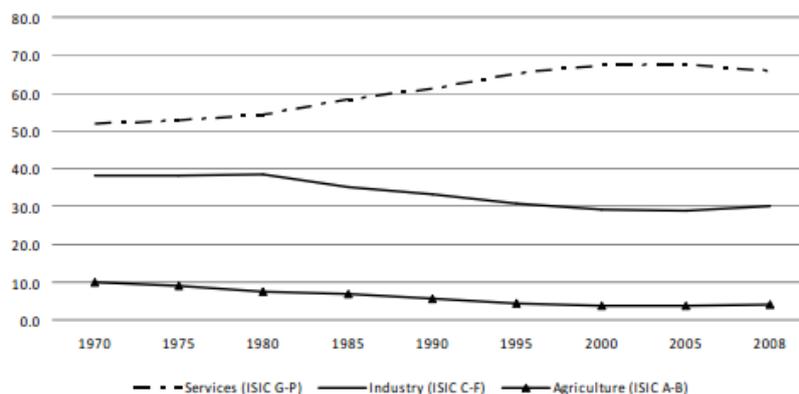


Figure 14: World value added by sector, Source: UNIDO calculation based on UN Statistics (data in current prices, in US\$)

### Energy/material intensity

Energy intensity is calculated as unites of energy per unit of GDP, which is a measure of amount of energy used to produce one unit of economic output (Peck and Chipman, 2007). Material efficiency in industrial production is, on the other hand, related to the amount of a particular material needed to produce a certain product. Reducing the amount of energy and materials used per unit in the production of goods and services has been seen a way to relieve the environment pressure and to enhance the productivity and competitiveness in terms of

economy and industry. Energy and material intensity are thus indicators of sustainable development. The energy and material which are the most important have been categorized into oil (polymers), ore (metals and ceramics) and biomass (timber and paper) (Allwood et al., 2011). The supply of oil and ores are non-renewable while the demand has increased rapidly in the past years (see Figure 15). It implies that the materials will eventually be exhausted with continuing global demand trend in these key materials.

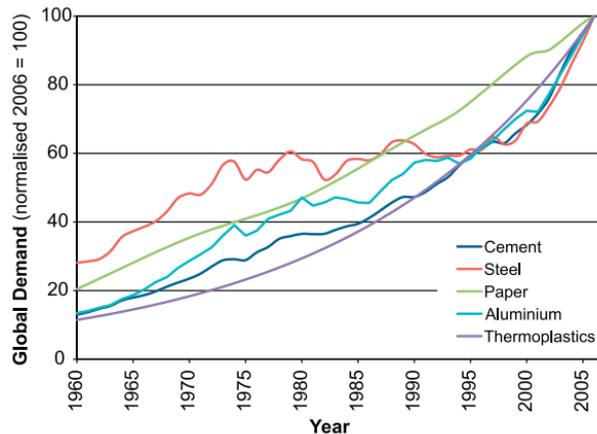


Figure 15: Normalised demand for five key materials 1960-2005 (Allwood et al., 2011)

Energy plays a vital role in the global economy (Jochem, 2005). Energy is supplied to meet people’s needs in living comfort level, mobility and services. The inefficiency of energy use is associated with technological, organizational and behavioural changes (Peck and Chipman, 2007). The inefficiency of material use includes unnecessarily material waste in the production process, construction, trade and private households, lack of recycling (Jochem, 2005). Capital stock should also be taken into account, which refers to that people prefer to owning rather than pooling appliances, cars or plants with low annual operating hours between 10 to 300 hours. An example from passenger transport is showed in Figure 16 (United Nations, 2007). The energy consumption of passenger transport and derived CO<sub>2</sub> emissions depends on the mode of transport, the distance travelled and the number of passenger sharing the travel. Walking and biking use no fuel; traveling by train is more fuel-efficient than by car or air plane.

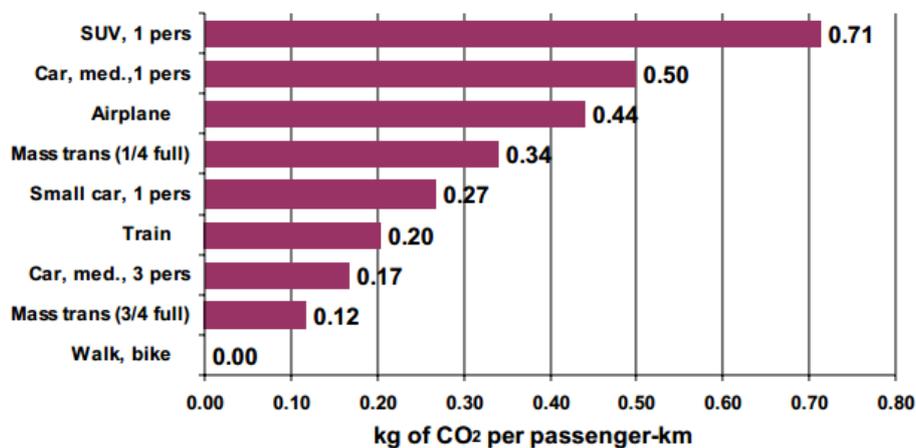


Figure 16: CO<sub>2</sub> emissions for passenger transport (United Nations, 2007)

In order to reach the three goals of energy policy which are security of supply, environmental protection and economic growth, the single most important step is to improve energy efficiency (International Energy Agency, 2007). Almost a third of global energy and material demand and CO<sub>2</sub> emissions come from manufacturing in the industries such as chemicals and petrochemicals, iron and steel, cement, paper and aluminium. It is thus important to understand the usage of the energy and material, the global trends and potential to improve (see Figure 17).

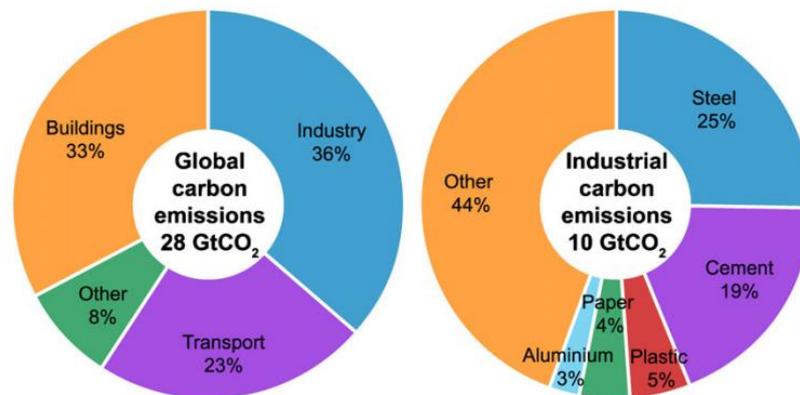


Figure 17: Breakdown of global CO<sub>2</sub> emissions in 2006 demonstrating the importance of five key materials

### Resource utilisation

During the past fifty years, per capita use of mineral resources, especially fossil fuels, has increased steeply. The improved energy and material efficiency enabled by the development of technology has been overwhelmed by the rapid increase in demand from the rising incomes and populations (United Nations, 2010).

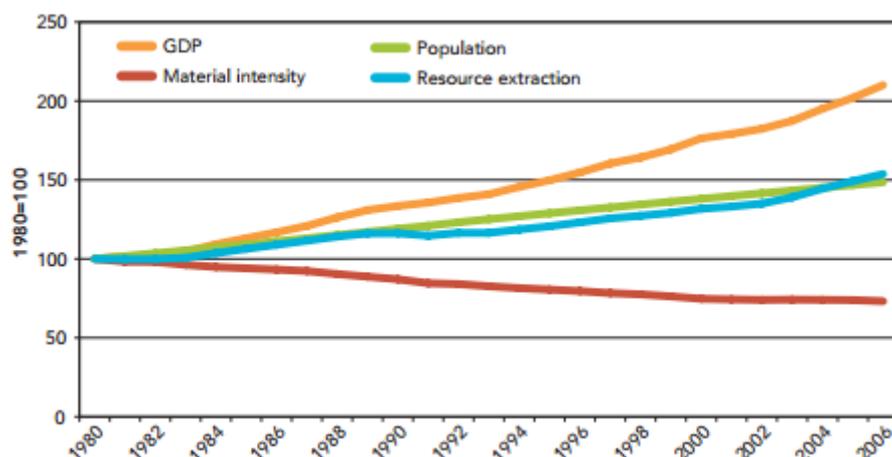


Figure 18: Trends in global resource extraction, GDP and material intensity (1980-2005), 1980=100. Source: SERI, 2010

According to key energy statistics from International Energy Agency (IEA) (2013), the oil share of total primary energy supply (TPES) has reduced from 52.6 per cent to 36.1 per cent while the share of biofuel and waste, nuclear and hydro have increased from total 5.7 per cent

to 17.2 per cent. Coal, oil and natural gas, however, still account for the absolutely dominant of the shares with 80.3 per cent.

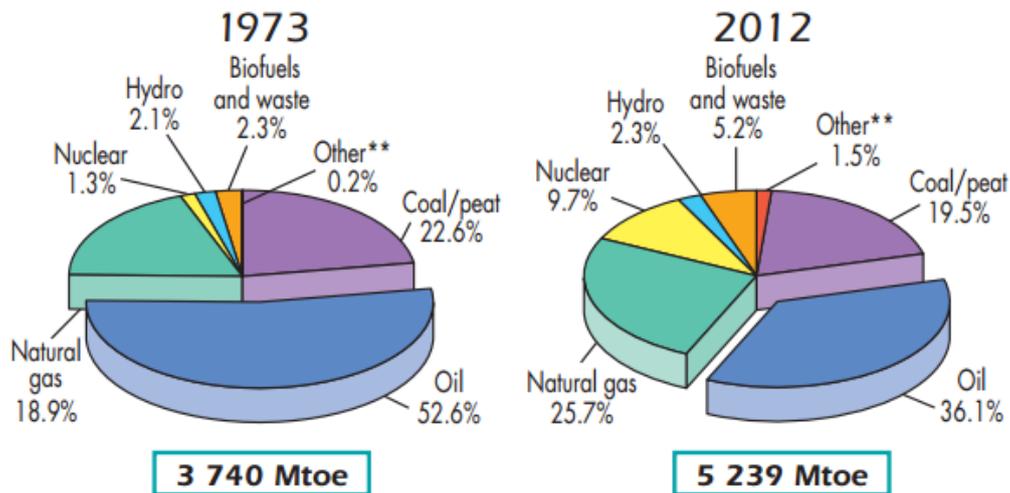


Figure 19: 1973 and 2012 fuel share of TPES excluding electricity trade \*\*Other includes geothermal, solar, wind, heat, etc. (International Energy Agency, 2013)

The transport sector has been the only sector with increased oil consumption between the year 1973 and 2011 (see Figure 20). IEA indicated that the energy consumption in the transport sector comes mainly from oil and the trend is predicted to continue in the next 15 years.

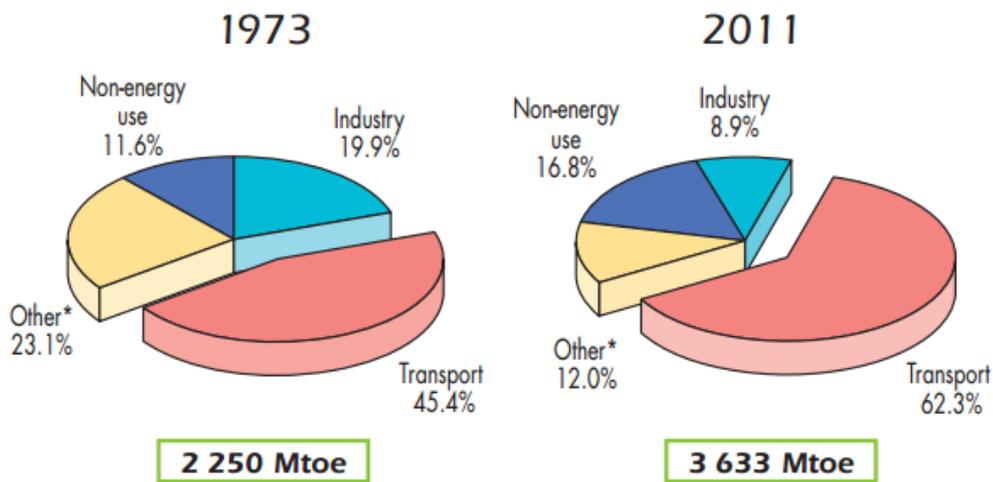


Figure 20: 1973 and 2011 shares of world oil consumption,\* including agriculture, commercial and public service, residential, and non-specified other (International Energy Agency, 2013)

Except oil, other resources such as metals, water and soil are scarce to some extent depending on the different geographical locations.

## Assimilation capacity

The CO<sub>2</sub> emissions have been increasing steadily since 1751, with 329 billion tons of carbon released to the atmosphere due to the use of fossil fuels and cement production (United Nations, 2007). Most of the emissions have taken place due to the economic development after World War II.

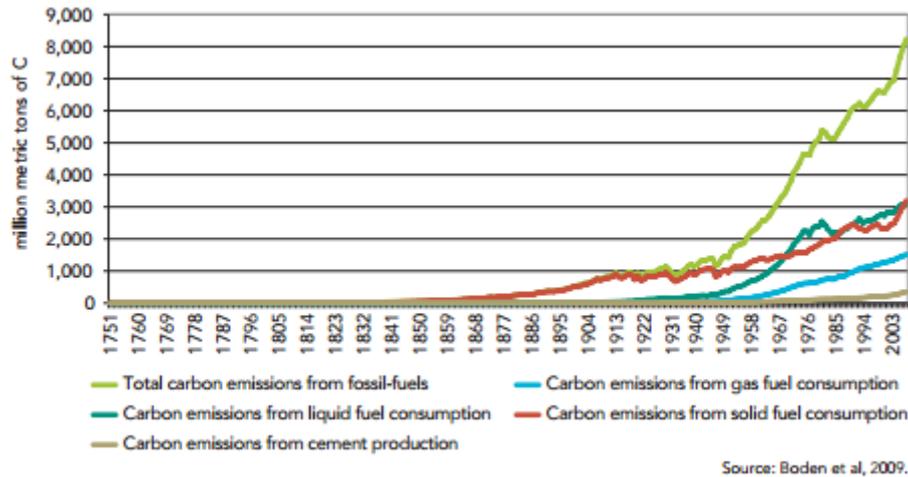


Figure 21: CO<sub>2</sub> Emissions from fuel consumption – Source: United Nations (2007)

Recent research defined eight earth biophysical subsystems or processes, the threshold boundaries that should not be exceeded to avoid major environmental disruptions (Rockström, 2009). Several thresholds have been exceeded such as climate change (measured by CO<sub>2</sub> concentration in the atmosphere), the rate of biodiversity loss and nitrogen cycle. Some are approaching the thresholds such as global phosphorous cycle, ocean acidification, global freshwater use and change in land use.

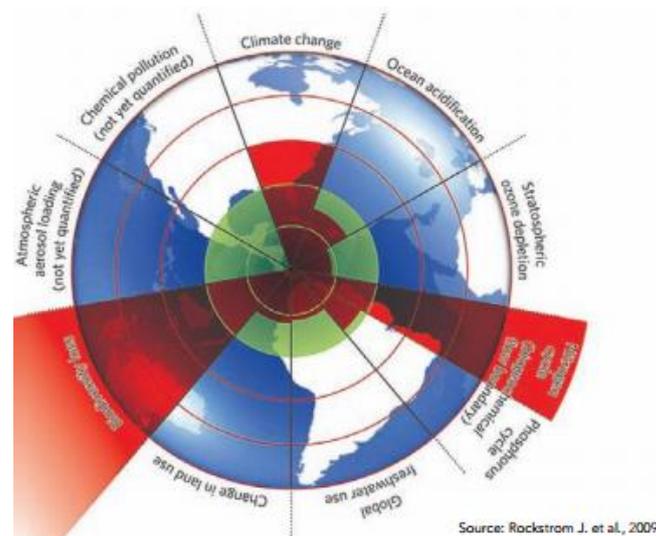


Figure 22: Earth's biophysical subsystems or processes and their safe threshold boundaries- Source: Johan Rockström (2009)

## Land use

Hooke, Martín-Duque and Pedraza (2012) estimated that humans have modified >50 per cent of earth's land surface. The main reason is the increase of human population and the derived demand for more resources such as minerals, soil and water. It is understood that earth's ability to provide the ecosystem upon which we depend is exhaustible. During the last fifty years, rainfall decreased; biodiversity, ecosystem services and soil degraded due to human activities. Human beings rely on the land with the biodiversity, which provide food, fiber, mineral, resources, medicines, industrial products and ecosystem services like cleansing our waste water, dampening flood peaks, breaking down rocks into productive soil, maintaining the supply of oxygen in the atmosphere etc. Our ancestors firstly exploited cropland and pasture at the expenses of forest and later people expand urban area at the expense of agricultural land. The research also showed that some agricultural land has deteriorated to the extent that no longer worth cultivating.

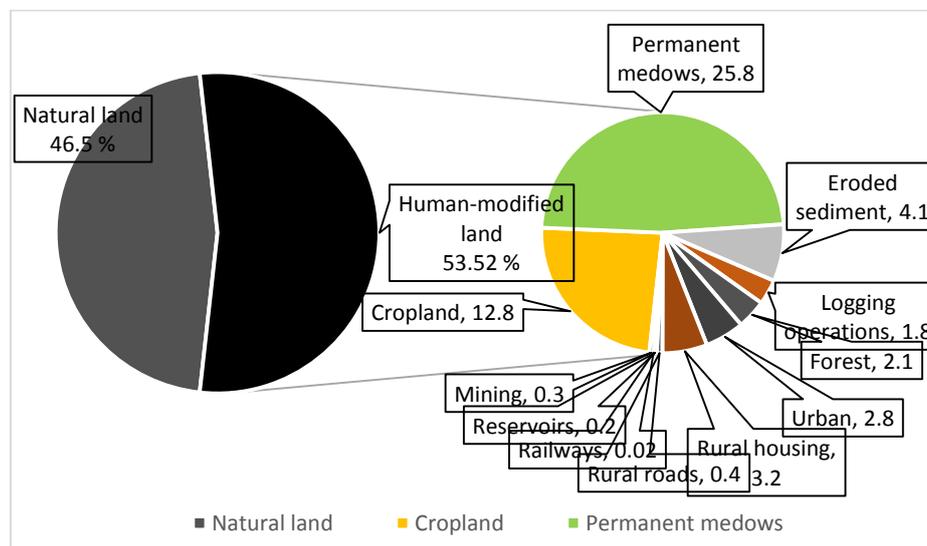


Figure 23: Change in land space by humans. Source: Hooke, Martín-Duque and Pedraza (2012)

## The Compass

Encouraging a comprehensive view of the world, the compass tool allows people to become aware of the interactions of each of the following dimensions/perspectives and thereby understand the key sustainability goals.

- Nature: Taking action to address climate change, conserve the natural environment, and protect the ecosystem networks that sustain life on Earth
- Economy: Ensuring our school and community operates in an economically sustainable way
- Society: The importance of valuing culture and understanding and supporting the immediate and wider community
- Well-Being: Our responsibility to care for each individual's rights and needs

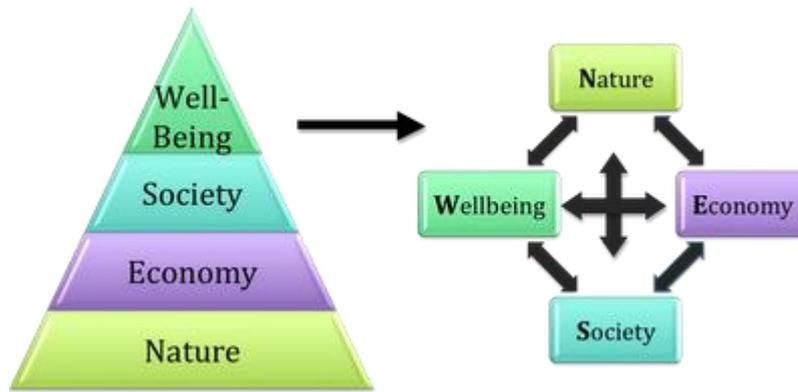


Figure 24: Herman Daly's Means to Ends Triangle & Atkisson's Compass (Atkisson, 2008, p.35-36)

The Challenge Lab team of students underwent this task of framing the compass and came up with the following.

Table 3: Compass Attributes

<i>Nature</i>	<i>Economy</i>
<ul style="list-style-type: none"> <li>• Preservation “Development is sustainable if habitants for humans, animals and plants are preserved and consideration is given to future generations in the use of natural resources”. “Areas of natural importance are to be preserved”</li> <li>• Consumption rate “The consumption of renewable resources is to be kept below the rate of regeneration of natural replenishment”. “The consumption of non-renewable resources is to be kept below the rate of potential increase in renewable resources”</li> <li>• Environmental disasters “The impact of environmental disasters is to be reduced and environmental risks are only to be accepted to the extent that, even in a worst-case scenario, no permanent damage outlasting one generation would be caused”</li> </ul>	<ul style="list-style-type: none"> <li>• Income and employment “Levels of income and employment are to be maintained and increased as required, with due consideration being given to socially and geographically acceptable distribution”</li> <li>• Productive capital “It should be possible for productive capital, based on social and human capital, to be at least maintained and to show qualitative improvement”</li> <li>• Competitiveness &amp; innovation “Economic competitiveness and the capacity for innovation are to be improved”</li> <li>• Market mechanisms “Market mechanisms (pricing) should be the primary economic determinants, with due consideration being given to scarcity factors and external costs”</li> </ul>

<ul style="list-style-type: none"> <li>• Emissions &amp; toxic substances “Any impact of emissions and toxic substances on the natural environment and human health is to be reduced to a safe level”</li> <li>• Planetary Boundaries Countries worldwide agreed on limiting global average temperature increase to maximum 2 °C above pre-industrial levels. To have a reasonable chance (better than 50 per cent) of forestalling such a rise, cumulative global carbon emissions must be limited to 870 gigatons of CO2 equivalent (GtCO<sub>2</sub>-eq) between 2009 and 2100</li> <li>• Planetary Boundaries Sustain ≥80% of the pre-industrial aragonite saturation state of mean surface ocean, including natural diel and seasonal variability</li> <li>• Planetary Boundaries &lt;5% reduction in the ozone layer comparing to pre-industrial level of 290 DU</li> <li>• Planetary Boundaries A safe planetary boundary (here placed at 10 E/MSY) is an extinction rate within an order of magnitude of the background rate. This relatively safe boundary of biodiversity loss is clearly being exceeded by at least one to two orders of magnitude, indicating an urgent need to radically reduce biodiversity loss rates (Díaz et al. 2005).</li> </ul> <p style="text-align: center;"><b>Wellbeing</b></p> <ul style="list-style-type: none"> <li>• Cognitive Well-being Welfare economics ultimately deals with cognitive concepts such as well-being, happiness, and satisfaction. These relate to notions such as aspirations and needs,</li> </ul>	<ul style="list-style-type: none"> <li>• Public sector “The public sector is not to be managed at the expense of future generations (e.g. debt, failure to preserve assets)”</li> </ul> <p style="text-align: center;"><b>Society</b></p> <ul style="list-style-type: none"> <li>• Health and safety Human health and safety are to be comprehensively protected and promoted</li> <li>• Education Education is to be provided, ensuring individual development and identity</li> <li>• Culture Culture is to be promoted, together with the preservation and development of the social values and resources that constitute social capital</li> <li>• Justice Equal rights and legal security are to be guaranteed for all, with particular attention to equal rights for women and men, equal rights and protection for minorities, and respect for human rights</li> <li>• Solidarity Solidarity is to be promoted within and between generations and also at the global level</li> <li>• Adaptation The capacity of actors in the system to influence resilience has to be balanced</li> <li>• Equity The capacity of actors in the system to influence resilience has to be balanced</li> <li>• Health and safety</li> </ul>
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<p>contentment and disappointment. (Giboa et al, 2001)</p> <ul style="list-style-type: none"> <li>• Affective Well-being Well-being is most usefully thought of as the dynamic process that gives people a sense of how their lives are going, through the interaction between their circumstances, activities and psychological resources or ‘mental capital’. (Daniels et al, 2000)</li> <li>• Ethnic Identity Ethnic identity plays a crucial role in someone’s cognitive well-being. Studies show that “both social psychological and developmental perspectives suggest that a strong, secure ethnic identity makes a positive contribution to cognitive well-being” (Horenczyk et al, 2001)</li> </ul>	<p>Human health and safety are to be comprehensively protected and promoted</p> <ul style="list-style-type: none"> <li>• Education Education is to be provided, ensuring individual development and identity</li> <li>• Culture Culture is to be promoted, together with the preservation and development of the social values and resources that constitute social capital</li> <li>• Justice Equal rights and legal security are to be guaranteed for all, with particular attention to equal rights for women and men, equal</li> </ul>
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### Strategic goals

Mapping the goals is one important part of Challenge Lab process when building the visualized wall for the purpose to defining the vision of a sustainable future in the following steps. Initiated by European Union, goals of a sustainable society are generated with a top-down approach with different levels, in specific, European Union level, National level, Regional level and municipality level. Since the studies in Challenge Lab focus on Göteborg municipality, the description of goals are summarized from a few of significant documents issued by European Union, Sweden, Västra Götaland and Göteborg. In addition to the hierarchical level, the goals are also categorized by four time fences: 2014-2019, 2020, 2030 and 2050 (Figure 25):

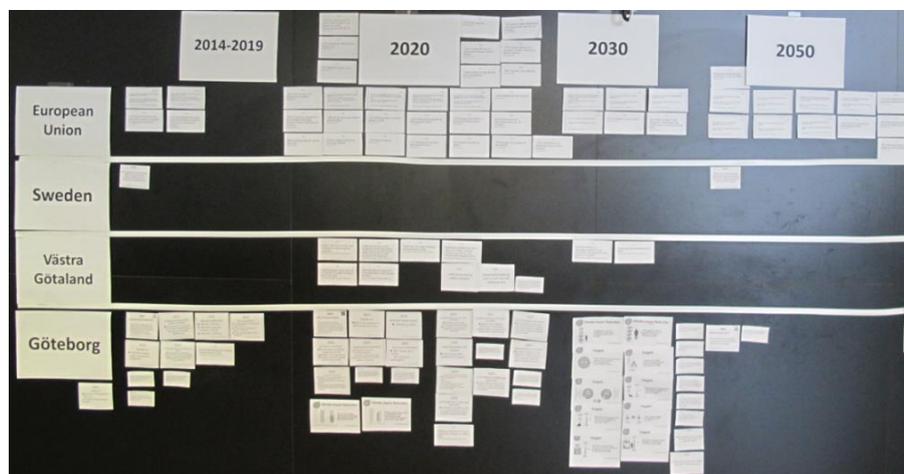


Figure 25: The goals are presented in the visualized wall – Photo Courtesy: Zhiiyu Tang

EU documents describe the challenges and give a long-term vision in the transport area with indicated activities to follow (European Commission Decision C, 2013; European Environmental Agency, 2013). The national level merged the EU visions into national strategies. The regional level and city level cooperate closely and have many joint projects and thereby have some shared goals. Their goals combined the national plans with dedicated departments in a local contexts. For example, there are different authorities taking responsibility of different strategies such as transport strategy, environment strategy, climate strategy, green plan, city development plan and the river city development. These authorities in the city of Gothenburg are cooperating closely and have frequent meeting together in order to make the goals consecutive across departments<sup>1</sup>. Meanwhile the authorities also get inputs from academia and industry. However, the execution power of these goals is unsure. Although the strategic goals are set and documented, there are not specific policy to support each goal, which shows a lack of execution and actions. For example, climate strategy was made but lack of action plan<sup>2</sup>.

Reading and summarizing the goals from numerous official documents from the public sector helps to understand the public efforts towards sustainable development. Mapping the goals helps to illustrate:

- The interaction between transport sector and other sectors
- Comparison of the goals and current trends

Transportation has a big impact in the world. On one hand, it facilitates the movements of people and goods. It has maintained and developed the societal and economic systems. On the other hand, it is a main source of pressure on the environment both regarding to exhaust of natural resources and emission of different kinds of pollution (European Environment Agency, 2013). Transport is still coupling the economic growth and increased pollution (see Figure 10, Figure 19, Figure 20, Figure 21). The interaction of the goals in different areas should thereby be taken into account as a whole. The goals and plans should not conflict with each other while one goal can help to set the goals in another area. For example, the climate strategy and environment strategy set the goal of CO<sub>2</sub> reduction and the transport strategy contributes to a proportionate of the total reduction.

Greenhouse gas (GHG) gets ubiquitous acceptance as an indicator and plays a vital role in the contexts of transport driven environmental impacts. For example, EU needs to reduce GHG emissions by 80-95% below 1990 levels by 2050 and the goal for transport will be to reduce GHG emissions to about 20% below 2008 level (Europe Union, 2011). In Sweden, the target is to establish a fossil free fleet by 2030 and realize a zero net output of GHG by the year of 2050 (Trafikverket, 2012). The result of the measure based on decided policy is not enough for transport sector to contribute to the national climate goals. Figure 26 shows the gap between the goals and current trend.

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<sup>1</sup> Sofia Hellberg, Strategic transportation planner, City of Gothenburg, interviewed 29 Jan. 2014

<sup>2</sup> Anna Wenstedt, Environment planner, City of Gothenburg, interviewed 31 Jan. 2014

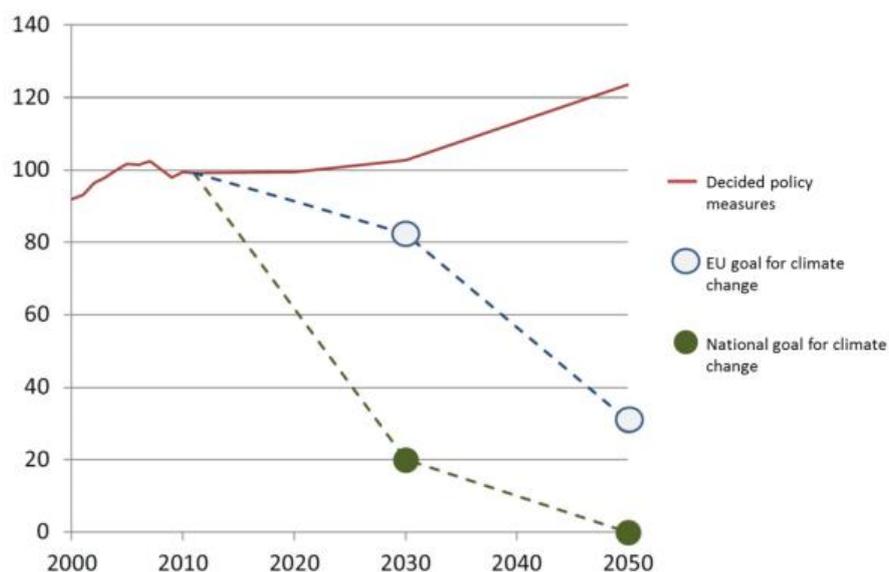


Figure 26: Road traffic impact on the climate in Sweden. Index 2004 = 100 (Trafikverket, 2012).

Obviously, it will not be realistic to reach these long-term goals without a deep-structural change in the current transport system. Technological innovations can partly contribute to a system transition, but it needs a holistic consideration of industry, technology, markets, policy, culture and civil society (Geels, 2012).

### The Wall

The framework gives the understanding where we lead to in the future, where we stand in the present scenario and the path forward to the sustainable future.

Holmberg(1996) states that the physical indicators to sustainability can be divided into three (main) groups:

1. societal activity indicators (that indicate activities occurring within society--the use of extracted minerals, the production of toxic chemicals, recycling of material),
2. environmental pressure indicators (that indicate human activities that will directly influence the state of the environment--e.g., emission rates of toxic substances)
3. indicators of the state of the environment or environmental quality indicators (that indicate the state of the environment--e.g., the concentration of heavy metals in soils and pH levels in lakes).

To the fact that most indicators categorized under the group of environment pressure indicators or the state of the environment indicators. These indicators helps in formulating the framework. Sustainable Development framework for the Challenge Lab was to build up the wall. Wall is based on the backcasting methodology. (Holmberg, 1998) The following shows the interpretation of the same in real time.

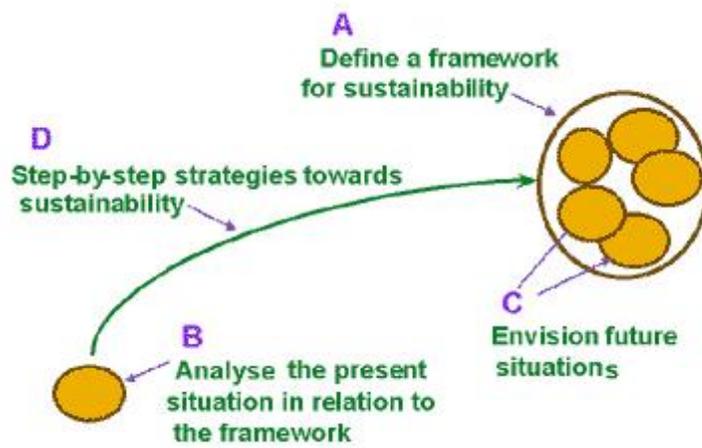
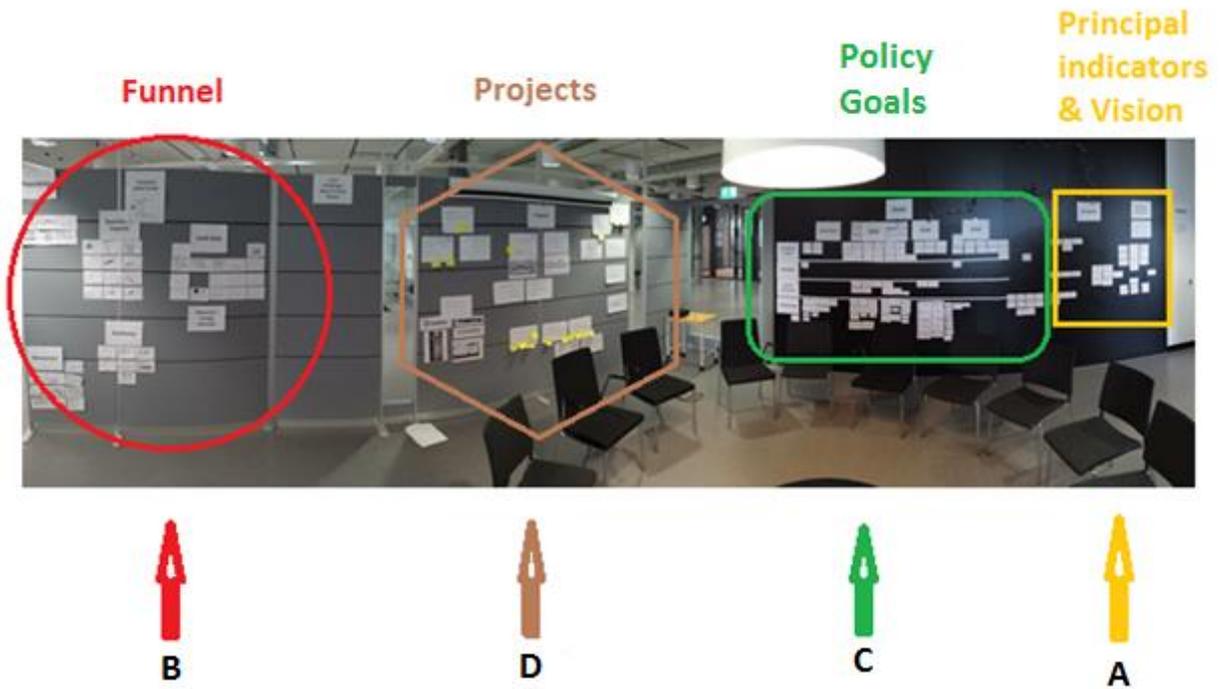


Figure 27: Wall interpretation with the backcasting model (Holmberg, 1998)

## Inside out Approach

Inside out approach in the Challenge Lab is to establish or showcase oneself with his inner values and goals to lead him and make him a truly change agent in the society.

There are five disciplines in a learning organization (Senge 2000)

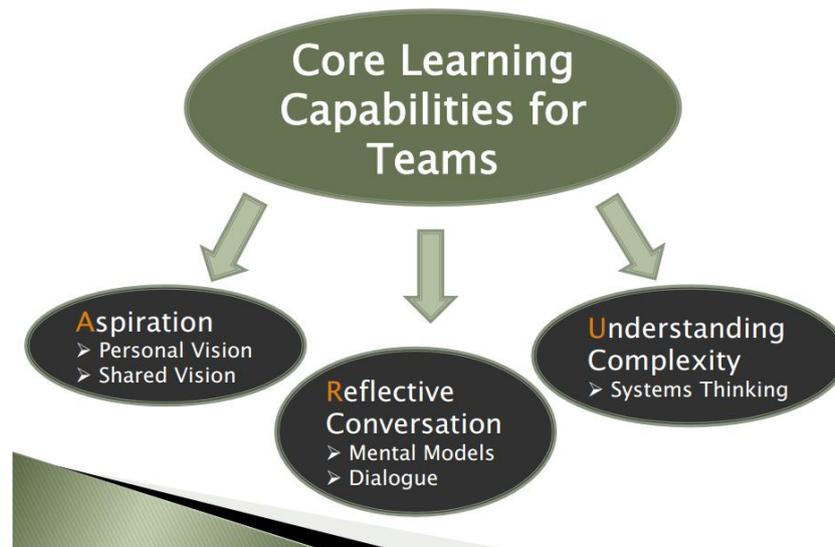


Figure 28: Core Capabilities in learning team (Based upon Peter Senge – Five Disciplines, 2000)

In the Inside Out approach, we used three tools to follow the competencies of Core Learning Capabilities for teams. A workshop on self-leadership was conducted for the Challenge Lab team by Dominic Von Marten (CEO of Self Leaders) to understand own values, strengths and goals and to build the team with openness and active listening. A workshop on the art of dialogue was conducted by Martin Sande (Executive Director of Preera). And for understanding complexity and leadership, seminar was given by Göran Carlstedt.

## Self-leadership

To work on a societal challenge in order to foresee a sustainable future, change agents are required. They need to be proactive, motivated and should be able to handle uncertainty and pressure in ease. This is complacent with skills the change agent possess. To be a great leader, it is not only high IQ and good technical skills, but needs more of emotional intelligence. (Goleman 1998)

According to Goleman(1998), this could be categorized into five types:

- Self-Awareness: knowing one's strengths, weaknesses, drives and values
- Self-Regulation: being able to control one's moods and impulses

- Motivation: being driven to achieve a goal by the achievement itself
- Empathy: being able to understand other people's feelings
- Social Skill: being able to find common ground and be proficient in managing relationships

The above mentioned framework goes with the ideal of self-determination mentioned by Ryan & Deci (2006). In the excerpt figure below from Ryan & Deci (2006), the most powerful and positive state is defined when the values congruent. This is a state when people understand the own values and goals and act accordingly. For a team to be successful, the team members' values and goals have to be congruent with the team's vision.

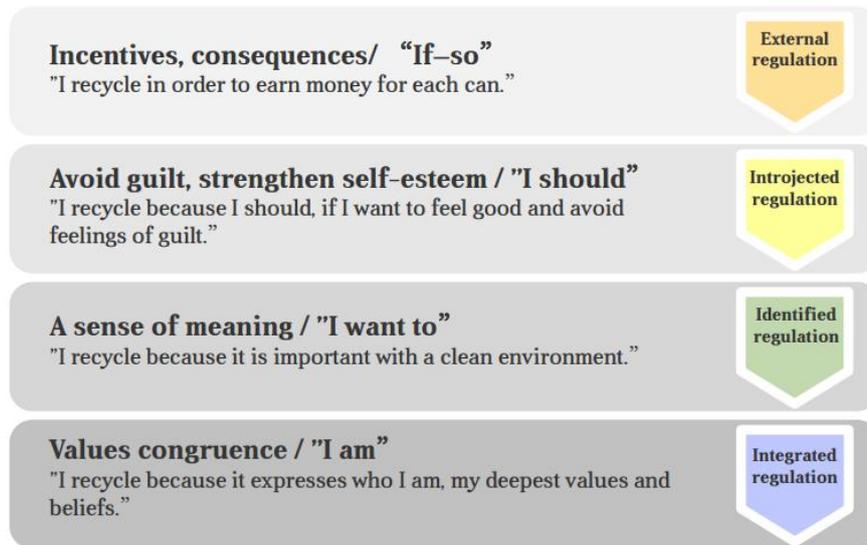


Figure 29: Self Determination by Ryan & Deci(2006)

Trust and openness within the team relates its position with the level of difficulty. The lack of trust and openness leads to personal gain & sub optimization, repeated conflicts and generalization. (Wenderheim et al, 1997)

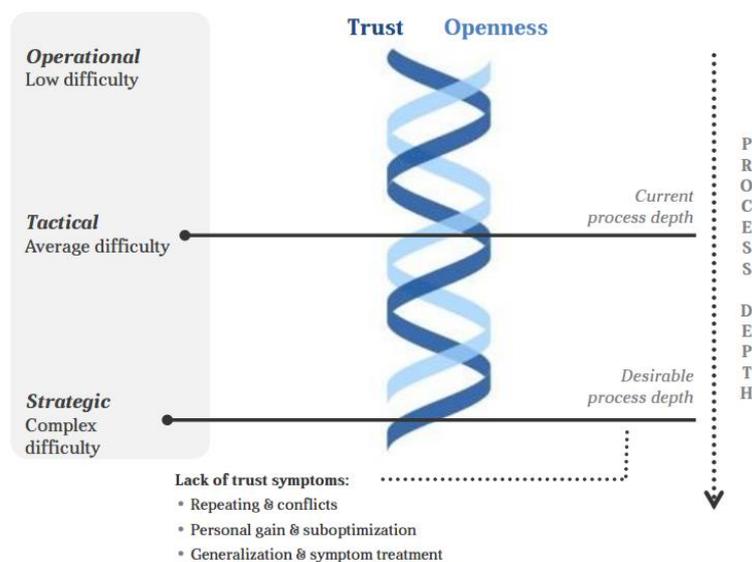


Figure 30: Trust & Openness (Wendelheim et al, 1997)

In the Challenge Lab team, Dominic introduced various tools for the team members to understand their inner values and group values. Meaning model has three ideals, foundation, focus & vision. In the meaning model exercise, the team was divided in groups of three and told to have a conversation what each thought about their foundation, focus and vision. This involved in each person taking an active role of facilitator, focus person or observer.

Monthly matrix was an exercise, part of the workshop, where each person had to talk about three important things happened in the previous month and explain the situation. This exercise was held in groups of two. So each person exchanged their reflections resulting a gain in positive attitude and atmosphere around them.

Exercises helped the team to keep the motivation high and focus it towards the right directions. As a team member, it was very interesting to understand one's own values and goals. This helped in team building and creating a positive and happy atmosphere in the team.

## **Leadership**

Göran Carlstedt (GC) had an inspiring lecture on highlighting important aspects about leadership in our current society

Leadership in old times is not as the same in the present world. There is a difference between today's leadership and the demand for tomorrow's leadership. GC states that leader is someone who keeps seeing the world with a new set of eyes as world is not seen as it is rather seen from perspective of how we are. Leader is person who creates the future and not predicts it. He is not the only person who creates the future but co-creates it with a view of a meaningful life endeavour.

"He who has a why to live for can bear almost any how." - Nietzsche

Successful and outstanding organizations all over the world are, with a few exceptions, driven by a challenging mission, a meaningful purpose and shared values. (Göran Carlstedt, 1990)

Rusell Ackoff quotes that a person can do only two types of mistakes.

- Doing something that should not have been done (errors of commission)
- Not doing something that should have been done (errors of omission)

Leadership has an emerged view of from iterative learning from mistakes or failures. This learning in a group contributes to a learning organization. Göran Carstedt (1992) states a learning organization to be "Where one constantly learns how to learn and how to develop things together". And in accordance with it the quality should not be seen as the absence of defects, but as the presence of value.

Peter Senge (2003) states that a sustainable future - has to be seen as something desirable. To be something desirable, we need a change delivered by personal values. There is no organizational transformation without a personal transformation (Göran Carstedt, 2011). These

personal transformation is attributed to a change agent. Change agents are the leaders in the desirable sustainable future.

The session for the Challenge Lab team became obvious by showing the importance of being change agents than being merely leaders. This session helped the team to choose on different projects forecasting the desirable future. It also showed that the change by the change agents can not only be brought about through focusing on the change itself but also by focusing on positive side effects.

## Dialogue tools

Martin Sande (2014) conducted a workshop on the art of dialogue and importance of understanding the dialogue for stakeholder management. In process of focusing a societal complex challenge it is very important to have a better dialogue with key stakeholders as the values perceived by the each has to be conveyed perfectly as needed.

Dialogue is the art of thinking together by agreeing to disagree” (Isaacs, 1999). There are three types of conversation, dialogue, debate and a discussion. In discussion and a debate, people converse with opinions and try to convince the other side. Rather dialogue is type of conversation where importance is given to any conversation raised and mutual agreement is sought in the conclusion. Dialogue is a tool for collaboration as stated by Sandow (2005).

The main rules for a dialogue as mentioned by Martin Sande (2014) are listen, respect, suspend and voicing. Listen denotes to be an active listener to the conversation without resisting opinions as when it is raised. Respect is to give value to each one’s opinions in the conversation. Suspend is to stop the conversation whenever needed or when the value is deviated. Voicing is raising an opinion or thought in the dialogue when one thinks, its wrong from his inner self.

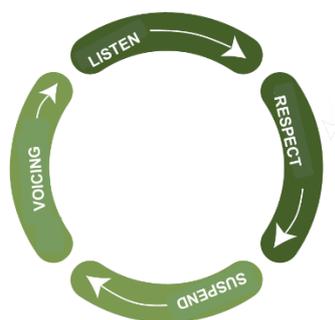


Figure 31: Rules of dialogue (Sande, 2014)

Adhering to the rules of a dialogue leads to a resilient organization. Listening and observing the dialogue leads to a better understanding in the conversation resulting in a motivated trust and collaboration. This collaboration results in increased participation, thereby fuelling the process of creativity and innovation. This entire process circle follows up excitement and

appreciation in the work. This creates a reinforcing cycle leading towards a resilient organization (see Figure 32). (Sandow, 2005)

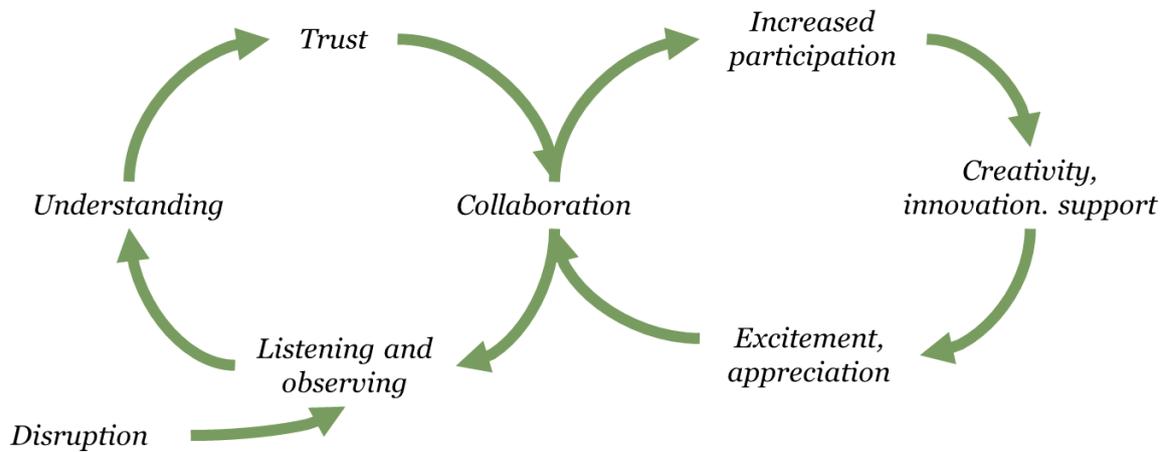


Figure 32: Reinforcing circle towards a more resilient organization – Source: Sandow (2005)

On the discussion with Martin Sande, while focusing on a societal challenge involving key stakeholders, the art of dialogue is very important to have better collaboration. Using the tools of dialogue, Challenge Lab team were able to connect with stakeholders from private and public sector and academia and there so have a common stakeholder meetings. The Figure 33 shows the stakeholder dialogue place in the Challenge Lab.



Figure 33: Stakeholder Meeting place in Challenge Lab – Photo Courtesy: Zhiyu Tang

## **Sustainability transition of a socio-technical system**

By going through the outside in and inside out approaches especially after mapping the goals, Challenge Lab students realized that a deep transition is inevitable to reach the goals.

In the multi-level perspective (MLP), the transition processes are not linear. The transition will not happen until there is interplay of multiple developments at three analytical levels: niches, socio-technical regimes and socio-technical landscape (Geels, 2012).

### **Niches**

Innovations emerge in niches level. Among numerous innovative ideas, some of them get support from the academia, industry or public sector such as innovation office. These novelties get the chance to intervene the existing regime and influence it or even to replace it, while the others are screened due to the lock-in mechanisms in the regime. Niches are the key to shake the current system since they might make knock-on effect. Niches are often carried out in demonstration projects to learn the real world, to get the purpose more precise, to get broader acceptance in the society.

In the transport system, the niches could be technology innovations, for example, vehicles powered by new energy (electric buses), or new business models, for example, car sharing.

### **Regime**

Regimes are related to the well-developed technologies, industry, policy, user patterns, infrastructures, user behaviour and culture (Geels, 2012). Various actors have different activities in the system according to deep-rooted regulations. They are a part of the system and share the perceptions and actions that lead to limited changes in a predictable directions in the system. This “thinking inside the box” creates a protective screen for the diffusion of the innovation.

The regimes in the transport system is include the different transport modes such as automobile, train, tram, bus and cycling (Geels, 2012). Users of these transport modes have cultivated their habits, norms, standardized behaviour and intangible rules and reflected in concrete actions.

### **Landscape**

The landscape level has the broadest scope and have an impact on its sub-levels, to be specific, the niche level and the regime level. Landscape is also deeper-rooted in the group and individual actors and it is the hardest to change among the three levels. Urban layouts, social values, macro-economic trends and media structure are belong to landscape.

Geels (2012) discussed the interaction among the three levels:

- a) Niche-innovations build up internal momentum
- b) Changes at the landscape level create pressure on the regime
- c) Destabilization of the regime creates windows of opportunity for niche-innovations.

Increasing structuration  
of activities in local practices

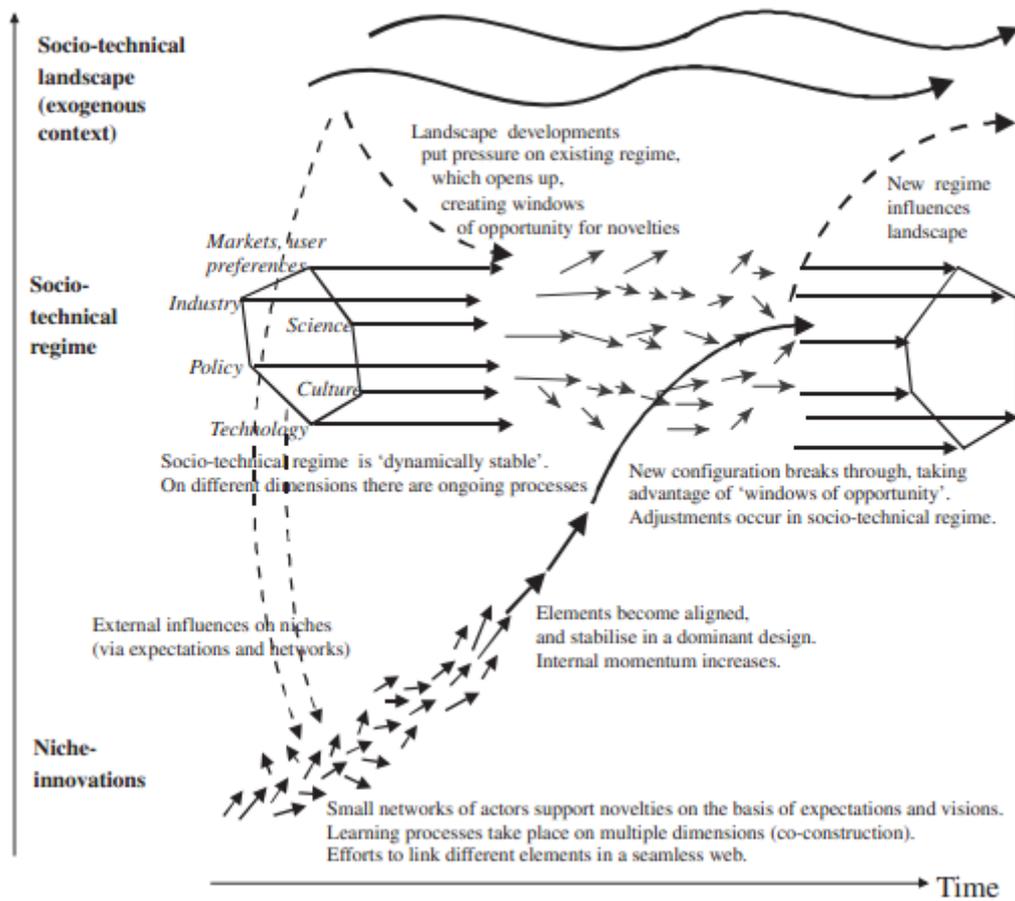


Figure 34: Multi-level perspective on transitions (Geels, 2002)

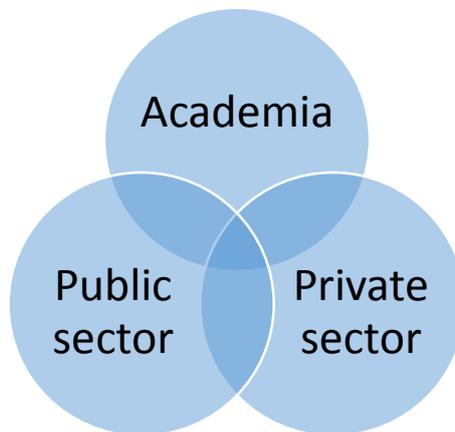
## Reading and interaction with stakeholders on a strategic level

In this part, the way to understand the system as well as drivers and barriers will be introduced.

Reading and interaction with stakeholders are the most important process to find the hotspots, to team up with the master thesis partner and initiate the preliminary idea for the second phase in Challenge Lab. The information gathered from reading and stakeholder gave a basic and holistic view of the system. In order to “think out of the box”, it is significant to understand “the box”.

Reading went along with the whole process of Challenge Lab from the very early stage. The initial reading list was spread out before the learning modules so that students could preview the articles and get a better understanding. Additional reading tasks were added with more input from different stakeholders. Reading helped to introduce related theories, methods and tools that could be used to facilitate the Challenge Lab project. Such theories, methods and tools were from various disciplines in terms of sustainability, for example, backcasting, leadership, transport system.

The stakeholders were from academia, public sector and private sector, among which, some of them were not only active in one sector but in two sectors (see Figure 35). All of them has been related to subjects or projects in the area of sustainability and transport. There are 12 persons from academia, 6 from the public sector and 10 from the private sector (see Appendix III).



*Figure 35: Stakeholders for sustainable transport and mobility*

On one hand, students started to make contact with the stakeholders who came to Challenge Lab during the leaning modules. On the other hand, students contact more stakeholders through various channels such as homepages and seminars in the city. It was also probable to get more related contacts through the interview with one stakeholder, which made a snowball sampling to enlarge the network. Snowball sampling was also used for the project (see Phase II Methology)

Since the stakeholders were from different sectors, the drivers and barriers they had talked were from different perspective. Some of their comments even conflicted with the others.

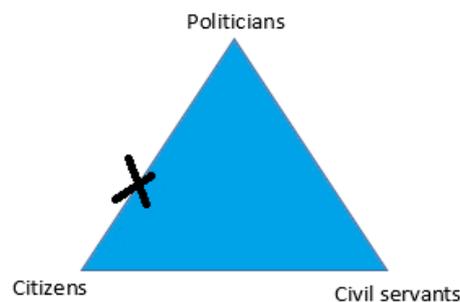
### **Academia**

Chalmers has much research related to sustainable transport and mobility due to transport is regarded as one of the areas of advance. In the area of advance in transport, more focus is put in logistics, especially urban logistics and the use of information and communication technology (ICT). Like a metric with headers and row labels, different areas of advance make a metric, for example, the area of advance is one of the headers and under the header has personnel from different departments. These personnel contribute their specific expertise to the transport area. The department of physical resource theory also plays an important part. Three of the stakeholders are from this department and John Holmberg, the main founder of Challenge Lab, is a professor of the department.

Most projects in academia are funded by foundations such as Vinnova, by the public sector or by the private sector. Some projects are a part of the EU initiated projects, for example, CLOSER. If these projects cannot get fund, they can rarely be started or continued. Thus fund is very important to projectification. Academia takes the research work and gives suggestions to the public sector and private sector but has little power to implement it.

### **Public sector**

In the public sector, there is a triangle relation concerning the process to approve policies or strategies. The strategic transportation planner works as a civil servant, who makes the suggestions to the politicians but cannot decide. Civil servants have more connections with the citizens in the city while the politicians have not, which leads to possible gap of the understanding when making the strategies (see Figure 36).



*Figure 36: The relations in the public sector*

The public sector on one hand is the user of the transport such as waste, school and elder house supply, and on the other hand, has the responsibility to manage and provide the land or infrastructure for transport.

Funding is also a problem for the public sector to do a project. Since, it always takes a long lead time to approve a project through numerous discussions and meetings. One thing worth mentioned is that this is the election year in Sweden, which leads to many new strategies.

Another thing is that stakeholders from the public sectors paid more attention to the passenger transport but little about the freight transport. The reason could be that “goods don’t vote but passenger do” (OECD, 2003). However, one stakeholder from the academia also mentioned in a seminar that the public wanted to help the industry to make the urban logistics more efficient but the suggestion was rejected by the industry since the industry regard themselves as experts and can do better than the public sector in terms of logistics. Thus the current situation is that the public sector mainly manage the passenger transport and the private sector mainly manage the freight transport.

### Industry

More and more companies has paid attention to cooperate social responsibility (CSR). Policies are also a driver for the companies to be aware of the environmental and social issues. However, the purpose of business to a big extent is still to make profits. The sustainable products and services are attractive for the customers possibly not because they are sustainable but because of other reasons such as low price, status or incentives. For example, in order to encourage people to use electric vehicles, Norway issued a package of incentives including lower tax, using bus lane. Another driver relates to the increasing cost of raw materials. Manufacturers have started to recycle and re-manufacture some parts with expensive materials in order to reduce the cost.

The automotive industry is starting a transition from traditional products to sustainable products to meet the trend in the society and the policies. However, it takes a lot of money and time to develop a new product. Feasibility, desirability and viability should be considered when designing a new product.

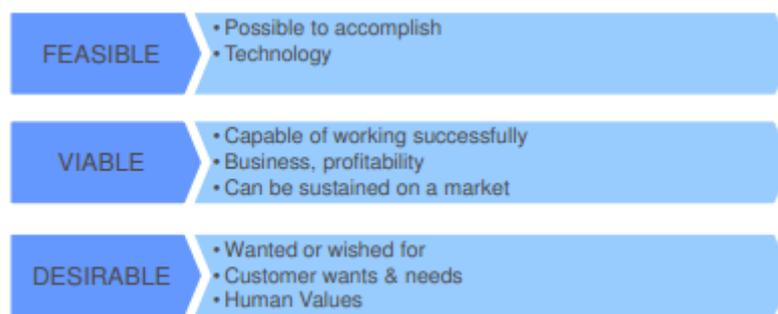


Figure 37: Product requirements, Volvo Car

In addition to the high cost for R&D, customers’ willing to pay is a barrier for developing sustainable products and services in the private sector. Usually the price for a green product is more expensive due to the huge investment from research, development, production, logistics, marketing, sales and aftersales. Globalization is another concern. While the public sector can consider only in the local context, a global company need to take into account issues in the global context. The renewable energy business, for instance, requires the consistency of the markets around the world. It is unrealistic for customers to be willing to drive an electric car to another country without charging stations. It contains high risk for new-energy vehicles to enter

a market at the wrong time. The industry need the support from the public sector to facilitate the business, for example, sufficient charging stations and other infrastructures, and new policies in terms of CO<sub>2</sub> tax, congestion tax and so forth for the potential customers.

The private sector thinks that they are customer-driven and the public sector thinks they are making policies for the well-being of the citizens. But they have different assumptions of people's need. The gap between the different thinking exists might due to that public sector makes 50-year strategy while the private sector usually only has a 5-year plan. Also, the private sector has a target customer group with specific characteristics while the public sector has to consider everyone in the society.

## Design thinking

Design thinking is a systematic approach to problem solving (Archer, 1965). It applies the methods of product development to individuals and businesses so that they can improve the problem solving processes and bring innovation to a higher level. Brown (2014) stated that the goal of design thinking is to match people's needs with what is technologically feasible and viable as a business strategy.

The process of design thinking depends on the context. Stanford D-school (2014) defines that the steps of the processes are to understand, observe, define, ideate, prototype and test. In Challenge Lab, design thinking was one of the learning modules. Söderberg<sup>3</sup> introduced the multilevel design methodology that adapted from Joore (2010). The general processes are 7 steps: Challenge, system, need, requirements, functions, ideas, concept, visualization and realization. The processes could be iterating as many times as possible if new thinking is come up.

The multilevel design methodology (Joore, 2010) adapts to the background of the sustainable developments complex challenge and divide the system into four levels: societal system, socio-technical system, product service system and product technology system (Figure 38).

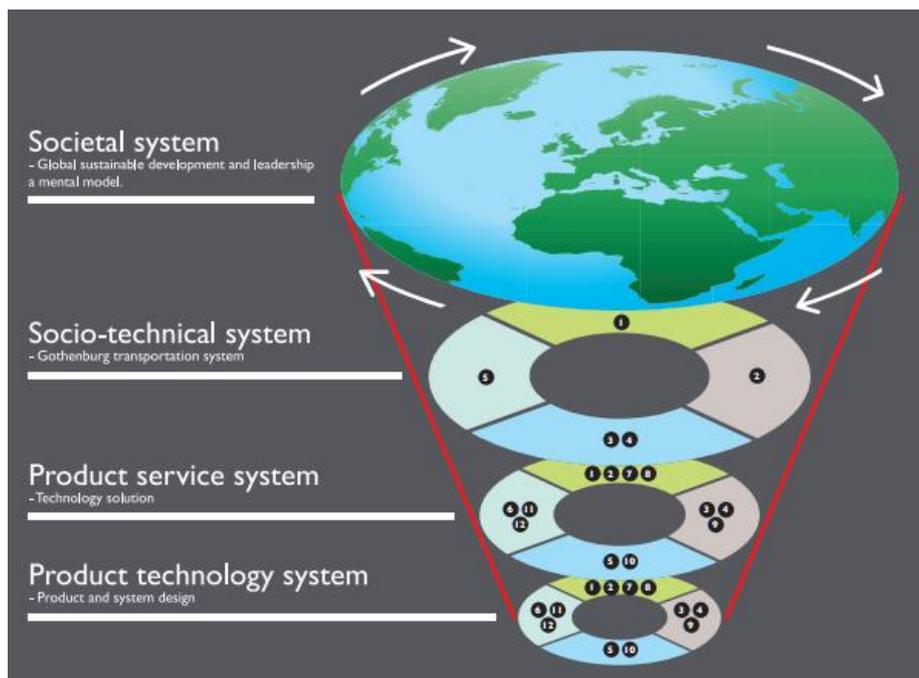


Figure 38: Multilevel design methodology (Based on the adaptation of Joore, 2010)

The first practice session in the design thinking learning module was to help students understand design thinking processes in traditional product development way. Challenge Lab students were teamed up randomly and discussed “what are the needs behind using a post card and a pencil”. The discussion was based on the need matrixes, which took into account the needs areas (process, surroundings, human, economy and society) and the product life cycle

<sup>3</sup> Örjan Söderberg, Teacher and Head of MSc Programme for Industrial Design Engineering, Design & Human Factors Product and Production development, 20 Feb 2014

period (establishing, manufacturing, disposal, usage and elimination). More factors could be added to the matrixes to understand the needs in detail.

Table 4: Needs matrixes – Source: Design Compendium, Orjan Söderberg, 2014

	Process	Surroundings	Human	Economy	Society
<b>Establishing</b>					
<b>Manufacturing</b>					
<b>Disposal</b>					
<b>Usage</b>					
<b>Elimination</b>					

The second practice session was to understand the root cause behind the needs in a specific field. After a discussion, Challenge Lab students decided to focus on the needs in the current transport system. The students were encourage to think deeply and to ask continuous questions. For example, when the students asked WHAT is the problem, additional question could be WHY the problem exists and HOW can the need be addressed (Söderberg, 2014). It was also a brainstorm session that everyone was encouraged to add comments in order to include more possibilities. The first-round question to be discussed is “why do we need transport”. The second-round discussion was thus to ask a further question based on the answers of the first-round. For example, one reason to use transport was “commute” and the second-round question was “why do we commute”. There came more continuous questions which triggered deeper understanding of the needs (Table 5).

Table 5: The expanded method of asking

Questions	Answers
<b>Why do we need transport?</b>	Because we commute.
<b>Why do we commute?</b>	Because we go to study/work.
<b>Why do we go to study/work?</b>	Because we need to make money?
<b>Why do we need to make money?</b>	Because we need to buy foods, clothes and so on.
...	...

It is an effective method to engage the students in the discussion and to dig more about the topic. Through continuous questions and answers, the students tended to discover the root causes of the problems and the real needs of people. It also motivated students to think about the substitutes of the current system. In addition, the brainstorm enables knowledge combination in the multi-cultural and cross-disciplinary student team.

The following brainstorm session focused on HOW the problems could be addressed. The possible directions to address the problems were given as examples such as infrastructures,

mode of transport, vehicles and fuels. The discussions were, however, not limited to these categories but could be anything that the students thought as related, for example, urban plan. The brainstorm sessions were done on the white board with stickers as shown in Figure 39.



Figure 39: Brainstorming session on Design Thinking

After being introduced design thinking as a tool, the student teams were assigned to write a report of problem description considering their projects. It was the first time that the students formulated their projects which was a preliminary version of their own projects. The student teams then got feedback from the instructors and had a discussion session afterwards. At last, students could start project planning with the help of project management tools such as Gant diagram.

## Network Map of problem

By participating all the learning modules with continuous group studying and self-studying, we have gathered amounts of useful information. It was an effective way to visualize all important data on the wall and put them in the way of backcasting.

The funnel was an important framework to map the background of current challenges in sustainability, which were problems that Challenge Lab students were expected to address. The documented goals showed a huge gap between the trends and goals while the strategies showed how the governments would make policies and potential opportunities to address the problems. Many recent finished and ongoing projects were also mapped. As the final step to complete the wall, Challenge Lab students were gathered and started a dialogue. Everyone talked about their own interest in the existed projects and at the same time created the opportunity to match the students who share the interests. Among all the projects, both of us shared the interests for the projects: Ubigo, CLOSER and showed passion for business model research despite that we also had individual interest in Go Smart and Commute Greener. The session made the first step to team up and try to find hot spot.

The method of design thinking brought our thought deep into the need for the transport.

- Why do people need transport?  
The need for the transport includes commute, travelling, shopping, trade and so forth. Transport ensures people's living standard, facilitates the trade and is one of the backbones of economy. We think transport is inevitable for human society.
- How could we do to adapt the transport system to a sustainable future?  
The demand for more transport and traffic is increasing while the capacity is limited. There are, however, idling capacity in the transport system that could be utilize. The most sustainable way to meet the transport needs is not to increase the number of vehicles, instead, people should firstly utilize the existing resources.

During the period to read and get inputs, 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).*

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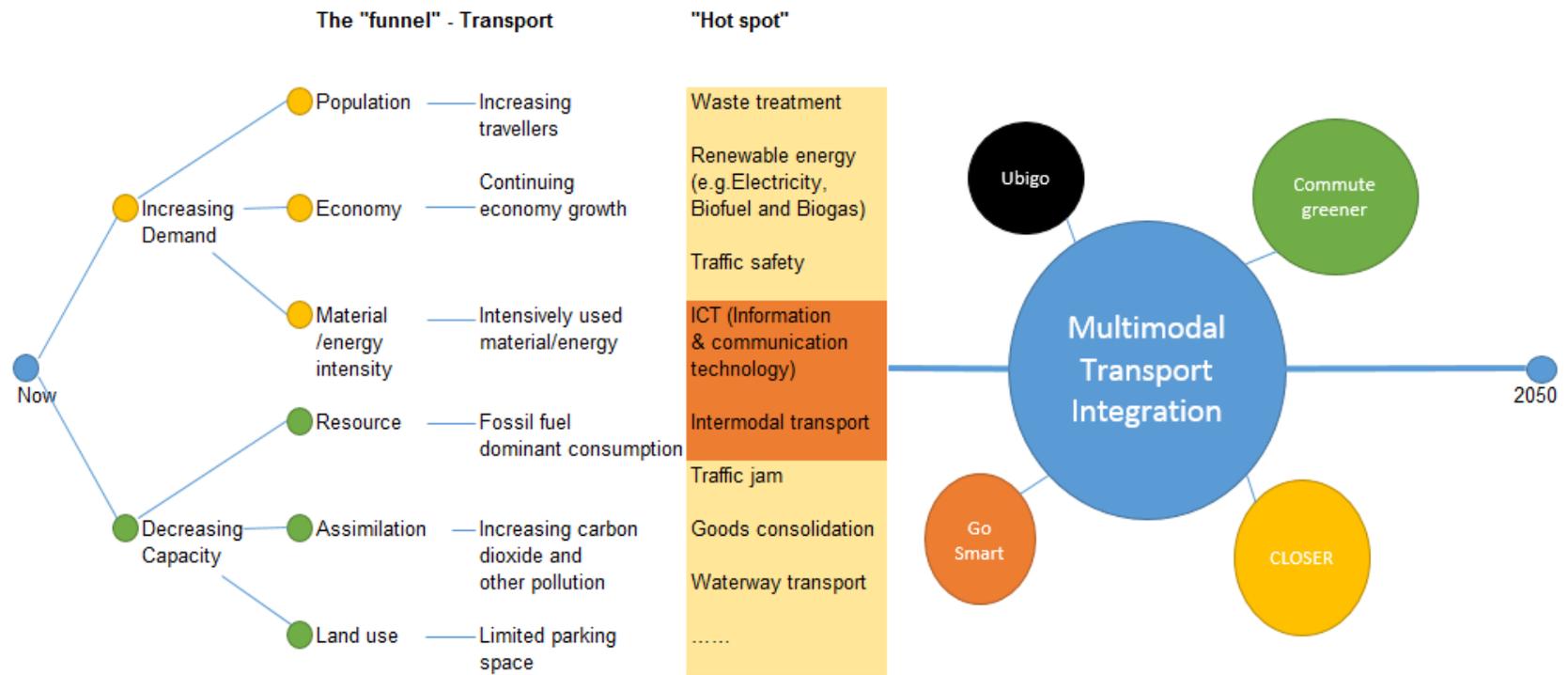


Figure 40: Network map Diagram

## Phase II

### Background

Gothenburg is the second largest city in Sweden. According the statistics from Gothenburg city in 30 September 2013, there are 532 222 people living in Gothenburg and about one million inhabitants in the metropolitan area (Göteborg Stad, 2014). The city has two respectful universities Gothenburg University and Chalmers University of Technology with a lot of students from the local and from all over the world. The famous automotive Volvo was founded in Gothenburg in 1927. Gothenburg has developed an intent automotive industry cluster with several big multi-national companies such as SKF and many other automotive suppliers and consulting companies. In addition to automotive industry, other industries are also prosperous such as chemistry, biotech and shipping. In addition, the city is a popular tourist destination due to a few annual events such as Göteborg international film festival, several music festivals, and many architectural highlights.

### The hub of Scandinavia

Gothenburg is located approximately half way between the Nordic capital cities Stockholm (Sweden), Copenhagen (Denmark) and Oslo (Norway) and it sits at the mouth of the river Göta älv. Gothenburg provides a gateway to Scandinavia and the Baltic Region. The Port of Gothenburg is the largest port in Scandinavia, which reaches the whole Baltic Region and all parts of Scandinavia. Within a distance of 500 km, the harbour covers 70% industry and the population in the Nordic Region including the capitals (The Port of Gothenburg, 2014). Every year, around 900 000 TEU containers, more than 160 000 cars and 20 million tonnes of oil are transported through the port. Gothenburg also serves as a rail hub with 25 daily rail shuffles transporting containers from the harbour to the inland terminals in Sweden and Norway. In addition, there are two international airports, Göteborg Landvetter Airport and Göteborg City Airport, serving the Gothenburg region, among which, Göteborg Landvetter is the second largest airport in Sweden. The unique geographic location and well-equipped transportation infrastructures help Gothenburg grow to be a significant trading city, a strategic transport hub and an effective logistics hub.



*Figure 41: The location of Gothenburg. The yellow circle is marked as 30 miles from Gothenburg and the red circle is marked as the 50 miles from Gothenburg (Trafikkontoret, 2014)*

## The Gothenburg region

The unique location and developed industry clusters in Gothenburg lead to the development of nearby cities. These cities created numerous job positions and attracted people commuting between the cities. According to Göteborg stad Trafikkontoret (2011), Gothenburg region includes Ale , Alingsås, Göteborg , Härryda, Kungälv , Lerum , Lilla Edet, Mark, Mölndal , Orust with suburbs , Stenungsund , Tjorn , Vårgårda, Öckerö, Boras and Bollebygd (see Figure 42). About 2.5 million trips start and/or end in the region every weekday.

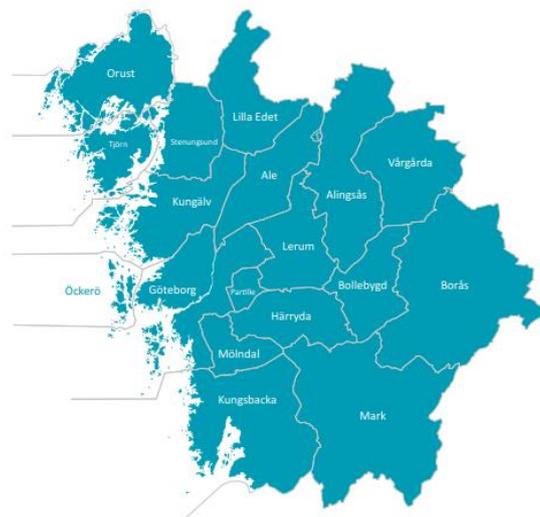


Figure 42: Gothenburg region (Göteborg stad trafikkontoret, 2011)

Seven main roads start from Gothenburg and lead to other cities, creating a hub-and-spoke structure in the region (see Figure 43).

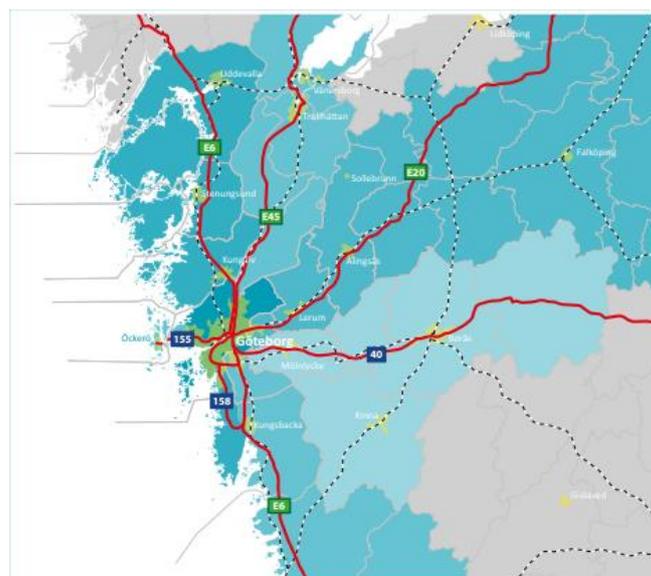


Figure 43: Seven major roads in Gothenburg region (Göteborg stad trafikkontoret, 2011)

Among all the travels, more than 60% are by car and 57% of the travel destinations are from the surrounding cities to Gothenburg, which leads to high demand of parking space (Göteborg Stad Trafikkontoret, 2011). 70% employees own a car and have access to the parking lot at the working place and the ratio in the surrounding cities are 86%.

### City transport and mobility

Gothenburg was a small town with short distances between homes, workplaces and shops until the mid-20<sup>th</sup> century (Trafikkontoret, 2014). Increasing number of people own a car, which lead to dispersed urban structure with separated main residential areas and the concentration of shops and services in the city center. The urban structure in turn encourage more car travels. The travel survey (Göteborg Stad Trafikkontoret, 2011) shows that people’s choice on transport modes differ in winter and in summer (see Figure 44). Travelling by car accounts for nearly half of total transport mode choices. Public transport and walking in total account for slightly more than half.

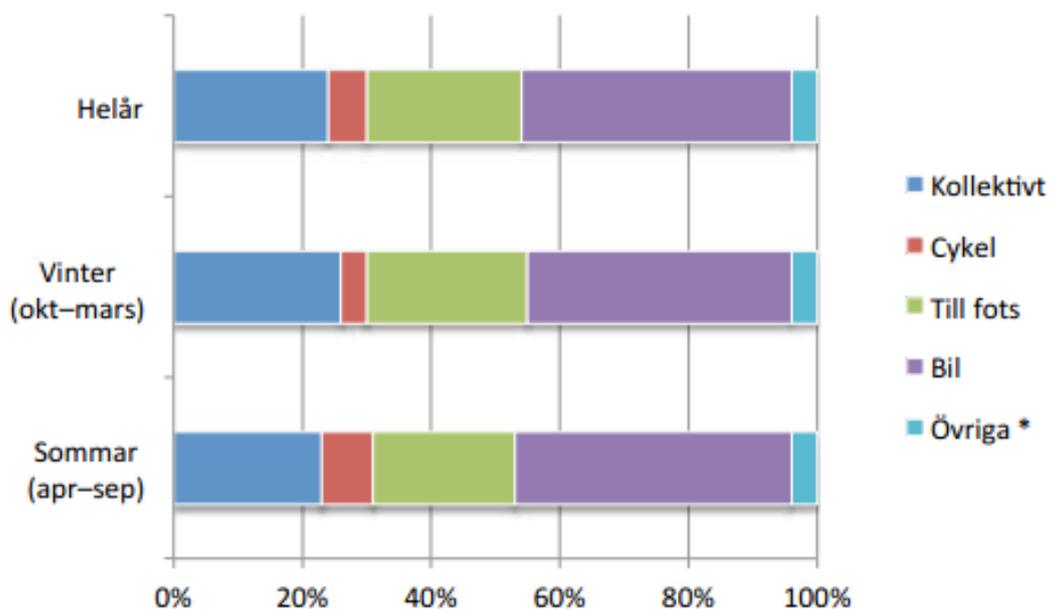


Figure 44: Model split in Gothenburg by seasons in terms of public transport, cycling, walk, car and others (by order). \* Other models are, for example, motor cycle, moped and boat (Göteborgs Stad Trafikkontoret, 2011)

Public transport is also important in the city. Västtrafik is the transport authority in Västra Götalands regionen, which cover Gothenburg region. They provide 1 768 buses, 101 trains, 263 trams and 33 boats with around 900 routes and 22 000 stations (Västtrafik, 2013). However, according to Göteborg Stad Trafikkontoret (2011), the number of travels by car doubles the number of travels by public transport and one reason is probably due to the travel time by public transport doubles the time by car (see Figure 45).

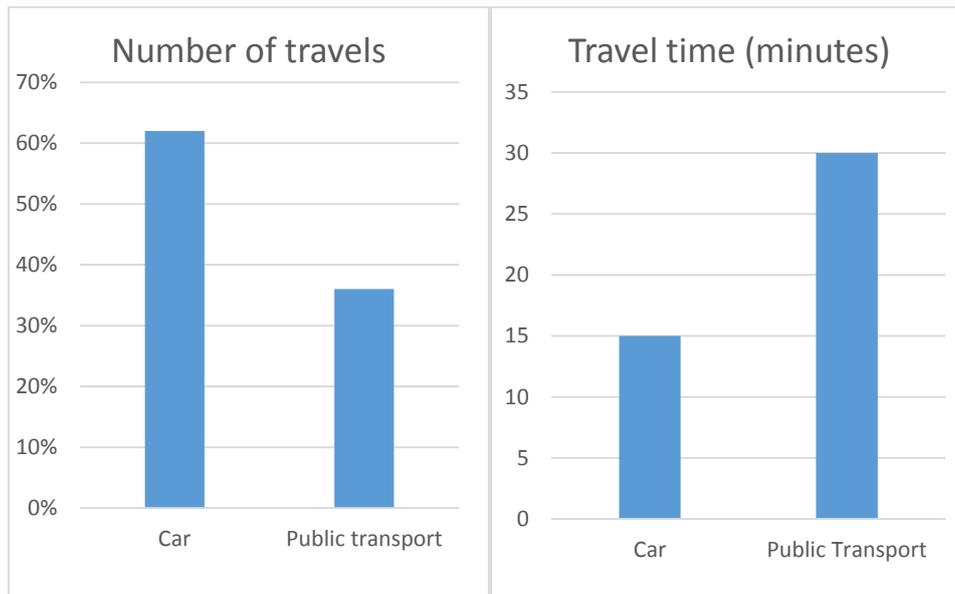


Figure 45: The number of travels versus the travel times between traveling by car and by public transport in Gothenburg (adapted from Göteborg Stad - Trafikkontoret, 2011)

Although only about 10 per cent of travels are by bike in 2011 (see Figure 45), cycling in the city is becoming increasingly popular thanks to the effort of the city planning in favour of cyclists. A self-service bike rental service, styr & ställ, has established 60 bike stations with 1000 bikes scattered throughout the center of Gothenburg (Styr & Ställ Göteborg, 2014). The relatively well developed bicycle network also depends on the route efficiency, separation and priority in the transport network in order to attract more cyclists (Trafikkontoret, 2014).

Bicycle traffic is given priority and speeds adapted to bicycle speeds where the bicycles and motor vehicles are mixed. The municipality of Gothenburg encourages inhabitants to travel by bike since cycling is the second most efficient, resource-economic and healthy transport mode after walking. It can also relieve the pressure on the road network including car travel and public transport during peak congestion hours. However, cycling is only applicable when travelling in the city. Driving a car is dominant travel mode in the surrounding cities (Göteborg Stad Trafikkontoret, 2011) and it is hard to substitute cars for people who commute between cities every day.

### Traffic strategy in Gothenburg

Gothenburg expects that 150 000 more people will move to the city and 80 000 jobs will be created by the year of 2035, which means that the city will be denser (Trafikkontoret, 2014). The transport system thus need to be developed to meet the needs for a larger population. K2020 set the target that at least 40 per cent of all motorized travels will be by public transport by 2025 while Gothenburg's target is at least 55 per cent. The traffic strategy focuses on travel,

city space and goods transports to achieve the target and create quality of life, competitiveness and sustainable development.

The West Swedish Agreement includes a package of projects in the transport area. It takes infrastructure initiatives for trains, busses, trams, bicycles and cars until 2027 in order to achieve the goals and enable people to get around more easily, especially focus on the development of public transport, transport for business and industry, and expanded commuting services for everyone living (Trafikverket, 2014). In specific, the infrastructure projects include (see Figure 46):

- A substitute bridge over the Göta River (start 2015)
- The Marieholm Tunnel (start 2014)
- West Link (tunnel commute and regional train; start 2018)
- Gamlestaden (hub for public transport; 2014-2015)



Figure 46: The West Swedish Agreement – Infrastructure (Source: Presentation slide of Sofia Hellberg, 2014)

The funding of the projects comes from Gothenburg city, West Götaland Region, Region Halland, congestion taxes, sale of land and the State with a sum of 34 billion SEK investment (Göteborg Stad, 2014b; Trafikverket, 2014). The congestion taxes accounts for 50 per cent of the funding has started from 1 January 2013, which also has been regarded effective to reduce the traffic in the city center.

However, a referendum will take place in September 2014 that the citizens will vote for the cancellation of congestion taxes (NEJ till trängselskatt i Göteborg, 2014). Once the congestion taxes is cancelled, the funding of the projects would be a problem and the implementation of the projects could be impacted.

Due to the unique geographical position in Gothenburg, the freight transport is heavy. The new traffic strategy and urban planning encourage to use inter modal transport by rail, water-borne and trucks to relieve the impact to the urban environment. One ongoing project, “Stadsleveransen” (Innerstaden Göteborg, 2014), is related to the concept of the urban consolidation center (UCC).

In the demonstration project, a UCC is built in the city center serving a number of small- and medium-size enterprises (SMEs) in the city center. Instead of delivering the goods to a scattered distributed stores by lots of trucks, all the goods are consolidated in the UCC and be loaded and transported by an electric trailer, which is smaller and has lower emission. The purpose of the project is to reduce the number of traffic in the urban area. The home delivery is, however, not popular in Gothenburg yet due to the city is not dense enough and the home delivery cost is rather high.

## **Theoretical Framework**

*The following sections will provide the theoretical background for the analysis. They are divided by themes that cover multiple aspects of the object of investigation.*

The project is about multimodal transportation and redefining the existing systems for a sustainable future. In terms of redefinition, it is easier to showcase the results in terms of business models. And when working co-creational and sharing systems, there is also big impact caused by behavioural change. To understand the behavioural change, we studied about Behavioural Economics. And also the solution has to be in line with the technology trends. In terms of trending technology, internet of things was studied.

## **Business Models**

Business model describes how an organisation can create, deliver and capture value. (Osterwalder et al, 2010). Business Model helps a normal person understand how the organisation work. The business model is "an architecture of the product, service and information flows, including a description of various business actors and their roles; a description of the potential benefits for the various business actors; a description of the sources of revenues". (Timmers, 1998).

The business model depicts "the content, structure, and governance of transactions designed so as to create value through the exploitation of business opportunities" (Zott and Amit, 2010).

"Business model was one of the great buzzwords of the Internet boom" – Harvard Business Review

Although since pre-classical times, business models have been a part of trading. (Teece, 2010). To contemplate the emergence of business models, Ghaziani and Ventresca (2005), searched for the use of the term "Business Models" in publications from 1975 to 2000. Their search resulted with a total of 1729 publications. In which only 166 were published in the period of 1975 - 1994 and the remaining (1563) were published during the period of 1995 -2000, thereby showcasing the dramatic increase in usage of the term "Business Models".

Zott and Amit(2010) characterizes the business model as follows

1. Business Model as a new unit of analysis
2. Holistic perspective on how firms do business
3. Emphasis on activities
4. An acknowledgement of the importance of value creation

A good business model is a requirement for every successful organization, whether it's a new venture or an established organization. Business models can be anything but arcane. Joan Allion and Fahey (2012) describes business model as a lot like writing a new story and at some level, all new stories are variations on old ones, reworking of the universal themes underlying all human experience. There comes the need for a business model design.

The business model design is about showcasing the operation of a business with concern of identifying sources of revenue, customer base, products and channels of obtaining customers and details about financing. The Business model design defined from the perspective of design themes and content wherein design themes refer to system's dominant value creation drivers and design content refers to the activities performed and to be performed by linking and sequencing of the activities who will perform the same. (Zott and Amit, 2010)

Business models are used mainly to the following three phenomena. (Zott and Amit, 2010)

- e-business and the use of information technology in organizations
- strategic issues, such as value creation, competitive advantage, and firm performance
- innovation and technology management

Business model are interpreted in various methods or perspectives. But all mainly answer the question, how do we sustainably deliver value to our customers? Sustainable means how could one deliver value and still continue to exist in the future. The common models of business models are as follows.

### Value Networks

Value Networks is a method developed by Verna Allee. Verna has been working on the basic concepts of business model since 1990. The tool developed as a result of her research was the Value Network Mapping. The core understanding of this business model is value creation and exchange. And it is only possible to showcase if the value creation and value creation for whom is clearly articulated. The key point here is that the value created or shared is not only in monetary terms but also public and social good. Intangible value could be created and also exchanged. The Figure 47 shows a representation of Value Network Map.

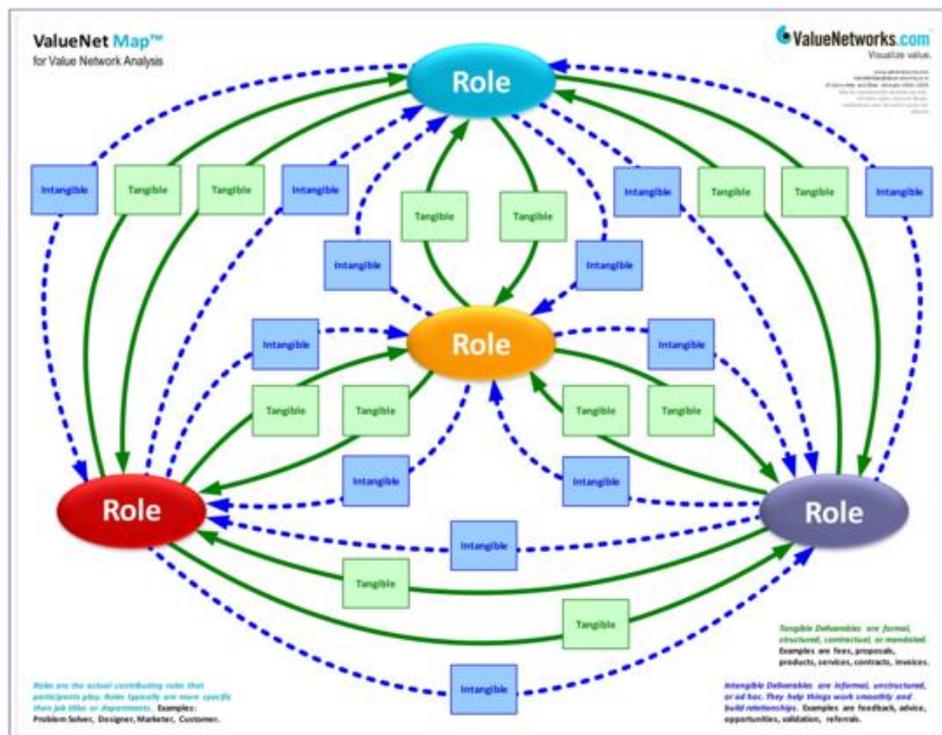


Figure 47: Value Networks Map - Excerpt from (Allee, 2000)

## Henry Chesbrough – Open Innovation Model:

Chesbrough describes about business models in an article with Richard Rosenbloom (2006) and also in his book *Open Innovation*. Often when there are new innovations, new business models are sought for. Chesbrough not only describes about the business models but also changing a business model can be an innovation just by itself. The Figure 48 shows how the business model mediates in between economic and technical domain.

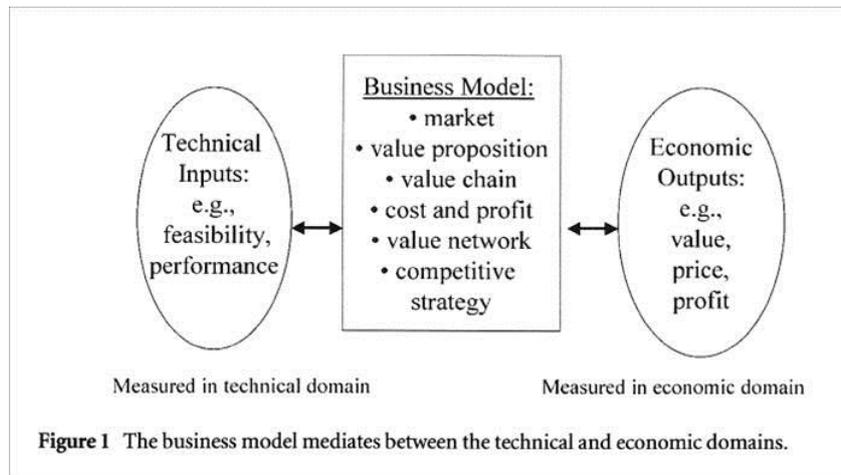


Figure 48: Henry Chesbrough Model, Source - *Open Innovation*, Harvard Business School Press, 2006

## Strategy Diamond:

The strategy Diamond is a strategy tool developed by Hambrick & Fredrickson (2001). The key point of this model is that a good business model is well integrated and all the elements need to be consistent with and support the others. And so if one element is changed then most likely all the other elements would have to be changed. The Figure 49 shows an example of integrated strategy.

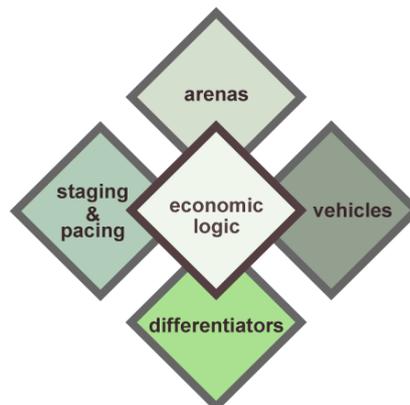


Figure 49: Strategy Diamond Model – Source: Hambrick and Fredrickson (2001)

## Stahler's business model:

Patrick Staehler worked on creating business models in the Digital Economy and published in 2002. This model has four main blocks of value capture and delivery. Value architecture block defines how the value is delivered to the customer or user. Value Proposition block defines what value is given to the user. Revenue stream block defines the economic state of the value capture and delivery. Values block is unique in Staehler's model and it relates with Hambrick's strategy diamond model in the key point of integration. If one changes the relationship style within the organisation, then the rest of the business model also has to be changed. Figure 50 shows how the Staehler's business model looks like.

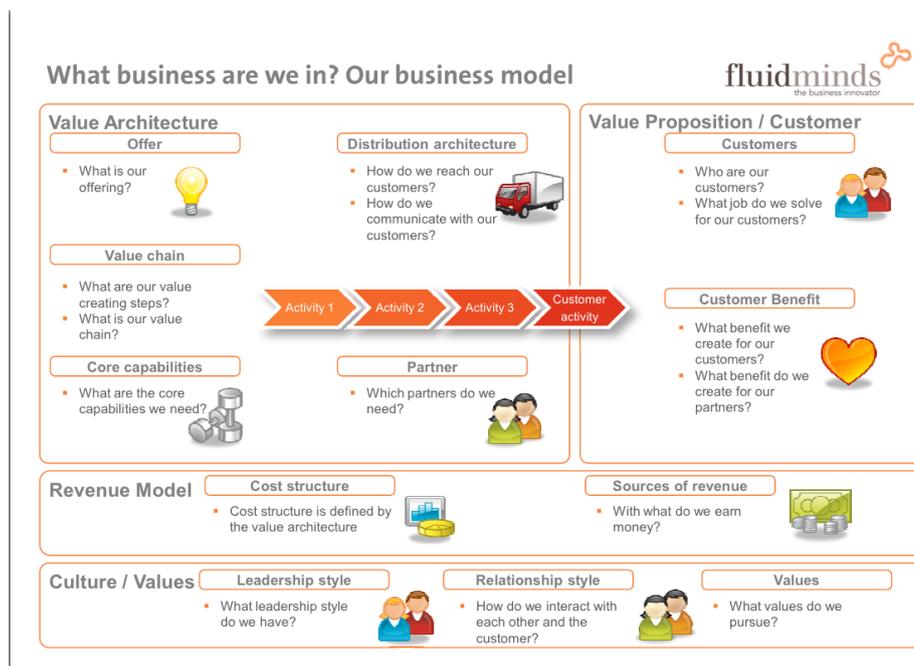


Figure 50: Staehler's Business Model – Source: Staehler (2002)

## Long Range Planning:

Teece (2010) developed this model to use in description for academics. Teece's model is designed solely for description/classification. This model is basically used as a business model which aren't as practical.

## Seizing the White Space:

In 2010, Mark Johnson came out with a framework for a business model with four fundamental building blocks that make business models work. Figure 51 shows the building blocks of the model. (Johnson, 2012)

The four-box business model

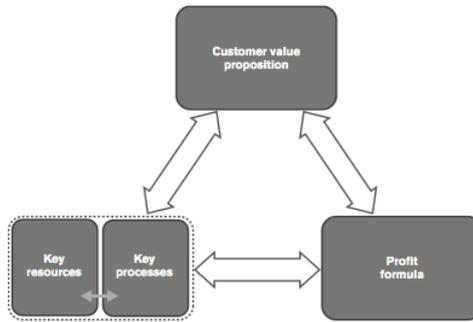


Figure 51: Seizing the White Space Business Model – Source: Johnson (2010)

### Business Model Canvas:

Osterwalder(2010) developed a tool called the Business Model Canvas. This version of business model shows where your organisation should be heading. It is constructed with 9 basic building blocks. These basic building blocks showcases how the company intends to make money. And they cover four main areas of business, customers, value proposition, infrastructure and financial viability.(Osterwalder, 2010) This is the most often used interpretation of business model. Figure 52 shows the building blocks of the business model canvas.

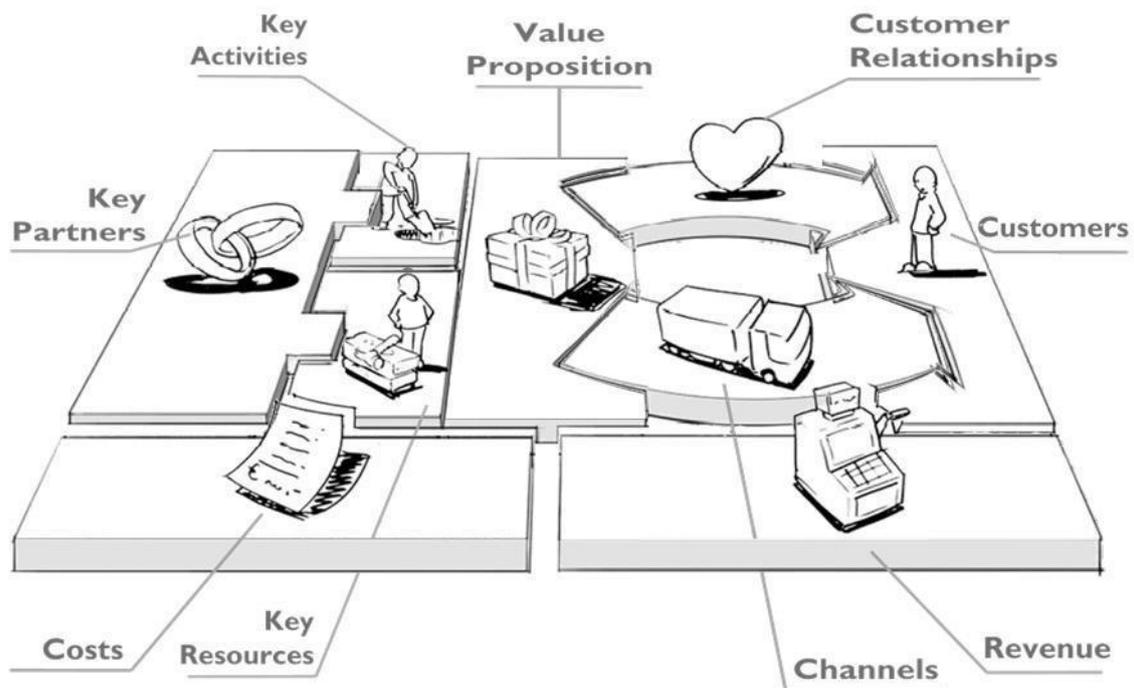


Figure 52: Business Model Canvas - Adaptation by Steve Blank, 2012

### **Customer Segments**

This building block defines different target customer segments that is the groups of people or organization too whom the proposed value needs to be reached or served. Different types of customer segments are mass market, niche market, segmented, diversified and multi-sided platforms.

The characteristics of customer groups representing separate segments are as follows. (ibid)

- Their needs require and justify a distinct offer
- They are reached through different Distribution Channels
- They require different types of relationships
- They have substantially different profit abilities
- They are willing to pay for different aspects of the offer

### **Value Proposition**

This building block defines what value is created for the particular customer segment. This value could be solving any customer problem or satisfying a customer need. In simple words it could be defined as benefits that a company offers a customer. These benefits can be quantitative or qualitative.

Different elements that contribute to customer value creation (ibid.)

- Newness
- Performance
- Customization
- Getting the job done
- Design
- Brand/status
- Price
- Cost & Risk Reduction
- Accessibility
- Convenience/usability

### **Customer Channels**

This building block defines and describes how the organisation communicates and reaches the target customer segment to deliver value proposed. Various functions of this building block are as follows. (ibid.)

- Raising awareness among customers about a company's products and services
- Helping customers evaluate a company's Value Proposition
- Allowing customers to purchase specific products and services
- Delivering a Value Proposition to customers
- Providing post-purchase customer support

The customer channel can be of two types, direct (owned) or indirect (partnered) channels. And both types have five distinct phases, Awareness, Evaluation, Purchase, Delivery and After Sales.

### **Customer Relationships**

This building block defines what kind of relationship does the organisation establishes and maintains with the target customer segments. Main motivation in this block is driven by three factors. They are Customer Acquisition, Customer retention and Boosting Sales. The customer relationship can be any of the following category. (ibid.)

- Personal Assistance
- Dedicated Personal Assistance
- Self-Service
- Automated Services
- Communities
- Co-creation

### **Revenue Stream**

This building block describes how and what the company earns from the value proposed to the customer segment. It takes its roots on understanding the customer's willingness to pay. Different ways of revenue streams are Asset sale, Usage fee, Subscription fees, Lending/Renting/Leasing, Licensing, Brokerage fees and Advertising. And the pricing mechanism is fixed pricing or dynamic pricing.

A business model can involve two different types of Revenue Streams: (ibid)

- Transaction revenues resulting from one-time customer payments
- Recurring revenues resulting from ongoing payments to either deliver a Value Proposition to customers or provide post-purchase customer support

### **Key Resources**

This building block defines the most important assets needed for the business model to work. This differs from each and every building block. These resources help the organization to propose the value to the customers. These resources can be physical, financial, intellectual or human. And they can be owned, leased by the organisation or acquired from key partners. (ibid.)

### **Key Activities**

This building block defines main activities that have to be performed for the business model to work. The key activities are needed to be done to maintain customer relationships and continue earning revenue. The key activities can be categorised as Production, Problem Solving or Platform/network. (ibid.)

### **Key Partners**

This building block describes the network of partners, suppliers or buyers that contribute for the business model to work. Identification of key partners can help the organization in reducing the risk and also to optimize the business model. The motivations for the key partners in the business model are optimization and economy of scale, reduction of risk and uncertainty and acquisition of particular resources and activities.

The four different types of partnerships: (ibid.)

- Strategic alliances between non-competitors
- Competition: strategic partnerships between competitors
- Joint ventures to develop new businesses
- Buyer-supplier relationships to assure reliable supplies

### Costs

This building block describes all the costs incurred to operate the business model. All the building blocks incurs cost. Therefore the costs can be calculated easily after defining the other building blocks. These cost structures can be broadly classified into cost-driven and value driven. Cost structures have the following characteristics. (ibid.)

- Fixed Costs
- Variable Costs
- Economies of Scale
- Economies of Scope

The business model canvas can be split into the right and left part. The left part is more about efficiency for the functioning of the business model and the right part is more about the value generated, captured and shared through the business model.

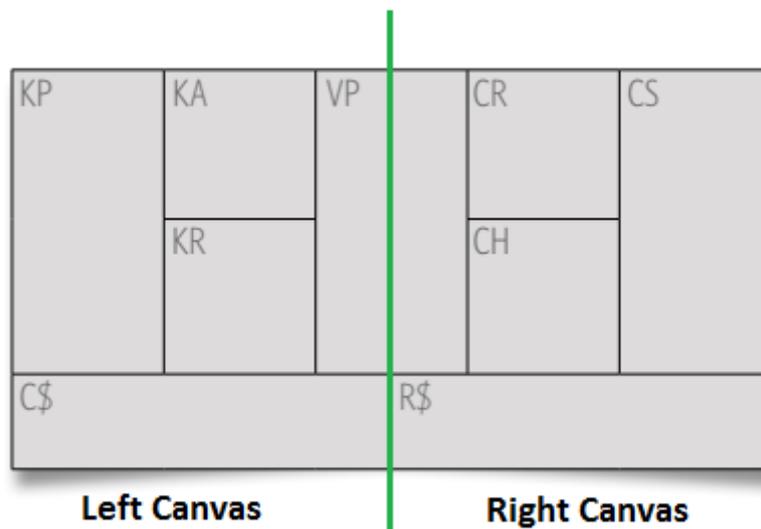


Figure 53: Business Model Canvas - Left Side and Right Side

### Complementarity

John Robert's book, "The Modern Firm" analyses the features of business environment, competitive advantage and organizational design. Robert describes that these features could be analysed by the concept of complementarity.

Robert describes that choosing a business-model is difficult and complex as it has to comply with the organisational structure and environment. Only when it fits properly, a successful performing organisation can be created or adapted. The choices and the opportunities are widely affected by the technology and behavioural choices. Some business models fit also with respect to environment and which can result in good performance. This choice of understanding characteristics with respect to business models can look like working in a coherent manner until the environment changes. The importance is to choose the most fitting one of the workable ones. In the workable ones, there would be few key characteristics. Roberts identifies the Concept of Complementarity as the relationship between characteristics. (Roberts, 2004)

*“Characteristics need to complement each other to create Complementarity. When changing one characteristic it is beneficial to change the other characteristics only if they complement each other. Many aspects around firms affect the choice of business-model, for example the technology development and behaviour that occurs within the industry. When firms are able to recognize and distinguish possibilities and constraints it will guide them to the right fit.”*  
(Goransson, Jonsson and Persson, 2007)

## **Behaviour of people**

Williamson (1996) argues that bounded rationality, moral hazard, agency and opportunism are factors that produce transaction difficulties with a self-seeking interest. For example, by agents working for a firm the result could end up in deceit due to unequal distribution of information. Two other factors that also produce transaction difficulties are irregular information and small numbers of bargain firms. (Goransson, Jonsson and Persson, 2007)

There are two different kinds of uncertainty described by Williamson. The first, primary uncertainty is an uncertain strategic choice from one party. In other words, one of the parties has valuable information that it is withholding. Second, secondary uncertainty is when one of the parties has more or all information compared to the other party. Due to lack of communication secondary uncertainty is rather innocent and in contrast to primary uncertainty of non-strategic kind. (Goransson, Jonsson and Persson, 2007)

## **Internet of Things**

Internet of things (IoT) represents uniquely identified objects and representations through network connectivity. The term, Internet of things was proposed by Kevin Ashton in 1999. (Ashton, 2009) In basic terms, IoT, is defined as any object connected through a network and this connection is reflected and shared in a platform. Internet of things is an emerging global internet based architecture facilitating exchange of goods and services. (Weber, 2010)

Tan and Wang (2010) defines IoT as "Things have identities and virtual personalities operating in smart spaces using intelligent interfaces to connect and communicate within social,

environment, and user contexts". IoT results in any time connection, any place connection and anything connection. See Figure 54.

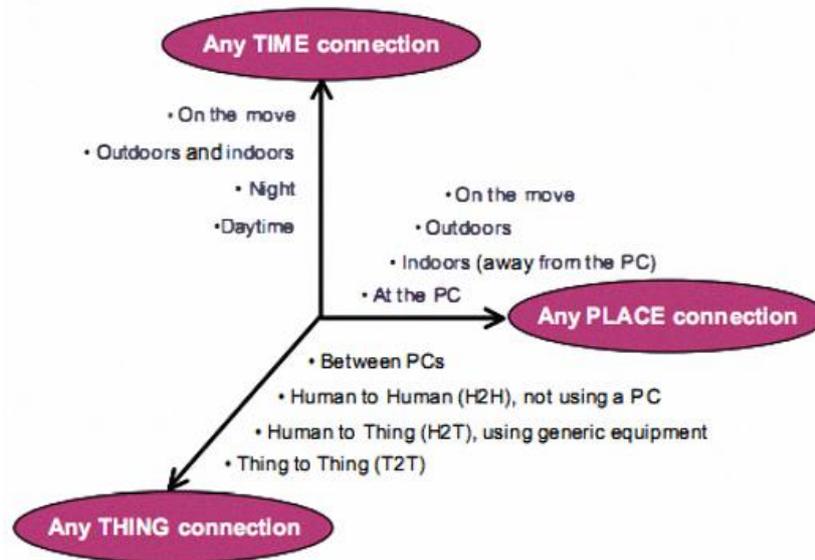


Figure 54: IoT - Anytime, Anyplace, Anything - Source: Tan and Wang, 2010

The web search popularity, as measured by the Google search trends during the last 10 years for the terms Internet of Things, Wireless Sensor Networks and Ubiquitous Computing are shown in Figure 55. As it can be seen, since IoT has come into existence, search volume is consistently increasing with the falling trend for Wireless Sensor Networks. IoT has gained high level of significance in the last two years. But also in consideration is the bias caused due to the hype factor.

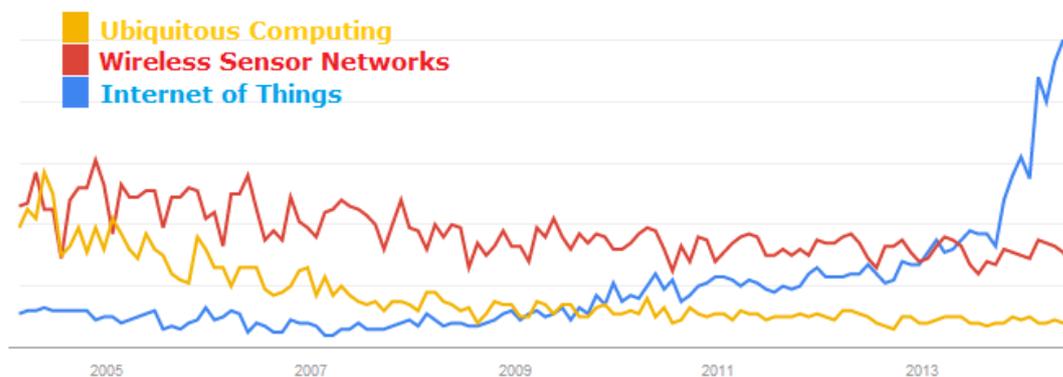


Figure 55: Google Search Trends for Internet of Things, Wireless Sensor Networks and Ubiquitous Computing

The IoT framework consists three main layers, Wireless Sensor Networks or the network of things, Cloud Computing and Applications. The objects which needed to be managed or facilitated with exchange of goods or services is connected with wireless sensor networks. This wireless sensor networks send and receive data signals. These data signals are interpreted in a computing system. In recent times, this computing system is managed in a cloud platform, therefore called as cloud computing. In the cloud computing system, the data signals can be

analysed, stored, computed and also visualized for specific needs. These needs in the cloud computing system can be used or manipulated for various applications. Application areas can be for example surveillance, health monitoring, environment monitoring, smart transportation and critical infrastructure monitoring.

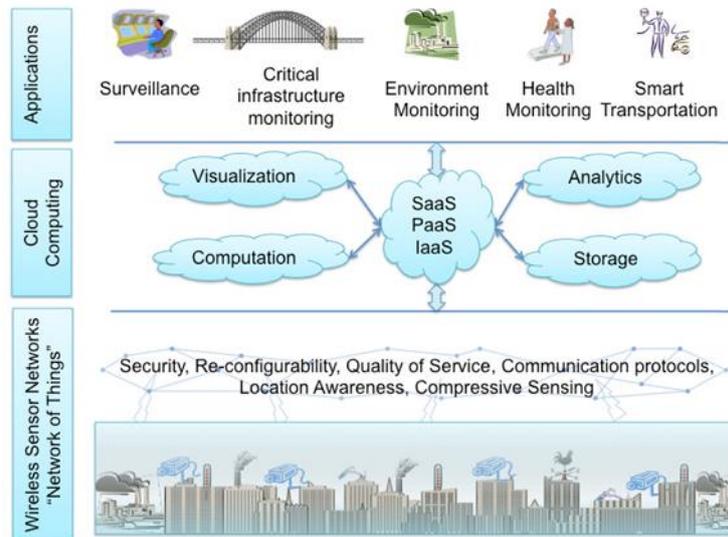


Figure 56: Internet of Things framework - Source: Gubbi et al (2013)

Nicholas Cravotta quotes that “The use of intelligent sensors in transportation systems enables a whole range of advanced capabilities that can increase passenger safety and improve operating efficiencies” (Reporter, 2014).

### Transportation and logistics

City expansion accompanies with the development of transport system, which not only facilitated commutes of long distances to the city center but also the movement of goods. The exchange of goods is a constant feature of human economic activity (Hesse and Rodrigue, 2004) and thus transport plays an important role in the economic development and regional development.

Transportation refers to the movement of people, animals and goods from one location to another (Oxford Dictionaries, 2014). Although transportation benefit the society economically, transportation also cause problems in the society such as air pollution, noise generated by the traffic, accidents, visual intrusion and vibrations (Lumsden, 2011)

Logistics is to manage the movements of people and materials between the point of origin and the point of consumption in order to satisfy all interest’s group’s needs and wishes with focus on the customer (Lumsden, 2007).

Transportation is considered as one of logistics tools since the goods must be attached to some kind of load carrier such as a trucks, aircrafts, or ships. According to Woxenius and Sjöstedt (2003)’s model (see Figure 57), however, transportation and logistics systems are complementary and are two separate systems.

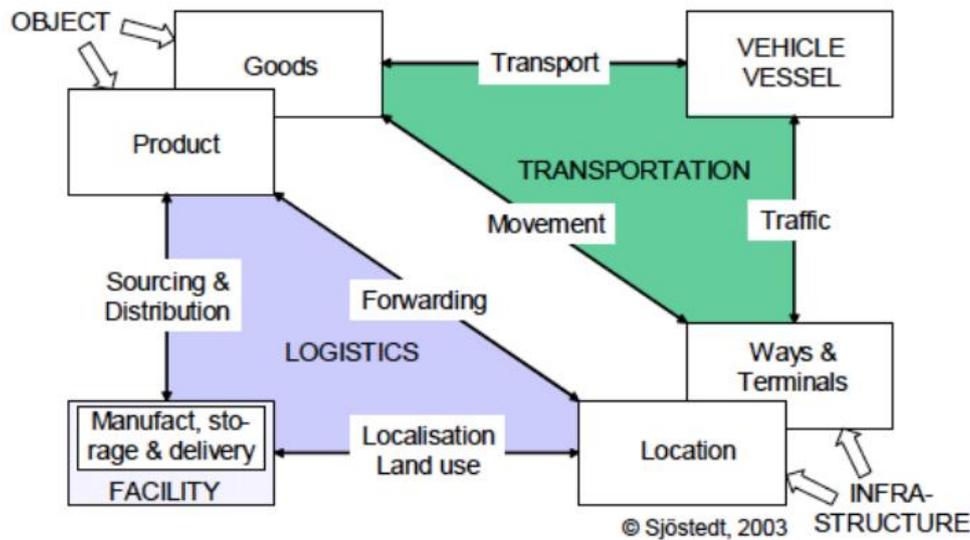


Figure 57: The relationship between transportation and logistics (Woxenius and Sjöstedt, 2003)

Logistics contain a wide set of activities dedicated to the transformation and circulation of goods, which are included into two major functions: physical distribution and materials management (Hesse and Rodrigue, 2004). Physical distribution, assumed to be derived from materials management demands, refers to a range of activities involved in the movement of goods from points of production to final points of sale and consumption (McKinnon, 1988). It should make sure that the mobility requirements of logistics are all met. It consists of all the functions of movement and handling of goods, particularly transportation services (trucking, freight rail, air freight, inland waterways, marine shipping, and pipelines). It also includes transshipment and warehousing services, trade and so forth. Materials management, assumed to be inducing physical distribution demands, considers all activities related in manufacturing of commodities in every stage of production (Hesse and Rodrigue, 2004). The relationship between the induced/derived demands is considered as integrated transport demand of logistics and is illustrated in Figure 58.

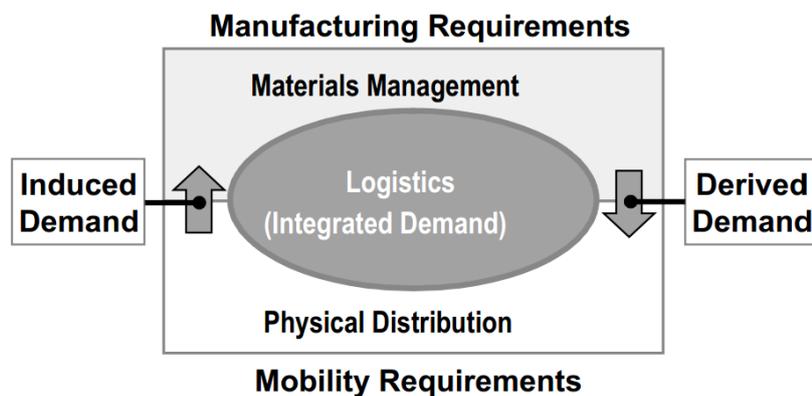


Figure 58: Logistics and integrated transport demand (Hesse and Rodrigue, 2004)

Urban areas are major spots of production and consumption and most transport operations including both passenger transport and freight transport. Transport flows often start, end and bypass urban areas on their way between logistics activities as well as key gateways such as truck terminals, ports, rail terminals and airports (Rodrigues et al., 2006).

Increasing number of people in the urban area lead to increasing demand of goods and thereby increase the needs and requirements of transportation and logistics. Customers require improved service levels as well as decreasing distribution costs. The goal of sustainability also urge the transport industry to meet the challenges. It seems difficult to solve but the developments in information technology and transportation facilities can provide new opportunities (Ford, Gadde, Håkansson and Snehota, 2003).

## **The production view of the firm**

### **Outsourcing and crowdsourcing**

Outsourcing means that the company divests itself of the resources to fulfil a particular activity to another company, to focus more effectively on its own competence (Weele, 2010). According to Deloitte' survey (2012), 60% companies regard outsourcing as a standard practice. The outsourced business functions include information technology, operations, finance, human resources, legal, facilities, procurement and sales and marketing support. The major objectives to outsource are to reduce operating costs and to improve customer service. In addition, the most critical factor to a successful outsourcing relationship is “a spirit of partnership between client and vendor”.

Crowdsourcing, referring to “outsourcing to the crowd”, was coined by Howe (2006) in an article published on WIRED, a digital magazine. Howe set iStockphoto as an example. iStockphoto created a marketplace on the internet that all the users can share and exchange images freely instead of the traditional way that the professional photographers sell the photos to the customers.

Both outsourcing and crowdsourcing are activities that shift one or several functions to others and both of them accelerate the globalization of labour and the economic dislocation. However, there are fundamental differences. In the process of outsourcing, the roles of provider and customer are obvious and specific, and the providers should be professionals. Comparatively, the roles in crowdsourcing are vague that the consumers can also be the contributors, and the contributors could be professionals or amateurs. In other words, people co-create a product or service, share their endeavours and consume. Howe (2009) stated that crowdsourcing could interrupt the traditional industry by the way work is organized, talent is employed, research is conducted and products are made and marketed. Crowdsourcing uses internet to foster an unprecedented level of collaboration among people with different background and geographical locations. The rise of crowdsourcing gives the possibility to connect and integrate the amount of resources such as knowledge, labour or time that dispersed among a large number

of people. It also shows people's willingness to share and contribute to the community which is contrary to the wide-spread assumption that people are self-interested.

### Distribution and re-distribution

Distribution is one of the major functions of logistics. Distribution enables the consummate transactions between buyers and sellers by overcoming the discrepancies between the buyers and the sellers (Rosenbloom, 1995). Rosenbloom (1995) indicated four discrepancies:

- Discrepancy in quantity
- Discrepancy in assortment
- Discrepancy in time
- Discrepancy in space

Distribution break down the large production output of the manufacturer to a smaller quantity desired by individual customers. Distribution sort and combine products of different manufacturers and provide customers with a wide and convenient assortments of products which greatly simplify the shopping process and enhance shopping experience. Distribution hold the goods when they are produced until they are needed by final customers. Distribution connect the distant goods from where they are produced and provide to the final customers at where they are needed. Thus the function of distribution is to bridge the gap of what are produced to what are needed by the final customers. It is an inevitable function between production and consumption.

The structures of generic distribution systems (see Figure 59) are linear and show the middlemen in the channels between the producers and customers. If one middleman is eliminated, the function will be shifted either forward or backward in the channel since the function cannot be eliminated (Abrahamsson, 1993).

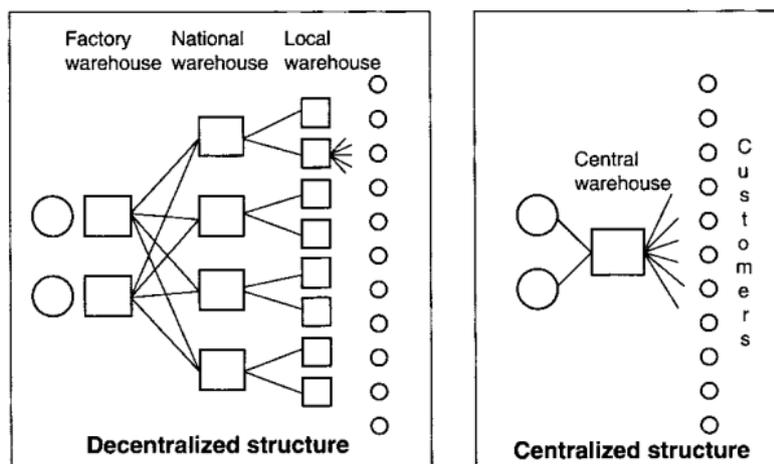


Figure 59: A decentralized and a centralized distribution structure (Abrahamsson, 1993)

Redistribution is introduced in the book “*What’s Mine is Yours: the Rise of Collaborative Consumption*” (Botsman and Rogers, 2010). It is a result of entering into the sharing economy. Redistribution shifts from the generic distribution system which focus on the vertical material flow from the upstream to the downstream along the supply chain, to product sharing on a horizontal level among the consumers. The manufacturers and middlemen are excluded from the redistribution system while only the customers are both product or service providers and consumers. The shift leads to the complexity in the downstream of the supply chain, that is, the collaboration of customers. Supply chain management is defined by the Global Supply Chain Forum as “*the integration of key business processes from end user through original suppliers that provides products, services, and information that add value for customers and other stakeholders*” (Lambert and Cooper, 2000). In the redistribution system, the system users or customers are thus create value for each other. The synergy could be captured not by control and plan but by self-service of the customers.

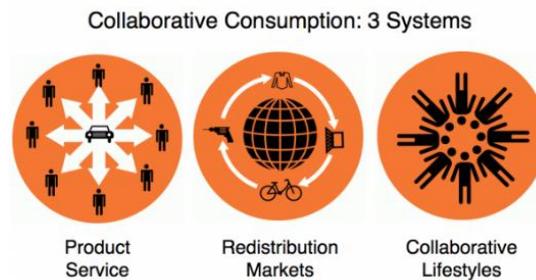
### **Consumption and collaborative consumption**

Consumption in economics refers to the purchase of goods and services by the public and in general it means the action of using up a resource (Oxford dictionaries, 2014). Traditionally, consumption takes place individually. Consumer behavior is based on personal choice and affected by the consumption culture. People consume less to make the ends meet, consume more to improve personal well-being, consume differently to help the world’s poor and consume to save the economy under the global financial crisis (Pedersen, 2013). With the deterioration of environment, the current production-consumption system cannot “*meets the needs of the present without compromising the ability of future generations to meet their own needs*” which defines “*sustainable consumption*” (Bruntland Commision, 1987).

Sustainable consumption is closely related to how much people are willing to pay for “green” products. According to GMA and Deloitte Study (2009), 95 per cent of shoppers would buy green products but only 22 per cent have actually bought them. Pedersen (2013) also stated that the sustainable consumption still remains a niche solution compared to the mainstream consequence of unsustainable consumption. In this case, consumer engagement depends on personal choice of purchase, which is however not enough to alter the current systems. To what extent the level of consumer engagement could help to a sustainable future is to be discussed. In addition, Pedersen (2013) mentioned the significance of the policies and principles that could guide the consumers towards an equal, fair and sustainable consumption style.

Botsman and Rogers (2010) introduced the concept of collaborative consumption, which challenges the traditional economy and raises the sharing economy with the renovation of the product service, redistribution markets and collaborative lifestyles (see Figure 60). The new concept also indicates that people consume not for the ownership of the product but for the function that the product can bring. In the age of collaborative consumption, consumers changes from passive receivers to active participants.

The consumers are unprecedentedly highly engaged in the activities that usually companies do such as creation, production and distribution of the products. With the changing role of the consumers, the boundaries of other roles such as producers, distributors and suppliers are becoming vague. It makes the obsolete products possible to be used again by another consumer instead of being recycled or discarded. The life cycle of the product are pretended by swapping the products between the consumers guided by the need of each individual. The consumption culture are thereby transformed.



*Figure 60: Collaborative consumption systems*

The four principles of collaborative consumption refer to critical mass, the power of idling capacity, belief in the commons, and trust between strangers (Botsman and Rogers, 2010).

Critical mass refers to what extent it is possible to persuade enough people to join activities of collaborative consumption. The right point of critical mass depends on the different contexts. Critical mass also provides social proof that enables people to cross the psychological barrier and to make decisions based on copying the actions or behaviours of others.

The idling capacity is huge in households. Lots of the items people own are used only several times during the product’s life cycle. The idling capacity relates to not only physical products such as vehicles and tools but also intangible assets such as time, space and skills. The utilization of the idling capacity would be a great potential resource.

“The commons” means things common to all such as air, water as well as public knowledge, culture and language. People who believe in “the commons” would like to share the goods with others which was private before. The more people believe in the commons, the more value could be created for each other.

Trust is to be built between strangers through peer-to-peer platforms. The platforms enable to connect the decentralized resources and strangers and build the trust between people based on the transparent community. Any wrong or embarrassing thing will be known by the whole community, which makes the system open and monitored by the crowd. Peer-to-peer trust is believed to be strengthened most of the time rather than broken. In order to understand trust among peers, a good managerial view of the firm has to be shared among the peers.

## **Stakeholder theory – a managerial view of the firm**

Freeman et al. (2010) discussed that the dominant mindset in business and management has separated the “business realm” and the “ethical realm”. The notion of “business is business” is widely accepted. The standard stories reflect that people regard business only with making money instead of connecting to other societal institutions; only shareholders matter; the physical resources are limitless; people are completely self-interested; business people are greedy and will cheat. The stakeholder theory are developed to counter these dominant mindset. They stated that businesses create or destroy value for stakeholders, constantly figure out the interface of stakeholder interests, and the conflicts can trigger value creation. Entrepreneurship can enable business through a stakeholder approach, which “is about creating as much value as possible for stakeholders, without resorting to trade-offs”.

A stakeholder is defined as any group or individual who can affect or is affected by the achievement of a corporation’s purpose (Freeman, Harrison and Wicks, 2007). Stakeholders could be customers, employees, funders, suppliers, communities, managers, etc. (Freeman et al., 2010). The society and business are experiencing turbulence (Freeman, 2010). The turbulence has led to internal changes on owners, customers, employees and suppliers and external changes on governments, competitors, consumer advocates, environmentalists, special interest groups and media.

The natural environment has been considered as one stakeholder as well (Freeman et al., 2010). One support is that different stakeholders such as customers have shared environment as a concern. Thus business could thus create value to sustainability. On the other hand, the degrading environment in which the challenges in the society are becoming huge business opportunities (Laszlo, 2008). The competitive context also urges companies to consider their strategies in the societal and environmental dimensions. Sustainability-as-business-opportunity can thus create value for business. Sustainable value helps companies to improve their business priorities, to drive innovation and achieve competitive advantage.

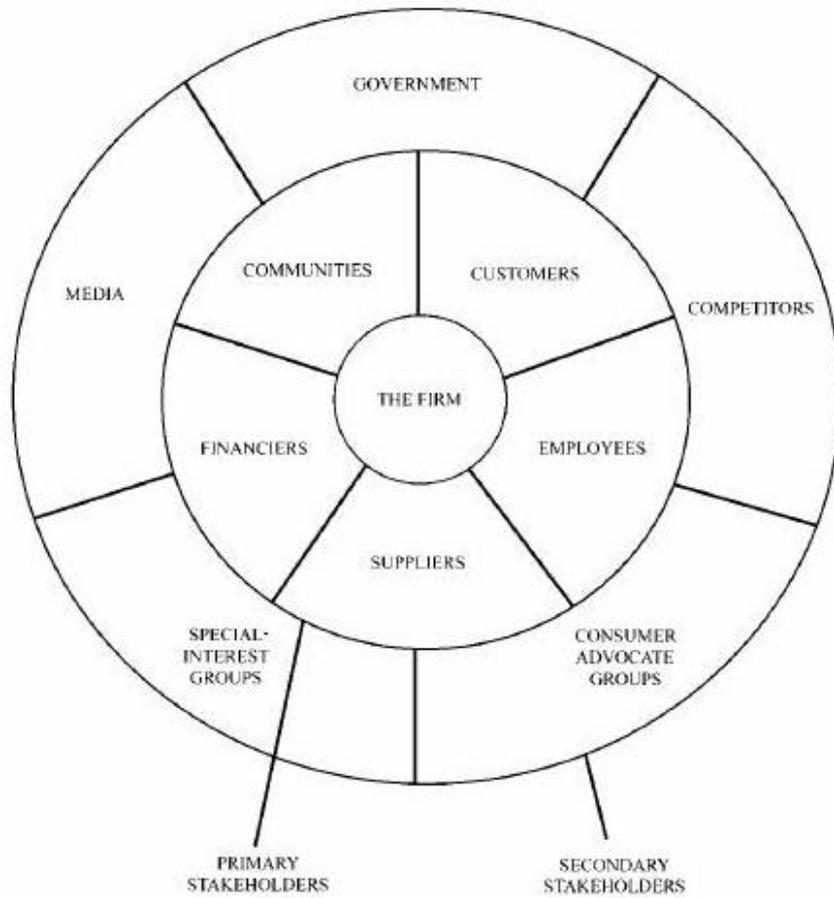


Figure 61: Creating value for stakeholders (Freeman, Harrison and Wicks, 2007)

## Methodology

The study is a result of the phase I research. We have collected both qualitative data and quantitative data to support the study. The qualitative research is exploratory through the unstructured interviews with stakeholders from the academia, public sector and private sector, and through a workshop with a student group in the business school in Gothenburg University. The quantitative research is generated by an online survey to focus group. Both of the qualitative and quantitative research is building upon literature review (see Figure 62).

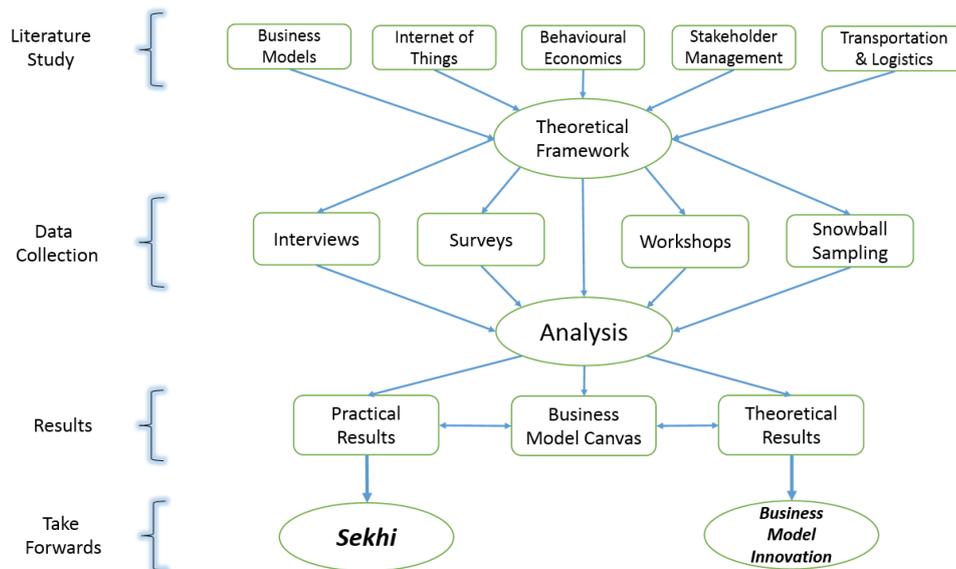


Figure 62: Phase II Working Process

A literature review was used to connect with established theory and research (Bryman and Bell, 2011). These theories and researches should help illuminate how the research questions should be approached. The literature review also shows how the research could contribute to understanding and knowledge. In the master thesis, the theories are related to technology (Internet of things), human behaviour (Behavioural Economics) and management (Stakeholder theory, logistics and transportation). The literatures are cross-disciplinary, and the combination of the theories lead to another perspective, both in terms of inspiration and solution to the research question.

### Unstructured interview

In an unstructured interview, the interviewer has a list of topics or issues with informal style of questioning which also differs in each interview (Bryman and Bell, 2011). Unstructured interview is used at an early stage of the research in order to explore more possibilities and get as much input from the interviewees as possible. At the beginning of the interviews, we usually introduced their business ideas and then they concentrated on listening, not interrupting or arguing with the interviewees and periodically explained in more detail based on what they have said. By doing unstructured interviews, we are open to all thought and comments from the interviewees for the purpose to find similar or existing examples and potential contacts

related to the research. The final business model in this master thesis has been modified a bit from the initial one due to the input from the interviewees.

### **Snowball sampling**

Snowball sampling is an effective way to expand the initial contacts from a small group of people who are relevant to the research to more relevant contacts by their guidance (Bryman and Bell, 2011). The initial group in Challenge Lab include the stakeholders and guests coming to the Lab and participating learning modules. We usually asked for relevant contacts at the end of each lectures and later in each interviews. As the people in the initial group are from academia, public sector and private sector, more relevant contacts are from all the three sectors, among who some have become the stakeholders in the research. One problem of snowball sampling is mentioned that people could become irrelevant with the decision-making network while new people could constantly come (Bryman and Bell, 2011).

### **Workshop**

A workshop was conducted between we and six master students from Business School in Gothenburg University during the course “*Social innovation and entrepreneurship*”. *Sekhi* as a business case was introduced to the student group by both onsite speech and written introduction materials. After the introduction, the students wrote a report regarding the business case from the perspective of the course (see appendix II). The report was written in a parallel time period with the ongoing research and the student group was writing the report independently without any other input from us. Unpredictably, the report has quoted some same references as in this master thesis mainly due to the same business that is discussed and the same background. The student group submitted the report to both we and their course supervisor. We are responsible to read the report and give feedback to the student group through onsite discussion. One of us attended the report presentation in University of Gothenburg and had a direct interaction with the students in the course and lecturers. The written report and discussion are well-structured and provide valuable inputs, but the content of the report limited to only personal transport case which is partly related to the business model in this master thesis.

### **Survey research**

An online survey (see appendix I) was designed and sent out by a link which was posted through social network websites such as Facebook. The initial version of the survey was firstly tested in Challenge Lab in order to get feedback. An improved version was sent out after the test. The survey includes eight questions excluding personal information questions. The survey tried to get people’s attitude toward transport sharing system with four questions about personal transport and the other four about freight transport, which connect to the business model discussed in the master thesis. The first two questions are about people’s travel habits in terms of different modes of transportation. The second and third questions are about people’s

experience and attitude about bike sharing and car sharing. The last four questions are about people's motivation to deliver goods on their way. The non-mandatory personal information includes name, gender, native country, email and mobile number. Profession is compulsory with options "student", "employed", "freelancer", "unemployed" and "others".

We have collected total 52 responses while only 40 responses whose profession is "student" will be analysed. One reason is that Chalmers University of Technology is one member of Green Campus Alliance, who is dedicated to enhance the sustainable development in the campus. There is also an environmental department in Chalmers making efforts to improve sustainability. Another reason is that students are seen as more open than average to accept innovations and are likely to be early adopters of the new business. (Hathaway et al., 2006)

### Validity and Reliability

Validity and reliability are both regarded with how the research has reached its target as designed but they are two different concepts (Bryman and Bell, 2011). Validity is related to the extent a concept, conclusion or measurement is well-founded and responds to the real world. Reliability is related to the extent to which a concept, conclusion or measurement is consistent, or will the result be the same if the research processes are repeated. A research is preferably valid and reliable (see Figure 63).

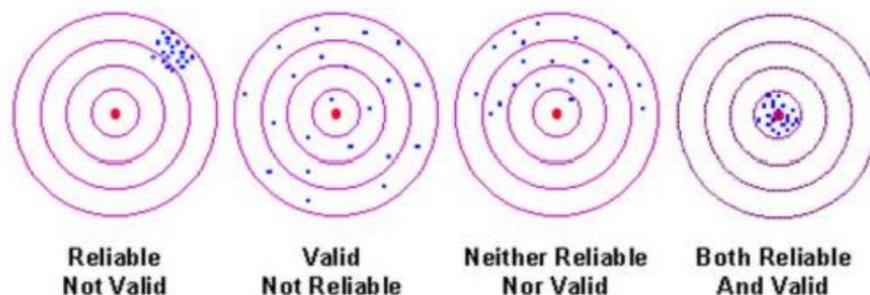


Figure 63: Validity and Reliability (Bryman and Bell, 2011)

### Validity

Validity can be divided into internal validity and external validity.

#### External validity

Bryman and Bell (2011) stated that external validity is about the limits and boundaries of the conclusions and how they are transferable to other environments. The research is built on the real-time facts of the city of Gothenburg. All the interviewees have Gothenburg background and the interviews are focused on the implementation in Gothenburg. The examples mentioned, however, are from all over the world with possibilities to implement in Gothenburg. All survey respondents are students in Gothenburg despite a multi-nationality background. The questions in the survey are also regarding the same city. The business model is thus tailored for

Gothenburg. It is possible to transfer the business idea to other cities but a further research in the context of specific city is recommended.

### **Internal Validity**

Internal validity requires causal relation between X and Y (Bryman and Bell, 2011). The study activities described in phase I lead to the initiative of project. But within the project, it has not been a primary concern.

### **Reliability**

System thinking of phase I will always lead to the initiative of the project. The analysis and data collection focus on the research question. The data collected are all real-time data from interviews, workshops and surveys. The policies from the government, the technologies from the industry and the research from the academia could evolve in the future and thus the result could differ if the research is taken in another time.

## Survey analysis

The survey conducted comprised of participants from 19 countries living in Gothenburg, Sweden. As shown in the figure 63, 80 percent participants were students which was the target group of study. The 80 percent students numbered to be 40, of which 24 were male and 16 were female. In the analysis of results, the 20 percent of participants were excluded.

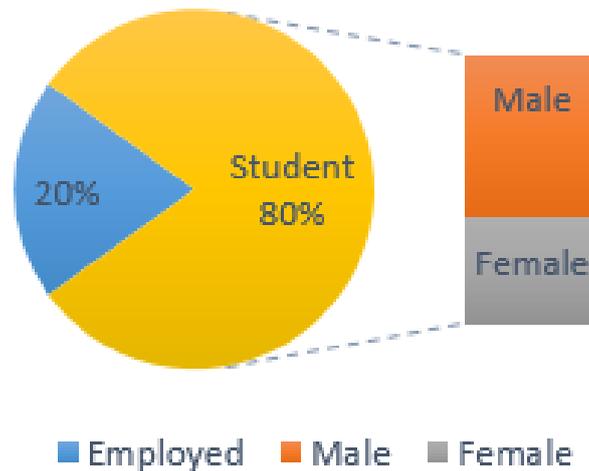


Figure 64: Survey Sample Classification

## Overview of survey results

The participants were posed question “Which means of transportation you often use?” to understand the favoured use of transportation in Gothenburg among students. The use of public transportation was ranked the maximum with 83.3 percent(30 out of 40 participants). Followed by it was to walk around the city and it amounted for 22(61%) people saying yes. 19(52%) people said yes for bikes, 4(11%) people said yes for cars and 2(5.6%) persons for taxi. Only 2(5.6%) persons chosed bike sharing and none for car sharing. Figure 65 shows the representation with the horizontal axis representing the number of people.

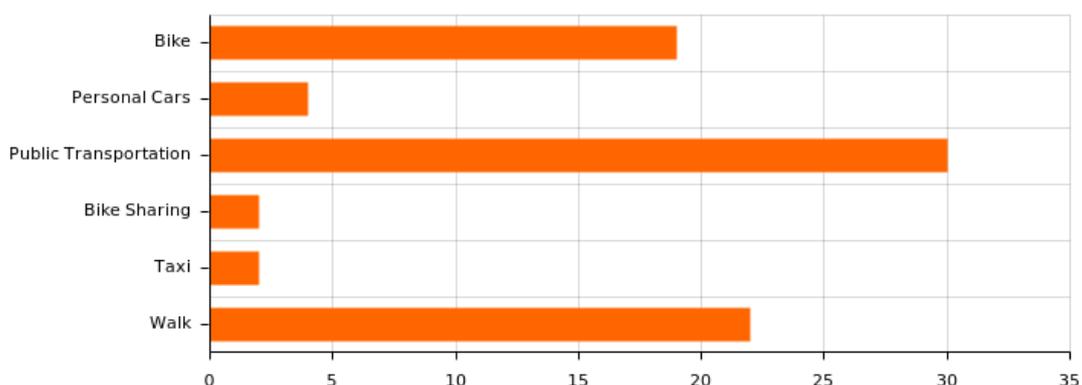


Figure 65: Survey Question 4 - Which is the mode of transportation you often use?

Figure 66 shows how often each transportation is used. Participants were told to answer in a range of 1 – 6, where 1 is the least value and 6 with the highest value. Here 1 represented a null usage of the mode of transportation and 6 represented the most usage of the particular mode of transportation. To contemplate the fact of Figure 66, this shows the abundance usage of public transportation and walking around the city. With the same state of very less usage of sharing systems, car & bike sharing.

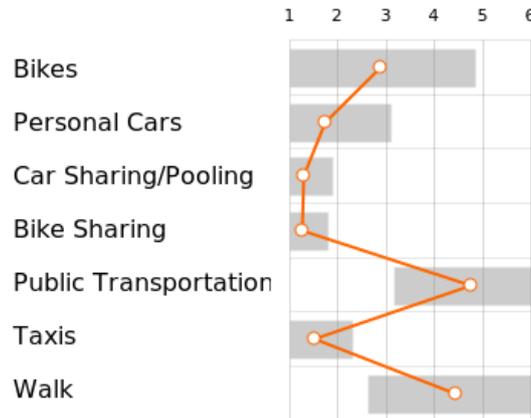


Figure 66: Survey Question 5 - How often do you use the following modes of transportation?

Participants were told to answer in a range of 1 – 6, where

- |               |               |
|---------------|---------------|
| 1 - Never     | 4 - 60% agree |
| 2 - 20% agree | 5 - 80% agree |
| 3 - 40% agree | 6 - Always    |

The Figure 67, shows the basic statistics on bike sharing of the survey, with the target group as students and target location as Gothenburg, Sweden. 40 percent of people are open to share their bike. And close to 50 percent of people are welcome to have smart locks in their bike.

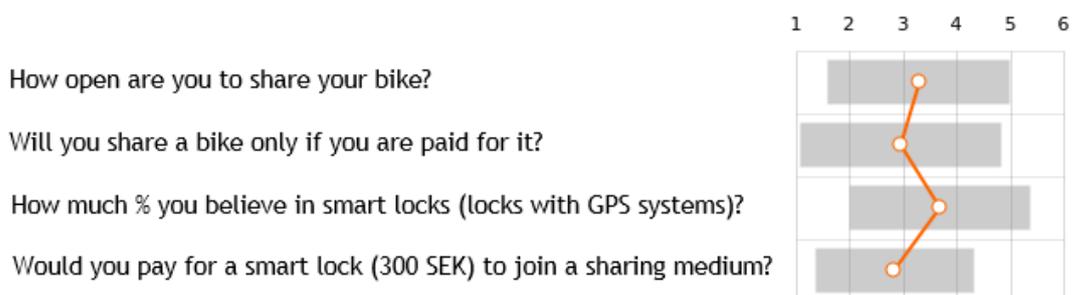


Figure 67: Survey Question 6 - Bike Sharing

The Figure 68, shows the basic statistics on car sharing of the survey, with the target group as students and target location as Gothenburg, Sweden. 60 percent of people are open for car sharing and 50 percent of people are ready to share a car ride with a stranger. But contrastingly when it comes to sharing a car to a stranger, it is a mere 20 percent acceptance with people.

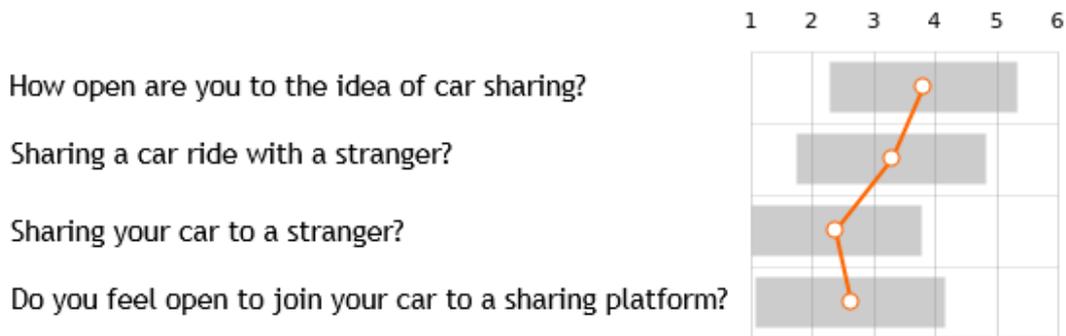


Figure 68: Survey Question 7 - Car Sharing

In what situation would you like to ask for a lift to bring goods for you?

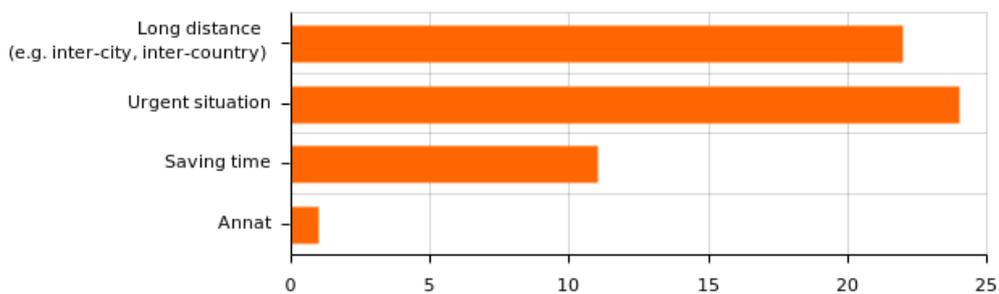


Figure 69: Survey Question 8 - In what situation would you like to ask for a lift to bring goods for you?

Figure 69 shows 65 percent of people would like to bring goods when it is a long distance transit. But urgent situation tops the list with 70 percent of people taking it as a reason.

Would you like to send goods by people who is on their commute way?

1. Yes, if it is free
2. Yes, I will pay to get my goods delivered
3. Yes, I would like to pay much more if I can get urgent delivery and customized delivery
4. Yes, but only for people I know such as family and friends
5. No, I will not consider it because I am worried about the safety of my goods
6. No, I will not consider it

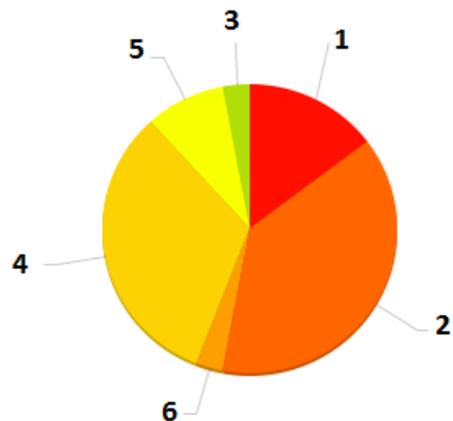


Figure 70: Survey Question 9 - Would you like to send goods by people who is on their commute way?

Figure 70 shows 33 percent of people would prefer to send only with family and friends and 38 percent agree on paying for goods transit. 15 percent of people rather would only go for this service if it was free and 10 percent said directly “No” to the service of goods transfer through other people.

Would you like to bring goods to others on your commute way?

1. Yes, if I get paid same with market level (assume the market level is 50Kkr within Sweden)
2. Yes, I would like to earn more than 50Kkr if I provide urgent delivery and customized delivery
3. Yes, I would like to provide free delivery on my commute way just because I like to help others
4. Yes, I would like to provide free delivery on my commute way because it doesn't need much extra operations
5. Yes, I would like to provide free delivery on my commute way because it is environmentally friendly
6. Yes, I would like to provide free delivery on my commute way only if I can also get free delivery from the others
7. Yes, but I only do this for my family and friends
8. No, I won't consider it.

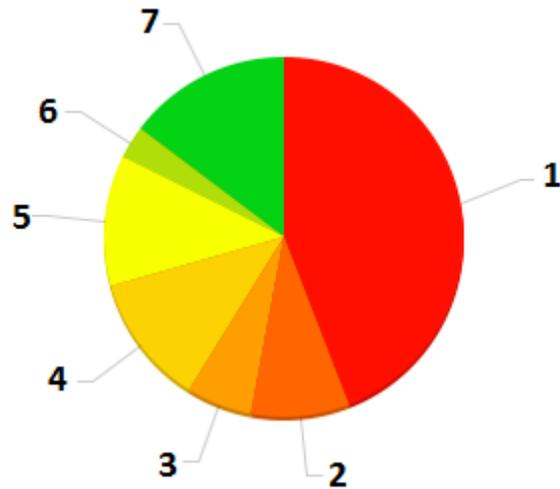


Figure 71: Survey Question 10 - Would you like to bring goods to others on your commute way?

Figure 71 shows the importance of incentives people expect for the goods transfer in their commute way. With close to half of the entire sample (45 percent of people) agree to do this only if they are paid on market level. Considering eco friendliness is only 11 percent of people. And no participant in the survey chosen the option “No, I won't consider it”, explaining the fact that people feel welcome to do the goods transfer in their commute way.

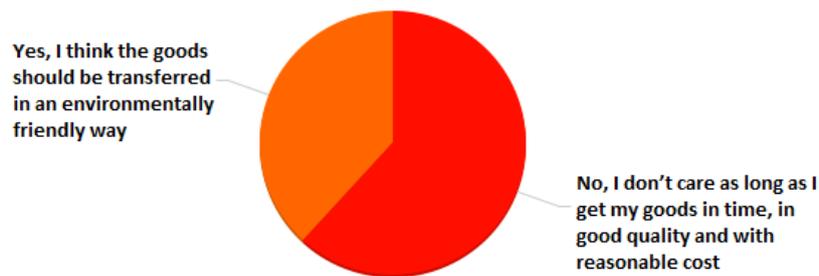


Figure 72: Survey Question 11 - Do you care about how the goods are delivered in terms of the mode of transport?

Figure 72 shows 62 percent of people don't care about environmental gains but rather only see it an opportunity for goods to be delivered with good quality in time and at a reasonable cost.

Participants were told to answer in a range of 1 – 6, where

1 - Never	4 - 60% agree
2 - 20% agree	5 - 80% agree
3 - 40% agree	6 - Always

Figure 73, shows the openness for bike sharing with people only taking specific mode of transportation. The openness to bike sharing varies from 55 to 65 percent and could be taken as a positive trend.

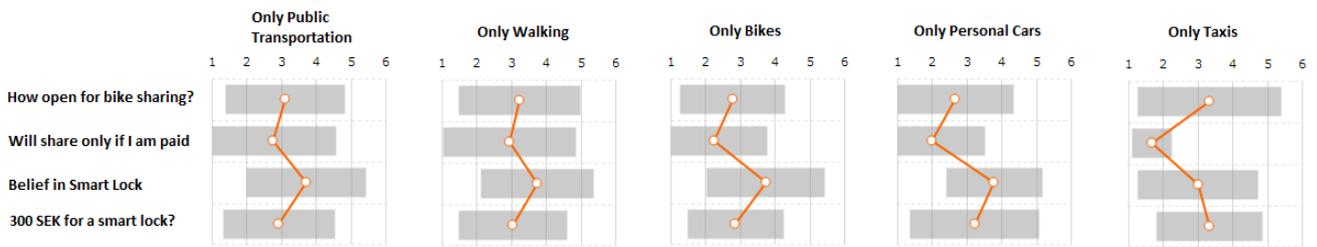


Figure 73: Openness for bike sharing with specific mode of transportation

Figure 74, shows the openness for car sharing with people only taking specific mode of transportation. Percentage towards car sharing increases by 25 percent from people using only public transportation to people using only taxis.

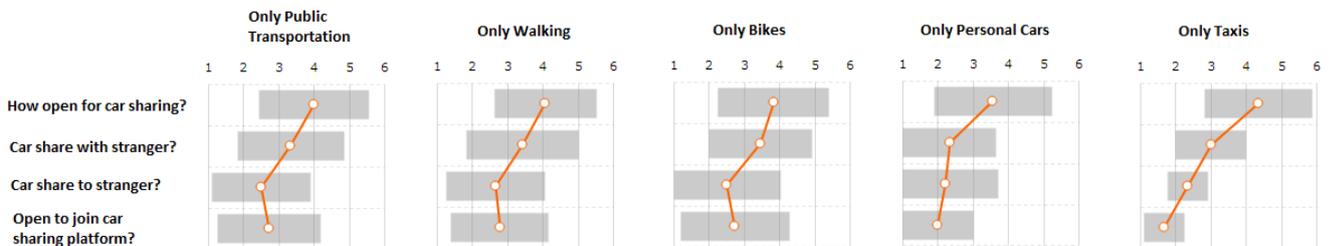


Figure 74: Openness for car sharing with specific mode of transportation

Figure 75, shows the comparison of openness for bike sharing among people in Gothenburg. The figure also shows the openness to bike sharing when people used only one mode of transportation or never used a particular mode of transportation. The deviations in people’s openness towards bike sharing changes from each perspective is surprising with a specific change in usage of public transportation.

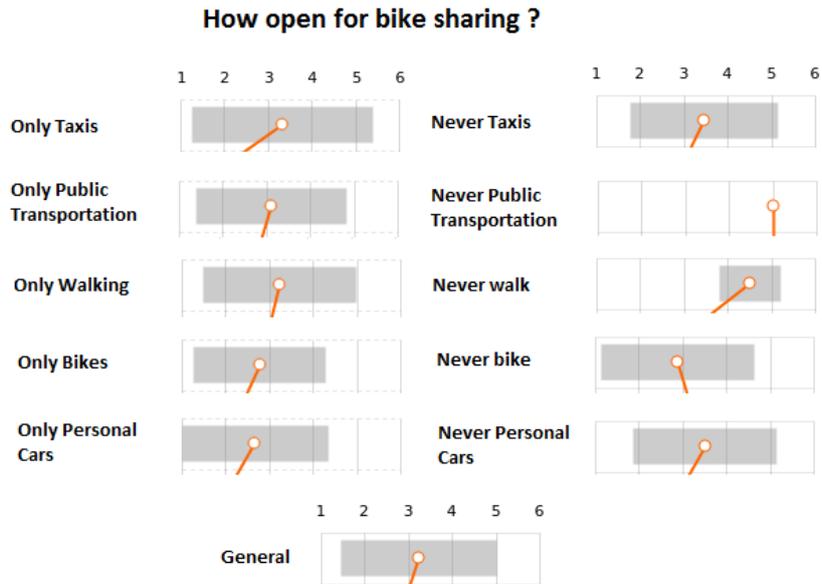


Figure 75: How open are people in Gothenburg for bike sharing?

Figure 76, shows the comparison of openness for car sharing among people in Gothenburg. When the Figure 75 and Figure 76 are compared, a phenomenon could be noticed. Bike and car sharing could be related it with people using public transportation or not. In general, people are open to car sharing and they score between 55 – 65 percent.

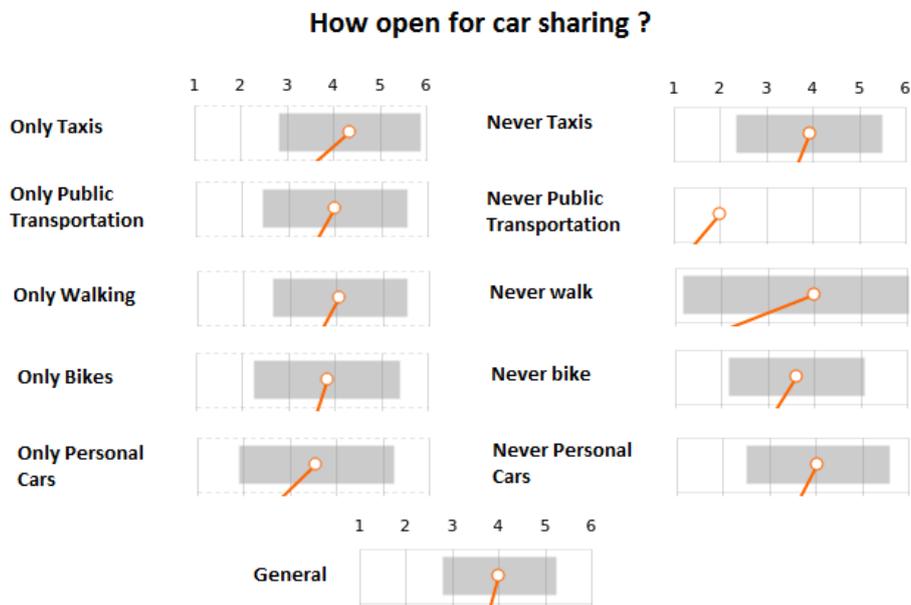


Figure 76: How open are people in Gothenburg for car sharing?

Figure 77 shows how sharing differs in concern with gender in Gothenburg. Interestingly the openness to bike sharing is more among female participants than the male participants. Male are more open to bike sharing when they are paid for it and vice versa for female. In terms of car sharing, female participants are less open to sharing their cars with strangers and also to strangers.

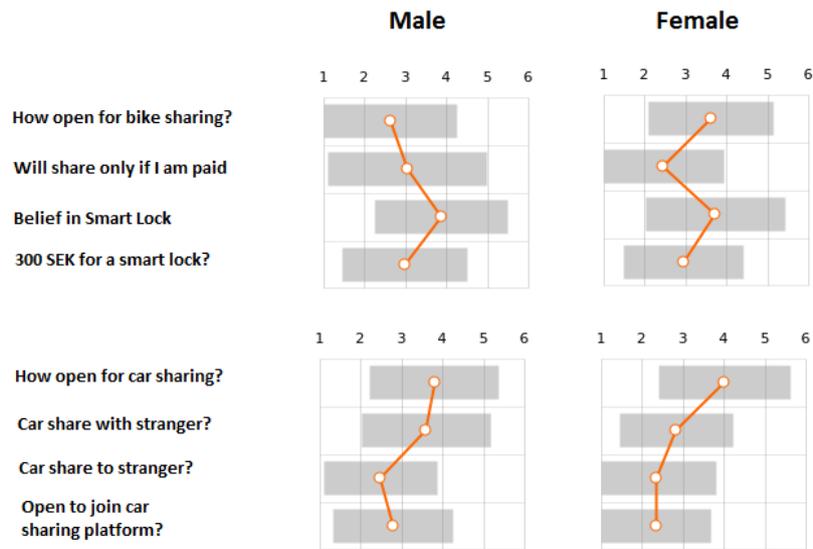


Figure 77: Sharing Economy difference in concern with gender

### Influence of freight with personal transportation:

When people consider a better means of freight transportation, they foresee in saving time with reference to Figure 69. But looking how would this option influence people’s perspective towards the sharing medium. In concern with “Saving Time”, Figure 78 shows people tending more for car sharing than bike sharing. That is people believe in car sharing more for freight transportation than bike sharing transportation means.

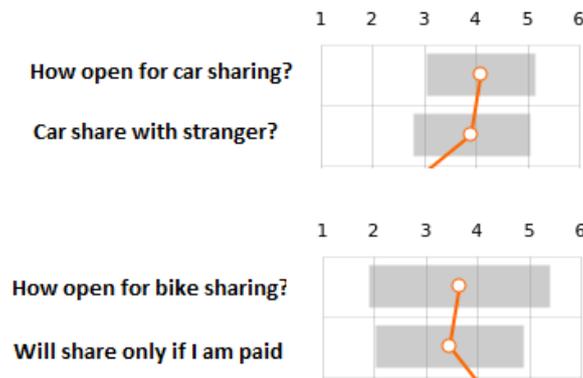


Figure 78: Participants who chose "Saving Time" option for survey question 8

In terms of eco friendliness, participants who answered positive to deliver goods without getting paid as it focusses on sustainable development, they also show very high positive attitude towards bike and car sharing. Figure 79 represents the high peak in openness to car sharing.



Figure 79: Participants who chose option 4(long distance) in survey question 10(reason for freight transportation)

In terms of long distance freight transportation, 42 percent of trust only their family and friends. And 30 percent people prefer to deliver goods for long distance only if they are paid more than the market level. This narrows down the freight transportation in the urban area to a smaller target customer segment. So when we consider urban area delivery of goods, and users pay market level for delivery of goods, then the sharing medium is also focussed on revenue model. In such constraint check, people share bikes more when they are paid. That is the equality of people open to bike sharing and people open to bike sharing when they are paid. Figure 80 shows the representation of the same.

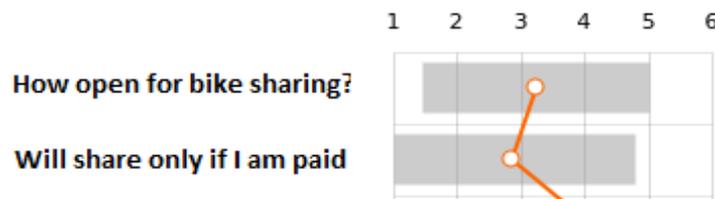


Figure 80: Participants who chose option 1 in survey question 10(reason for freight transportation)

Participants who selected the option of paid delivery coupled with possibility of paying higher in case urgency, participant's openness to bike sharing if paid, increased more than the general openness to bike sharing. Figure 81 shows the representation of the same.

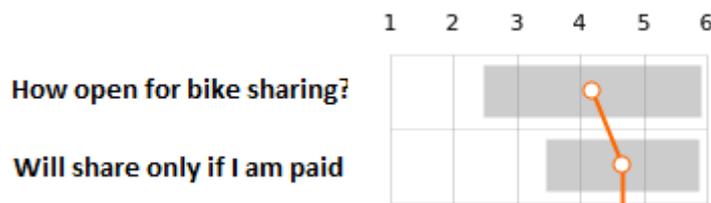


Figure 81: Participants who chose option 2 in survey question 10(reason for freight transportation)

## Stakeholder analysis

The internal/primary stakeholders are users, financiers, communities and the government. One critical stakeholder group is the users. In the case of vehicle sharing, the users are vehicle providers and actual vehicle users; in the case of crowdsourcing delivery, the users can be temporary “delivery man” and temporary “customer”. They would create value for each other. The success of the business rely on the participation of the users. The community’s attitude to the new business model decides how the majority in the society is willing to join the platform. The platform provides the opportunity for people to meet each other, help each other and bring value to each other. It means the business encourages people to make friends and build trust among people in the community. The financiers facilitate the development of the business and they could be the government, companies or other funding organizations.

The government could be the user, financier and facilitator in the business. If the government in Gothenburg sets policies in order to control the traffic flow in the urban area. It would help to facilitate the business. The urban planning especially the infrastructure for transportation would also affect the implementation of the business such as lockers in bus stops. The current traffic strategies shows great potential improvement of the traffic network infrastructures in the near future. Transport sharing system will boost traffic utilization rate to a large extent.

The external/secondary stakeholders include environment, competitors and media. Environment would be benefit from the business. Transport sharing system free up idling capacity of transport entities, which prevents over-production and over-consumption, since people who have to buy a new bike or buy service of logistics companies can enjoy the services through sharing instead of buying. The goods delivery activities are principally integrated into users’ commute transport no matter they are driving a car, taking a bus, cycling or walking.

The interaction of goods transport and personal transport would enhance the utilization rate of the existing transport capacity to cope with the traffic increase due to the development (such as growing population and increasing jobs) in the city. There are no potential competitors to be considered at the early stage since the business is designed to compensate the existing transport system. But we assume that there will be competitors emerging in the future. Media as a stakeholder could expose the platform to more potential users. In addition, it is been seen as a potential way to make money through advertisements on the transport entities.

## **Discussion**

*The following sections will provide the discussion based upon the analysis on the Challenge Lab process and the Phase II (Project).*

### **Challenge Lab Process**

#### **Self-Leadership**

Self-leadership as a learning module contains most practice and less theory study. It was organized at the start of the master thesis period with a follow-up section two month later. The planned time schedule has been seen as a success. One reason was that Challenge Lab students did not know each other at that time and therefore it was an opportunity for them to further understand each other. Another reason was that Challenge Lab students could practice what they have learned during the two months and got feedback in the follow-up section. The way to think and research oneself as well as multiple tools were effective when practicing in the real life.

When being conscious of own values, Challenge Lab students tended to be aware of others' values in the team and also the interviewees' values during Phase II. This motivated Challenge Lab students to find common grounds when dealing with people. The awareness of others' values also created mutual understanding, which contribute to team building. Shared value helped to team up the students and led to 7 sub-teams in the Lab. Despite of being divided into different teams, all Challenge Lab students were willing to share information which could be useful to other teams. It has been believed that self-leadership helped to create a selfless atmosphere of "All for one and one for all".

Self-leadership had not only influenced the work in Challenge Lab but also had a positive effect on people's personal life. At least in Challenge Lab, students were not only talking about study but also things happening in their lives and social network. Challenge Lab students had coffee together and hang out after work. The seed of self-leadership had grown to be flowers of friendship and the spirit to help each other.

Self-leadership had direct effects on personal development while only had indirect and limited effects on the master thesis. The session did, however, prepare the students to meet multi stakeholders and helped them to find common values of both sides.

Self-leadership had also positive effect on other sessions such as dialogue, which was another important part of the inside-out approach. There were three sessions through phase I and phase II. The first two sessions focused on practical dialogue tools and the follow-up session focused on onsite dialogue. The tools made it efficient to communicate within Challenge Lab and outside Challenge Lab with stakeholders. By using the tools such as "circle time and triangle time" and six hats, Challenge Lab students were able to control the dialogue efficiently within

time schedule. The onsite dialogue within the Lab created the mood to proper dialogue practice which was decided by the students to continue in the future.

### **Reflection around methods**

The physical area including a wall and a chair circle worked well with the methods. The wall had been an excellent way to visualize all the processes and background information with the selected methods. The wall was built based on backcasting; the vision was decided first and the necessary actions were discussed and presented afterwards. On the wall, the increasing demand and decreasing capacity was presented in the funnel model. The wall created a circle arena and the chairs were set like a circle. The setting of Challenge Lab created an open environment to visualize theory, to facilitate dialogues and to trigger innovation. An open and rational visual presentation made it easier for confusions to be detected and dispersed information to be connected. The process of building the wall boosted the internal collaboration and cultivate friendship in the Lab.

Design thinking was one of the methods behind the visual wall. The design thinking session provided the way to clear the mind, think deeply and lead to innovations. Challenge Lab students in the session discussed the root cause of transportation, the outlook of ideal transportation and potential ways to realize it. Design thinking was similar to backcasting considering the point that the target was set at the beginning of the work and most efforts need to be spent on how to reach the target. There was little limitation regarding the way to reach the target, which encouraged any activities that could contribute to success. But backcasting was more system-oriented while design thinking focused more on specific product and service. In Challenge Lab, design thinking was also used to design the sub-projects in Phase II. System transition was also a method using non-linear thinking. Since the transport system was impossible to reach a sustainable future with current strategies, people must figure out a solution to disturb the existing system. System transition as a method helped Challenge Lab students to think “outside of the box”.

### **External collaboration**

The external collaboration started with learning modules when people from academia, city of Gothenburg and industry came to Challenge Lab and gave lectures. The lectures brought perspectives from different fields, which were significant information to keep on research. All the guests showed great interest in Challenge Lab and were willing to offer all kinds of help. They shared their contacts which could be interesting to Challenge Lab students and kept contact afterwards. Some of them had been the stakeholders in Phase II and became one of the most important data source in the master thesis.

### **Case 1: Meeting with Areas of Advance (Energy)**

Jenny Forshufvud: Project Co-ordinator (Areas of Advance – Energy)

Jennica Kjällstrand: Environmental Manager – Chalmers University

We had a meeting with Jenny and Jennica to know more about the Green Campus Chalmers Project. In our meeting, when we mentioned about the Green Campus Chalmers Project to both the hosts, none knew about the project though it was connected with both their profiles. On further research with external agents, the project in charge was identified. It was Lars Reuterswärd, who is part of Mistra Urban Futures and also a Vice President in Chalmers. Though high level projects were undergone in the same system, key stakeholders were unaware of it. We as a part of Challenge Lab were active in creating this connection between key persons.

### **Case 2: Meeting with Viktoria Swedish ICT and CLOSER Project**

Stefan Pettersson: Research Manager on Electromobility, Viktoria Swedish ICT

Sofia Vennersten: Project Manager, CLOSER

The interview with Stefan and Sofia were set one after another at the same afternoon. Stefan was working on several projects related to electro mobility while Sofia was working on CLOSER which is an EU project for sustainable freight transport. Both of them worked on sustainability in Lindholmen Science Park, but they did not know each other until they happened to meet in the stakeholder meeting.

The case shows that the external collaboration not only happened between Challenge Lab and the stakeholders but also between different stakeholders. Stakeholder meetings provided opportunities for stakeholders to know each other, which usually was not the purpose. The activities of Challenge Lab has indirectly facilitated connection between stakeholders.

### **Case 3: Meeting with Commute Greener and UBIGO**

Magnus Kuschel: Managing Director of Commute Greener & Initiator of UBIGO

Interview with Magnus was focussed to have more information about Car sharing community in general in Gothenburg, Commute Greener project and about the UBIGO project. Magnus shared more information that was needed. This is a case to be reflected about connecting with important and powerful stakeholders in the system.

Two other Challenge Lab members, Burak & Diana, tried contacting the UBIGO service for more information but were rejected to share information. Rather it was easy for us to get information about UBIGO through Magnus. This co-relates to another Challenge Lab member's, Cecilia, project interest on identifying the potential key player or the powerful person in the respective system.

## Project

In the survey conducted, the result showcases positive attitude to transport sharing systems. According to the Figure 66, close to 50 percent were open to bike sharing and almost 60 percent were open to car sharing. And in terms of sharing your bike when paid also accounted for more than 40 percent (Refer Figure 66). Styr & Ställ has been here in Gothenburg for four years and is running profitable, whereas other public bike sharing systems globally like Citybike in New York, Velib in Paris are running under losses. The survey results shown goes with the profitability of Styr & Ställ.

But looking into the question why the remaining 50 to 60 percent people don't feel open for the idea of bike sharing gives in some interesting results. This question was analysed with filtering the results by often used mode of transportation. In Figure 72, the openness to bike sharing are less with people who are using only bike for their transportation needs in the city when compared with those who use only taxis for transportation in the city. This describes that people who use other means of transportation other than their own bikes and cars are open to bike and car sharing. Therefore to get the transport sharing community better in the city, the city has to limit people using personal cars within the city. Gothenburg has already looked in this case, and have congestion tax in place which reduces the car traffic in the city and focusses for a sustainable future with increase in need for sharing economy.

In concern with getting paid to share a bike, people who use public transportation and walking as a means of transportation, showed more likelihood than the people who travel by taxis. (See Figure 72) It goes with the fact of Behavioural economics, that if people are ready to pay a higher amount that is for taxis, they don't mind to if they are paid for sharing bikes or not. They also tend to be seen as someone who supports eco-friendly ways of transport by not expecting to be paid for sharing bikes. This case is also reflected in view of car sharing, wherein people who use only taxis are more open for car sharing and also car sharing with a stranger.

According to Figure 74, one could find a characteristic result with people who never use public transportation and never walk around the city. According to Behavioural Economics, people who like to travel lonely prefer bikes. This could be visually seen when Figure 74 and Figure 75 are compared. The likelihood towards bike sharing is high and for car sharing is very low.

When it comes to openness towards sharing system in Gothenburg, Sweden, it is not the same with both male and females. Female are more open to bike and car sharing when compared to male. And male are open to sharing when they are paid for doing so. (See Figure 76)

Single transportation mode sharing system exists, that is car sharing or bike sharing independently. Co-sharing system means with various modes of transport sharing system in one combined platform. Co-sharing systems are possible with smart locks using the technology of internet of things.

The above discussions result in more likelihood for co-sharing platform for the city of Gothenburg. This could be taken forward in designing a business model case for the same. Alexander Osterwald’s Business Model Canvas is widely used and recommended by many major talent sources. So considering the nine building blocks of the business model canvas and attributing to the present case, discussion on the building blocks is adopted as follows.

## Business Model Canvas – Personal Transportation

### Value Proposition

There is a need for a co-sharing platform in the city of Gothenburg. Co-sharing includes bike sharing and car sharing. So the value proposed here is to create a Co-sharing transport platform which facilitates bike sharing and car sharing systems.

### Customer Segments

Based on the analysis, most likely target segment is female students in Gothenburg. But considering the fact that male students are more open for sharing system when they are paid, give a pathway for a revenue system. So concluding the students are the main customer segment.

### Customer Channels

The customer channel to target the student group customer segment, is through educational institutions. The customer channel could be through Chalmers University, Gothenburg University and other high schools in the urban city area of Gothenburg.

### Co-Sharing Transport

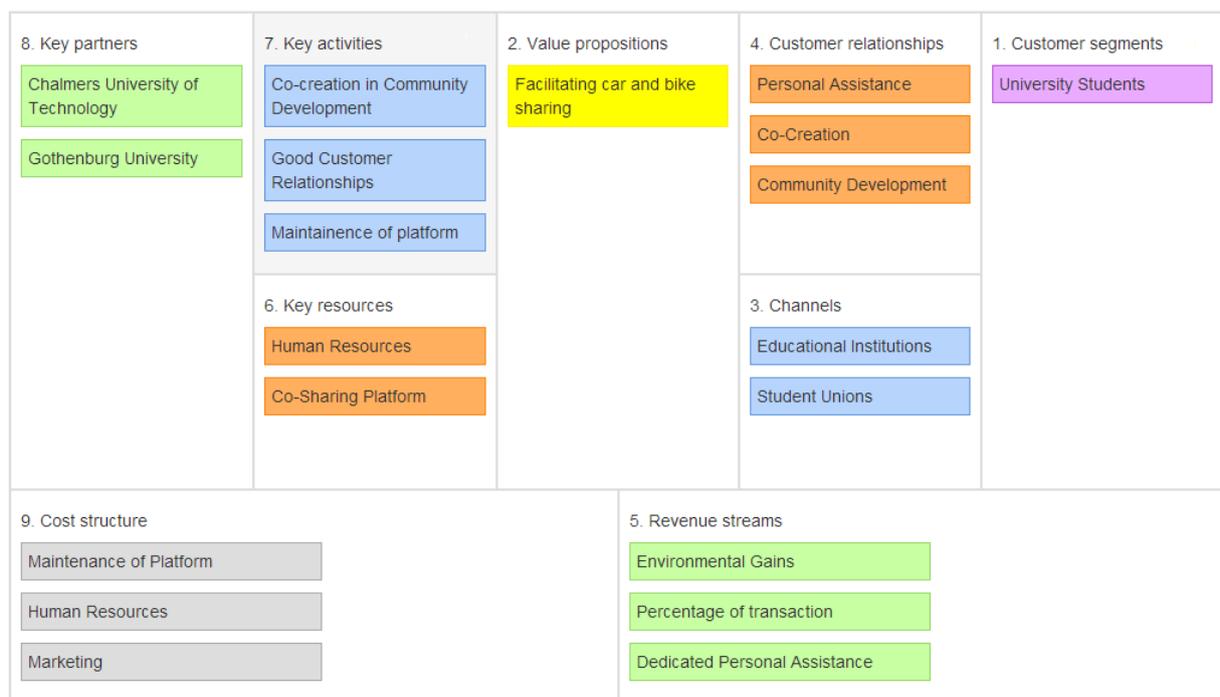


Figure 82: Business Model Canvas - Personal Transportation

### **Customer Relationships**

To focus the challenge of customer acquisition and customer retention, the communities could be created. And also to have a co-creational setup to maximise the use of sharing systems. This could be enabled through Student Unions in universities and high schools. Therefore the customer relationship could be maintained cordially through communities and co-creation. Added to that personal assistance for the service helps the user feel more privileged.

### **Revenue stream**

The revenue stream could be focussed on having a percentage of the transaction for the usage of the service. Dedicated Personal Assistance service for specific paid customers can also act as a source of revenue. The revenues obtained through the both the cases can enable the self-managed functioning of the co-sharing platform service. Revenue could be also seen in terms of decreasing environmental effects as people tend to use more sharing systems leading to sustainable development.

### **Key Resources**

The key resources for the system to continue to exist would be the co-sharing platform, staff maintaining and tweaking the system for updates and the community created around the sharing system.

### **Key Partners**

The main partners that support the system is the universities and high schools. Here in this case it is mainly the Chalmers University of Technology and Gothenburg University.

### **Key Activities**

The key activities would be to maintain the platform efficiently and have good customer relationships. And also co-creation activity for the community around the co-sharing platform.

### **Costs**

The main costs is to maintain the platform, having staff dedicated for personal assistance and the cost of taking the idea to public and making them aware of the service.

## **Business Model Canvas – Freight Transportation**

### **Key partners**

The government is seen as one key partner due to the traffic strategy relating to infrastructure construction which make the business more convenient for users. The users are also seen as key partners since the trade will not happen without users' willingness to share their lift or time.

### **Key activities**

The company should create the platform and maintain the platform such as keep the user privacy, technical support, fix bugs and regular updates. The users can be divided to two roles such as temporary “delivery man” and temporary “customer”. After the delivery man accepted the order, she/he should pick the goods in the right time at the right place and send it to the place at the time as agreed. The customer need to pay for the delivery as agreed. During the delivery, a same sum of money in the “delivery man's” credit card would be frozen and it will become normal until the “customer” confirm reception through the app.

### **Key resources**

The resources include the hardware, the software and the participants. The hardware is the platform with all the technology need, database and the lock. The lock make the delivery more flexible. One way to use it is to connect it with boxes and put them in certain locations such as bus stop, apartment buildings, office buildings, schools and campuses. There are already real examples as DHL Packstation (Germany), Bufferbox (Canada), InPost Lockers (U.K.) and Amazon Lockers (U.S.). The reader can find more about the box in another Challenge Lab thesis written by Andreas Lehner (Lehner, 2014). Another way to make the box moving, which is even more flexible.

A real example is the service provided by Volvo Car called Roam Delivery. The trunk of the car is equipped with the lock and delivery man can open the lock with app and put the goods in the car. Similar technology can also be used in trains or other vehicles. The similar application of the lock creates numerous small and dispersed pick-up and drop-off stations and make it flexible for the picking time and place, and thereby offer convenience for the users. The software is mainly about the app. The app should connect with the platform and provide the function of finding and providing services with easy access and operations. The participants include human and vehicles. The huge population offers a big amount of probabilities. The platform tries to collect lots of the coincidences and match them with both needs. The more the participants, the more services they can provide, the more chances people can meet their needs.

## Crowdsourcing Delivery

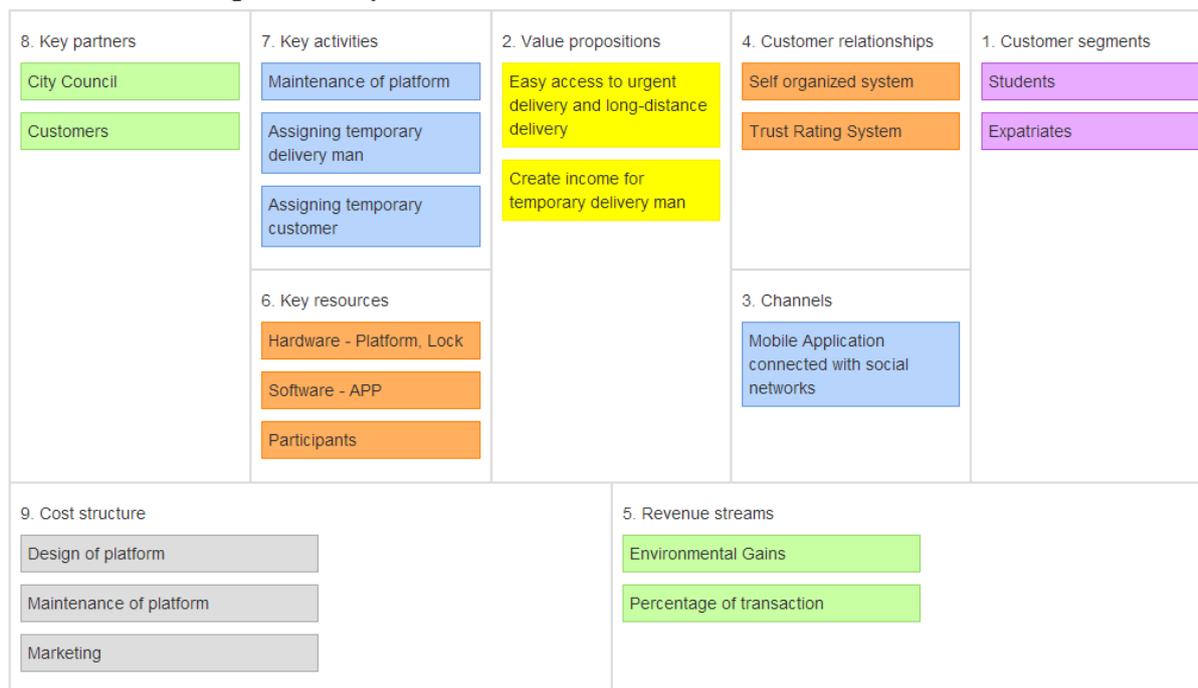


Figure 83: Business Model Canvas - Freight Transportation

### Value propositions

The value will help the temporary “customer” to deliver goods especially under urgent situation for long distance, and create income for temporary “delivery man”. The model tries to bring convenience to all the users.

### Customer relationships

The business is self-organized by the customer, who will create value for each other. Customer can also rate each other through the app and thus establish a recommendation system. The company will just make rules of using the platform and maintain the platform technically.

### Channels

The main channel will be through the app with access to users’ social networks. Word of mouth marketing will be focused.

### Customer segments

The early adopters are set as Chalmers students. Other potential users are businessmen, expats, and the people from surrounding cities next to Gothenburg.

### Cost

The cost includes initial investment for designing and making the platform. A marketing cost should be considered as a long-term cost.

## **Revenue**

Main revenue is from a deduction percentage of a trade (e.g. 20% of the actually trade price). The recommended price per delivery is set as market level of normal post service (i.e.50 SEK) Insurance and privilege will be considered as extra service with fee. A deposit could be charged in advance and which could be invested to make money with risk concerns.

## **External Collaboration**

### **Case 1: Meeting with Area of Advance (Energy)**

Jenny Forshufvud: Project Co-ordinator (Areas of Advance – Energy)

Jennica Kjällstrand: Environmental Manager – Chalmers University

The interview with Jenny was motivated by we' interest in Green Campus Alliance which Chalmers University of Technology is a member. Jenny worked on the environment issues for Advance Area of Energy in Chalmers Johanneburg Campus. She was curious about Challenge Lab and wondered how it would possible for Challenge Lab students and the campus to collaborate for sustainability. We introduced the general idea of Challenge Lab and possible specific projects that would be researched. Jenny showed the great interest in both Challenge Lab idea and specific projects.

In Johannesburg Campus, a new building is under construction for Johannesburg Science Park. It has been taken into consideration that future Challenge Lab generations would move from Lindholmen Science Park to Johannesburg Science Park and candidate topic would be about energy.

### **Case 2: Meeting during IMPACTS Summits 2014**

Jim Ringman: Projektledare

Stefan Eglinger: Head of Urban Transport & Mobility

We had an informal meeting with Jim Ringman during the conference process. During the conversation, we explained about the project and research being done. Jim and Stefan were very interested in the project and hinted us that the politicians in the city are stressing the city officials in finding new solutions of sustainable transport and mobility solutions. Stefan directed us to contact the person in charge of bike and car sharing in the Traffic office. This connection with key stakeholders in the system and identifying the need (insider information) was very crucial for the project.

### **Case 3: Meeting with Göteborg Stad**

Noel Aldritt: Projektleddare Transportinformatik

Anders Roth: Car Sharing

Malin Andersson: Bike Sharing

Stefan Eglinger, head of Urban Transport & Mobility, passed on the contact information of person in charge in the Traffic Office. On contact with Anders, he guided to few other contacts in the same field and the same was also with Malin Andersson. Everyone on the hierarchical structure continued to pass the agenda to next person and no one took responsibility to handle the project idea. This reflects the importance of finding hotspots in system with respect to stakeholders. We had a meeting with Noel and he finally expressed interest in the project on behalf of the Traffic Office.

### **Case 4: Meeting with Innovation office**

André Kelkkanen: Innovation Advisor - Innovationskontor Väst

We had a meeting with Andre, in terms of securing financing for the realisation of the project. Andre gave a very positive feedback on financing the project but needed an intent from any of the major stakeholder. This case could be related to the Challenge Lab Circle – Change Agents (See Figure 1). Though change agents occupy a median position, a change agent can't influence the system in all together that is a change agent can't influence the public sector, the private sector and the academia at once. To enable a change across all the circles, a change in one beginning circle is needed. This first circle change is the most crucial one. Identifying the first cycle and influencing the cycle takes a long time even though after identification of key persons or powerful persons in the particular system. This is a challenge for any change agent.

# Results

## Business Model Canvas

The overall business model merges the two business models that have been discussed for sharing transport and crowdsourcing delivery. Both of the two models are based on the platform and thus sharing transport and crowdsourcing delivery could be seen as two ways of application. The two business models have shared most of the partners, customers, activities, resources but different values are added on the platform. The cost structure are similar due to the same platform while the revenue streams are different. In the sharing transport model, deposit is very important because of the direct connection of the lock.

### Business Model Canvas

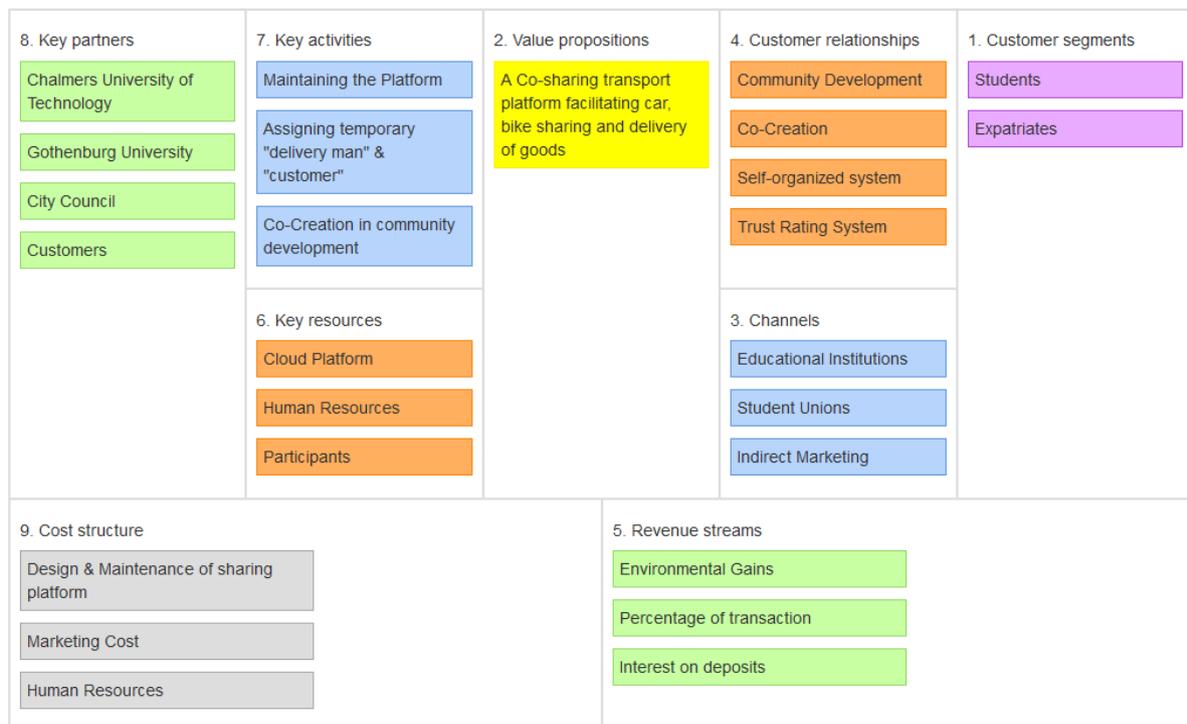


Figure 84: Business Model Canvas - Combined

## **Practical Result – Sekhi**

### **Problem**

A need to make the existing society to focus on sustainable travelling by creating a sharing platform with their existing resources.

### **Approach**

Creating a virtual mapping platform “Sekhi” of transport systems and then enabling a sharing system in that virtual platform.

### **Sekhi**

Sekhi, is a platform based on virtual mapping of system entities of transport systems. Entities are all modes of transport like cars, bikes and other vehicles. The virtual mapping is enabled by locks in system entities. We are designing a business model for “Sekhi” and have been analysing the multitude usage of the virtual platform in our master thesis.

The main idea was built upon looking on how could the existing transport system built up to a virtual mapping arena and used sustainably thereafter. The most common entity that could be modified and utilized with respect to technology change and adaptability is the locks present in all modes of transportation. Present scenario in advancement of locks is having smart locks with geo-tracking systems and sensors, the system usage of the transport entity could be maximized. This maximized usage could be translated into a virtual platform where all entities become actors and these actors (cars or bikes) could be shared in system for a more sustainable life. Thereby creating a sharing platform with the existing transport system resources without creating any infrastructure change.

Present system of creating a bike sharing such as Styr & Ställ is to invest in infrastructure whereas not using existing bikes. And car sharing system is where people manually enter about the availability of cars for sharing, but what if car being the main entity itself says that it is available to be shared. Sekhi enables all these drawbacks in present system to be fulfilled.

Sekhi could be further connected with freight transportation in urban area, thereby creating a link between personal transportation and freight transportation. Sharing platform could be used for delivery of goods when the transit locations are identified by the platform. During the commute, goods could be delivered without additional transportation need, thereby decreasing the traffic in the urban area. Interests and intents for realization of the project from Goteborg Stad, Chalmers University & Volvo.

## Value Proposition

- Anti-theft module for bikes and bike sharing system
- Combined Transportation Card (Car + Bikes + Public Transportation + Taxis)
- Boxes in bus stops activated using smart locks and used for delivery, transit of goods
- Crowdsourcing Delivery

### ➤ **Bike Locks & Sharing**

Students who bring bikes to college don't use it most of the day until they get back home. These bikes could be shared and the owners can be incentivized (10 SEK per hour). No investment in bike sharing cycle infrastructure, but using the existing bikes present in the virtual platform and create a new sharing platform. All this is possible by satisfying the fact of locking the bikes and serves as an anti-theft module. Usage analytics also possible (CO2 emissions, calories burnt etc.).

### ➤ **Combined Transportation (Car + Bikes + Public Transportation + Taxis)**

Creating a common platform for all the means of transportation. On repetition of usage, patterns could be identified and general transport combinations can be generated. Therefore in future, people are not going to look for a specific mode of transportation rather see the most ecofriendly way or fastest way with concern to environment or transport with more calories spent (with specific destination time) etc. All these information could be given to the user by the platform. Car sharing also could be enabled from the identified patterns (At present people manually enter the car available for ride share but car being the entity which is shared has to be in platform directly). And the user could get a monthly combined transportation card rather than single public transportation card or buying a car/bike or ordering a taxi.

### ➤ **Boxes for efficient goods transfer**

Creation of boxes in bus/tram stops and people could use it as a delivery point for goods. Each box is identified by an address and is actuated by a smart lock, thereby its presence is reflected on the virtual platform. The user could collect their parcels on their way home by using public transportation, enabling people use public transportation more. Goods could also be delivered to the trunk of the car which is in turn identified by the smart lock system.

### ➤ **Crowdsourcing Delivery**

The crowdsourcing delivery is a self-organized activity with the support of the virtual mapping platform. The users of the platform can both provide a delivery or ask for a delivery and thus the more people join the platform the more prosperous the community is. The core idea of it is to deliver goods through commute way and thus everyone could be the delivery man. The patterns of different modes of transport would be shown on

the platform and users would get the travel information about the start point and end point with a time estimation. The user who want to deliver the goods can send order to the moving point with favoured pattern through the platform. The other could choose to accept or reject.

With the rising of the sharing economy, the target users are firstly those who want to share their products but bother to send it through a traditional post service with much handlings. In addition, the business is also for those who want to send an inter-city or inter-country parcel or document but suffer from the high price and lack of real-time tracking and tracing system. Thirdly, the business tries to help those who want instant, reliable and visible information that can realize an urgent delivery in a short time.

Several steps of how crowdsourcing deliver works on the platform are explained as following:

**Step 1:** The person download the mobile app for free.

**Step 2:** The person registers herself/himself as a user in the virtual mapping platform as both service supplier and customer. The person must provide personal information include name, personal number, home address, mobile number and bank account number. The information will be checked and the person would receive a confirmation message through mobile phone. She or he should also pick a nick name. The selective items include the commute routes, owned vehicles, gender, office address, acceptable price for a service and so forth. The user can set the privacy settings as she/he prefers. On the platform, only the nickname, the real-time location and the mode of transport would be shown. The user can also choose to turn off showing the location and be stealth while the user can still check the others' location and send order.

**Step 3:** The user opens the map and the patterns are visible. The user can also search for the routes that is wanted and the map can show the information selectively.

**Step 4:** The user clicks a moving point on the map and more information about another user would be shown. The user starts a "dialog" with other user. The "dialog" is systematically optional questions to both sides and embedded in the app as a function. The questions would adapt to the role the user would like to be, that is, the delivery man and the customer. The question remind the users to consider some options and the "dialog" can only proceed if the users press "agree" button and finish until they have gone through all the optional questions. The users can also choose to add more details at the end of the process. The content of the "dialog" would be recorded as an agreement.

**Step 5:** The users make a deal.

The business is self-organized which means that the users are highly engaged in the production of the services while the company is rather a technical support and business facilitator.

## Theoretical Result – Business Model Innovation

In the standard business model canvas, it is hard to define the parts of key partners and customer segments. The customers in this case are highly engaged in creating value for each other and they can also be regarded as partners. Thus we use internal/primary stakeholders and external/secondary stakeholders to replace these two parts.

The business model tries to create value for each stakeholder:

- Users: save money, increase income, convenient to use
- Community: build trust
- Financier: dividend
- Government: self-organized transport sharing system, increased traffic efficiency, increased utilization rate of transport infrastructure
- Environment: released pressure on increasing population and increasing jobs
- Competitors: a complementary to existing system
- Media: increasing awareness of sustainability

Figure 85 represents the portrayal of the business model based on the assumptions in concern with societal entrepreneurship and understanding of importance of stakeholders in the project. As in Figure 84, students occupies the position of a customer segment and also as key partner. In societal entrepreneurship firms or projects, co-creation is a key factor. In terms of co-creation, it is assumed that co-creational actors can be characterised by internal or external stakeholders based on the benefits earned.

The Stakeholder benefits in societal and social projects are mostly environmental gains and customer benefits. Monetary benefits are also resulted but not in a larger ratio compared to the prior. (Ex. Climate Strategies etc.)

Any team project or an organisation working with social and societal causes, must comply with the strategies defined by government policies or governmental agencies. These strategies also goes with the values in terms of mission and vision of the project or company.

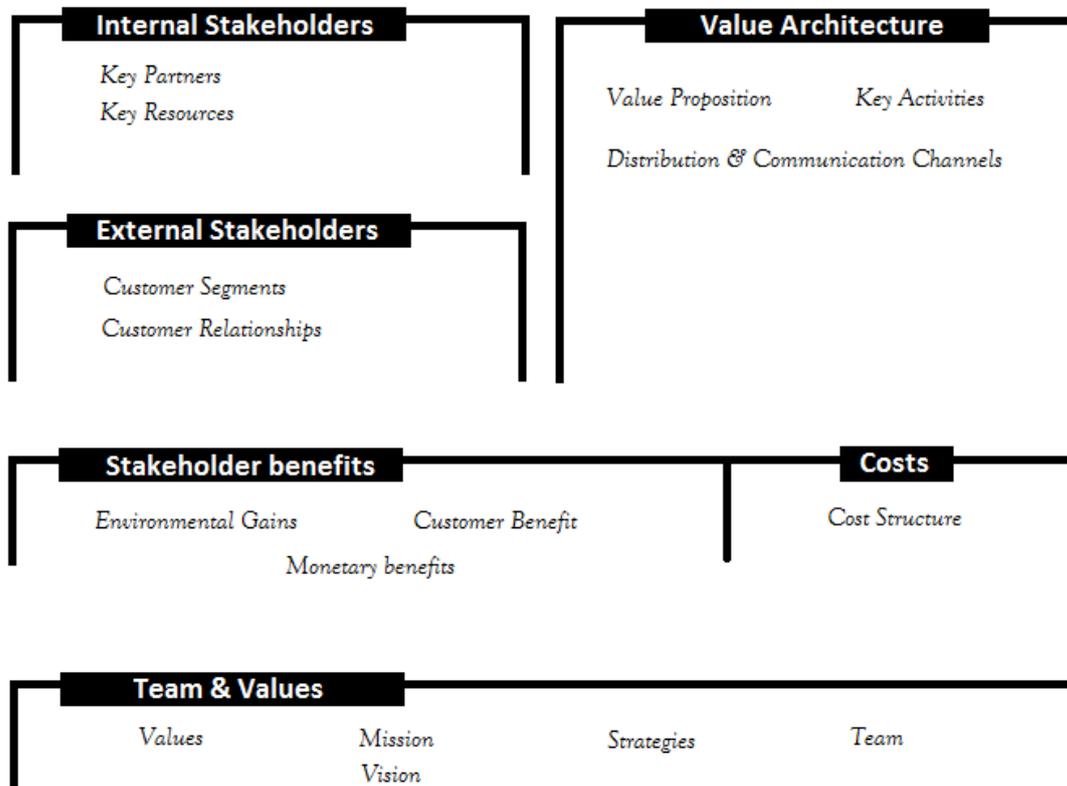


Figure 85: Business Model Innovation - Societal Entrepreneurship

## Conclusion

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. These cities, also called Gothenburg region, are very convenient for car travels due to the development history of the cities, however car travels are identified as one of the main causes of the greenhouse effect. The latest version of the transport strategy was issued in 2014 and plans to construct new infrastructure in Gothenburg to meet the needs of increasing population and new jobs in the city. 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.

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.

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)

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# APPENDIX

## APPENDIX I – Survey Questionnaire

### Transport Sharing Systems

Hi and welcome to this survey!

What's this all about?

We (Prashanth & Olivia) are currently working for our master thesis in "Challenge Lab" wherein we look into transport sharing systems and how personal transportation and freight transportation are influenced and interacted in the urban city area. Transport sharing system combines bike sharing, car sharing, taxi ride sharing & also travel sharing in a public transportation.

Challenge lab - A team of 12 students focus on a societal challenge by connecting academia, public sector and private sector. For more info about it, check out at <https://www.facebook.com/ChallengeLab>

What is it in for you?

- Chance to be pilot users for the project
- Chance to win free movie tickets
- Be part of upcoming sharing economy trend
- Get first hand updates of the project(first of its kind globally)

With the following questions we would like to validate our business model in Gothenburg.

Here is a short overview what is already existing in Gothenburg

### Transport Sharing Systems in Gothenburg



MOVE ABOUT  
Zero Hassle - Zero Emissions

*Samåkning*



## Personal Details

Enter your contact information if you wanted to be given a chance of pilot user or winning a movie ticket. In case, you want it to be anonymous, please only fill native country option.

Full Name

Email Address

Contact Number

Native Country

**Sex** – Male/Female

**Profession \*** - Student, Employed, Unemployed, Freelancer, Other

## Personal Transportation

**Which is the mode of transportation you often use? \***

- Bike
- Bike Sharing
- Car Sharing/Pooling
- Personal Cars
- Public Transportation
- Taxi
- Walk

**How often do you use the following modes of transportation? \***

	Never	Few times a year	Few times in 6 months	Few times in 3 months	Few times a month	Few times a week
Bike Sharing	<input type="radio"/>					
Bikes	<input type="radio"/>					
Car Sharing/Pooling	<input type="radio"/>					
Personal Cars	<input type="radio"/>					
Public Transportation	<input type="radio"/>					
Taxis	<input type="radio"/>					
Walk	<input type="radio"/>					

## Bike Sharing\*

	Never	20% agree	40% agree	60% agree	80% agree	Always
How open are you to share your bike?	<input type="radio"/>					
Will you share a bike only if you are paid for it?	<input type="radio"/>					
How much % you believe in smart locks (locks with GPS systems)?	<input type="radio"/>					
Would you pay for a smart lock(300 SEK) to join a sharing medium?	<input type="radio"/>					

## Car Sharing\*

	Never	20% agree	40% agree	60% agree	80% agree	Always
How open are you to the idea of car sharing?	<input type="radio"/>					
Sharing a car ride with a stranger?	<input type="radio"/>					
Sharing your car to a stranger?	<input type="radio"/>					
Do you feel open to join your car to a sharing platform?	<input type="radio"/>					

## Freight Transportation

**In what situation would you like to ask for a lift to bring goods for you? \***

- Long distance (e.g. inter-city, inter-country)
- Urgent situation
- Saving time
- Others, please specify

**Would you like to send goods by people who is on their commute way? \***

- Yes, if it is free
- Yes, I will pay to get my goods delivered
- Yes, I would like to pay much more if I can get urgent delivery and customized delivery
- Yes, but only for people I know such as family and friends
- No, I will not consider it because I am worried about the safety of my goods
- No, I will not consider it (reason?)

**Would you like to bring goods to others on your commute way? \***

- Yes, if I get paid same with market level (assume the market level is 50Kkr within Sweden)
- Yes, I would like to earn more than 50Kkr if I provide urgent delivery and customized delivery

- Yes, I would like to provide free delivery on my commute way just because I like to help others
- Yes, I would like to provide free delivery on my commute way because it doesn't need much extra operations
- Yes, I would like to provide free delivery on my commute way because it is environmentally friendly
- Yes, I would like to provide free delivery on my commute way only if I can also get free delivery from the others
- Yes, but I only do this for my family and friends
- No, I won't consider it (reason?)

**Do you care about how the goods are delivered in terms of the mode of transport? \***

- No, I don't care as long as I get my goods in time, in good quality and with reasonable cost
- Yes, I think the goods should be transferred in an environmentally friendly way
- Others, please specify

## **APPENDIX II – Business Case Study by Gothenburg University Students**

Project done by a group of six students in the course “Social Innovation and Entrepreneurship – GM1305” in Gothenburg University during Spring 2014. Students involved in this case project are as follows.

- Karl Antonsson
- Caroline Kaufmann Hellqvist
- Regina Roeper
- Linda Vestman
- Ruth-Ann Williams
- Fredrik Örneblad

### **Abstract**

Promoting sustainable transportation solutions, especially urban mobility, is a hot topic in modern society. Paired with the increasing social trend of collaborative consumption, Sekhi seeks to connect people on one platform to make use of their available means of transportation. This paper aims to explain motivations and issues of urban sustainable transportation, with a specific focus on Sekhi's potential for private bike-sharing in Gothenburg. Firstly, after generally describing and analyzing urban transportation sustainable solutions from an economic, social and environmental point of view, we discuss why this area could be suitable for social innovation and entrepreneurship. Secondly, by investigating how the concept of bike-sharing has evolved over time, we show that there is still an unexploited need and opportunity for private bike-sharing. Thirdly and finally, based on a qualitative study, we come to the conclusion that Sekhi's idea of private bike-sharing would be feasible in Gothenburg, but only if it differentiates clearly from already existing mobility options. Our suggestions are that Sekhi should focus on customers living outside of the city center or target specific customer segments such as mountain bikers, universities or companies.

### **Part One: The Social Problem and Social Innovation Solution**

"Today's problems cannot be solved if we still think the way we thought when we created them." Albert Einstein

#### **1.1 Urban mobility**

Mobility is one of the biggest challenges facing both the developed and developing world today. All members of society have the need to move from one place to another in the pursuit of goals: from home to school or work, from one city to another, or from one nation to the next. In suburban or rural areas, one doesn't have much choice but to get around through private and independent means, such as by car, bike, or

foot, but in urban areas, public mass transportation becomes a viable and effective option. Over 50% of the world's population lives in urban areas, and by 2050, this percentage is expected to increase to 70%. (World Health Organization, 2014 a) Almost of that growth will be in developing countries, where they will make up over 80% of urban humanity, straining the already insufficient resources and systems that they have. (United Nations Population Fund, 2007) In developed nations, most of the population is already living in cities; Sweden, for example, has approximately 84% of residents living in an urban area. Transportation systems in developed nations like these should be used as model for developing countries to imitate, but the problem is that our infrastructures are flawed to begin with. Even Sweden, considered to be advanced in its sustainability initiatives, has a higher than average 32% of total GHG emissions coming from domestic road transport alone, and this figure has increased despite vehicles becoming more fuel-efficient (UN Commission on Sustainable Development, 2011 a). Cars and other road transport are almost entirely reliant on fossil fuels, and the growing middle classes in countries like China and India are purchasing them in increasing numbers.

There's no question that around the world, urban areas are becoming larger and more numerous. In their current state, the road systems that support these cities are unable to handle this growth. Developing a sustainable solution for transportation is the only means of solving the problem of urban mobility, and cities must attend to this issue for the citizens that depend on it for their livelihood.

## 1.2 Sustainable development as a necessary step

In late 1987, The World Commission on Environment and Development convened to draw attention to "the accelerating deterioration of the human environment and natural resources, and the consequences of that deterioration for economic and social development," through what is known as *The Brundtland Report* (Strange, T. 2008). It highlighted the concept of **sustainable development** as a solution, defining it as "*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*. The report states that economic growth is not enough for development to be sustainable now and in the future- environmental and social aspects must also be taken into consideration. They are all interconnected and the decisions made in one will have an impact on the others and on the future. These are the three "pillars" of sustainable development that together ensure the long-term success of society.

## 1.3 Economic sustainability

A nation's economy is highly dependent on the ability for its citizens to be mobile. Ease of transportation can lead to economic growth, particularly in countries that currently lack adequate transportation systems. Investments in road infrastructure are

increasingly favored over public transportation in developing and transition economies because it provides jobs in construction and also reduces the costs of transporting goods. But the resulting traffic congestion on roads can be detrimental to economic growth, causing financial losses for nations, businesses, and individuals. In the United States, for example, road congestion costs an estimated \$90 billion a year, due to four billion hours and 11 billion liters of fuel lost in travel delays. (Steiner, A. 2009) Since it is impossible for urban areas to support road transport for a bustling economy, investment in public transportation systems is necessary. Sustainable transportation from an economic standpoint relies on using resources efficiently in a way that can sustain greater demand. Unnecessary travel would be reduced while maintaining the freedom for people to go where they choose.

#### 1.4 Social sustainability

Economic growth in the latter half of the 20<sup>th</sup> century was greater than any other period, bringing with it both positive and negative effects. The world's average income increased eightfold since the 1800's (Strange, T. 2008). Globalization opened up opportunities for people and reduced inequality. Wealth and prosperity may have improved standards of living in some areas of the globe, but it has come through the exploitation of others. Stark differences exist between the developed world and the developing one, and the gap between the rich and the poor in some countries is growing in tandem with economic advancement. Poverty in urban areas is also rapidly growing (KFF, 2014), despite the many possibilities that come from living in a city. Transportation options for those living in poverty are limited, which in turn narrows the employment and education options available to them. Public transportation is a mode of transport that separates the social classes- those that cannot afford to travel privately by car are relegated to share buses and trains with others. Gustavo Petro, the current mayor of Bogota, Columbia, proposed a vision that reverses this belief when he said, "a developed nation is not a place where the poor have cars. It's where the rich use public transport." In order to support sustainable growth, the solution isn't only to make cars more affordable, but to create public transportation that is accessible to all and seen as an attractive way of traveling by all.

#### 1.5 Environmental sustainability

Urban transport is the fastest-growing source of greenhouse gas emissions in the world. Road transport alone consists of 17% of these global emissions, as well as contributing to air pollution, noise pollution, congestion, accidents, and other health problems (Tibaijuka, A. 2009). The environmental effects of urban road transportation can be examined from a local and a global perspective. On a local level, the use of private cars/roads can be deleterious to one's health. Road traffic injuries are the 8<sup>th</sup> leading cause of death in the world, and the number one cause of death among youth aged 15-29. In 2010 alone, approximately 1.24 million deaths were caused by road traffic accidents (World Health Organization, 2014 b). In the

developed world, road deaths and injuries are decreasing, but in developing countries, they are increasing and likely to continue doing so as people purchase more cars (WBCSD, 2004). The increasing reliance of using cars to get from point A to point B also means that people are walking less, and miss out on the benefits that physical exercise provides. In comparison to urban areas where many people use public transport, regions that depend on cars are likely to have a higher obesity rate.

Pollution in the atmosphere is another health issue directly attributed to motor vehicles. New Delhi has recently become the most polluted city in the world, and 10 of the top 20 most polluted urban areas are in India (CNN, 2014-05-08). The country has the highest rate of chronic respiratory disease deaths in the world (World Health Organization, 2013), contributed by the tens of millions of vehicles that run on diesel. Globally, road transport is the largest driving force for demand for energy. Advances in technology have made cars that run on clean energy more affordable, but they still have not reached the convenience and cost benefits that traditional cars have. The sprawl of cities and the roads that go hand in hand with them encroach upon natural habitats of animals and plants, putting many different species at risk for extinction. Roads also limit the amount of land available for agriculture, putting even greater pressure on food supplies. Climate change is possibly the most detrimental consequence that road transport contributes to. The continuing growth of fossil fuel energy consumption, especially in China, India, and the USA- the three countries that produce the most CO<sub>2</sub> emissions- will not only be damaging to their environments, but endanger the entire global atmosphere. Sustainable transportation requires reduced dependence on private cars, less road traffic, and a well-integrated public transportation system in order to improve and preserve the local and global environments (Low, N. 2003).

## 1.6 Sustainable urban transportation

Twelve international companies- eight automobile, two oil and two large suppliers- gave their definition of sustainable mobility in an initiative called Mobility 2030: *"sustainable mobility is the ability to meet the needs of society to move freely, gain access, communicate, trade and establish relationships without sacrificing other essential human or ecological values today or in the future."* (WBCSD, 2004). Combining this with our previous definition of sustainable development, we can conclude that for sustainable urban mobility to be possible, sustainable transportation must have the following qualities: 1) it should be able to support greater demand while being resource efficient and giving people the freedom to travel where they want; 2) it should be accessible and attractive to all social classes; 3) it should reduce the dependence on private cars and alleviate road traffic; 4) most essential of all, it should not negatively impact the natural environment.

## 1.7 The sharing economy and sustainable transport

The increased awareness of the unsustainability and inequality of many of our world's institutions, including transportation, has caused some people to design new approaches that don't just fix single issues, but reworks the entire system. The sharing economy, a socio-economic model also known as collaborative consumption, is one of them. It is a system that allows for the sharing of goods and services in a way that increases value for participants. There are four underlying principles that make collaborative consumption work: *critical mass*, *idling capacity*, *belief in the 'commons'*, and *trust between strangers* (Botsman, R. 2010).

- *Critical mass* is a quality that means enough users of an innovation exist for it to be self-sustaining. A sufficient number of options must be available for people to feel like they can make a good choice. Clothing and other product swaps, for example become more worthwhile as a greater number of people participate in them.
- The unused potential of a good is known as its *idling capacity*. Collaborative consumption takes this wasted value and puts it to good use by redistributing it to someone else. It benefits the environment when resources are used more efficiently and waste is reduced. Carpooling is a perfect example of how drivers are putting the empty seats in their vehicles to good use by offering others a ride on the way to their destination.
- *Belief in the commons* refers to public resources, or resources that belong to all of us. With collaborative consumption, a good that once was private can now be shared with anyone. Unlike the "tragedy of commons", the belief in the commons makes goods more valuable the more people share. The Creative Commons, for example, gives license for people to share, revise, or reuse content without financial compensation to the owner, giving people the freedom to be innovative.
- Most systems of collaborative consumption cannot work without *trust between strangers*. With peer-to-peer marketplaces, such as eBay or AirBnB, people no longer need middlemen to negotiate transactions for them. Transparent, autonomous communities where reputations must be self-managed allow for trust to be built between strangers.

High population density in urban environments is a favorable environment for a sharing economy to occur, and Internet features such as social networking, electronic payment systems, and smartphones with GPS mapping make it even more convenient for people to participate. Websites and apps that allow users to share goods and services are now popping up all over the market, but collaborative consumption shouldn't just be seen as a trend—it is a sustainable solution.

Finding sustainable solutions to urban transportation is a social problem that affects

all inhabitants within the urban areas. As mentioned above, a more sustainable and more frequently used urban transportations system will not only affect the economy and environment of the area, but also the health of the individuals in question. Research and studies on the field also shows that there is a shared interest within many communities to solve the problem regarding finding a more sustainable transportation solution, and when the commitment from the community is already there, there is a much higher chance for a social venture to succeed (Kickul, J., and Lyons T. S. 2012).

Apart from the general community interest, the field of urban transportation is also much discussed on both a global and national level. Rules and regulations regarding emission quotas etc. forces organizations to constantly re-innovate themselves and develop their environmental strategies to match these requirements. This is an indication of that the lack of sustainability within the urban transportation system is an acknowledged social problem all over the world (www.ec.europa.eu, 2014).

There are many actors that have been and are approaching this social problem to find a sustainable solution to one of our daily habits, transportation. Some of the attempt so far have for example been; car-sharing, bike-sharing, electrical cars, carpooling lanes, electrical bikes, carpooling websites, and commercials for increasing the usage of public transportation (Goldman, T., and Gorham R. 2006). Apart from these attempts, new inventions and alternatives tries to make it to the market continuously. It seems the market opportunity for a sustainable urban transportation system is still to some extent untapped. To fill this untapped market need, the idea provider behind the Sekhi project, Prashanth Sekhar, wants to introduce people to the ability of shared transportation, by using smart locks and connecting them to a virtual platform that maps transportation patterns. Further follows a deeper introduction to the Sekhi project.

### 1.8 The social innovation: what is Sekhi?

Sekhi is a virtual platform for the mapping of entities within a transportation system. The virtual platform helps find and store patterns of how different entities such as cars, bikes and other vehicles move within the selected area. Many of these transportation entities have the attribute of needing to be unlocked to access them, and by using smart locks with geo-tracking and other sensors, information for the platform can be collected. Sekhi's aim is to use this information provided by the platform to maximize the usage of the transportation entities and enable a system for sharing these entities, resulting in more sustainable transportation habits within society. Imaging the example of Bill, living in Gothenburg and traveling by car to work every morning. Bill is an environmentally aware person with an interest in finding a more sustainable transportation habit in his life, but the bad public transport connections to and from his work, and the distance being too far to bike, makes this a problem for

Bill. By using the Sekhi platform to map his transportation habits and share with others, Bill could easily find out whether more people are traveling the same way as him in the morning and carpooling could be made possible. The usage of Sekhi's cloud service could for example also help Bill find a quicker or less trafficked route by following the example of other vehicles whose transportation patterns have been mapped. Sekhi could also open up the option for Bill of maybe taking the car only half the way to work and then use the Sekhi bike-sharing system to travel faster and more sustainable through the center city to his office.

The value that Sekhi brings to the market is an increase in the utilization of already existing resources that are part of today's transportation systems. This is a sustainable solution to the urban mobility problem that is in line with what the market is asking for today. Not only does Sekhi provide the customer with a smart lock and a cloud service for access to a system of sharing entities, the platform also provides a tool for deeper analysis of environmental effects, for example, CO<sub>2</sub> emissions. Connecting the transportation entities to a virtual system will also serve as an anti-theft module when tracking is made possible.

There are several solutions to the urban transportation problems that build on the idea of sharing vehicles on the market already, but they require an investment in infrastructure before the actual sharing can be enabled. Sekhi circumvents this barrier to entry by using already existing resources within the transportation system. The connection to the cloud platform is also a unique feature that will provide additional value to the market when compared to the solutions for shared-vehicle systems that are already out there. (Sekhi Case Material, 2014)

With the described vision, Sekhi aims to be a part of the solution in finding a sustainable system for transportation in urban areas. There is no doubt that urban transportation is both a local and global social problem, but whether Sekhi can be defined as a social venture is yet to be determined. According to Alter (2007) social enterprises can be categorized in nine different classes positioned on a spectrum between completely nonprofit and completely for-profit. The social enterprises that do not apply to either of these two extremes are defined as hybrids (Alter, K. 2007). Where on this spectrum Sekhi belongs is not possible to determine since the idea is still at an early stage and there is yet no organizational structure to be analyzed.

## Part Two Bike-Sharing: Trends and Driving Forces

### 2.1 Introduction to bike-sharing

Sekhi aims to connect all available means of transportation within a sharing community, a concept also known as inter-modality (European Commission, 2011). The following section will focus on one part of such intermodality- collaborative bike

sharing. Bike sharing has, at least historically, been a prominent and often discussed alternative within collaborative sharing. As there are many primary and secondary sources available, this will allow us to obtain a more holistic view on bike-sharing and therefore, provide a more objective analysis on the potential of bike-sharing in Gothenburg.

## Evolution and motivation of bike-sharing

As mentioned earlier, heavy traffic and pollution in big cities have become an immense problem and there is a constant need for improving transportation. As people become more and more aware of the environmental impact, sustainable transportation solutions have become necessary.

Many major cities like Paris, New York, London and Beijing want to become more sustainable and environmentally friendly by providing or promoting public bike-sharing systems (USA Today, 2013). By doing so, they aim to reduce emissions, energy consumption and traffic congestions as well as to improve public health, increase mobility and reduce costs for consumers. The purpose with such a system is that individuals should be able to use a bike when needed without the costs and responsibility of owning it. The bike-sharing schemes provide bikes for a limited time usage within the city's urban area. They provide several self-service bike stations where the consumers can pick up and return the bikes. Since the first introduction of a bike-sharing system in the 1960's, there has been rapid development, which not only can be seen in the increased amount of systems around the world but also in the design of the service. At first, bikes were provided to borrow from any location without any control or security of return. Now, there are more complex systems with locks, GPS tracking and smart card access (UN Commission on Sustainable Development, 2011 b). Additionally, there are examples of further development of the business model. One example is the world's largest urban bike-sharing operator, JCDecaux, who uses advertising as an income source, which makes it possible to put a lower customer price on the service (Bloomberg Businessweek, 2013 b).

### 2.3 Customer's perspective on bike-sharing

There are several reasons to why people use a bike-sharing service. First of all, if comparing biking to walking within the urban area, using a bike makes it possible to transport longer distances more quickly. When it comes to the bike-sharing service compared to owning a bike, there are no initial costs in purchasing a bike nor any costs of maintenance. Moreover, individuals are less exposed to the risk of thefts.

The service of public bike sharing is convenient and attractive, especially for tourists. But is such convenience also perceived by urban inhabitants? The success of such public bike sharing system relies on two conditions: the density of stations within the

city and surroundings and the availability of bicycles (UN, Commission of Sustainable Development, 2011). Connected to that, public bicycle sharing operators are challenged by first, limitation of space within public hotspots; second, by costly dispersion into suburban areas and third, the costly management of the proper distributions of bicycles per station. The capability for the business model of public bike sharing to be self-sustainable can be therefore questioned. (Bloomberg BusinessWeek, 2013 b).

It may contribute to the frustration of a customer if one either does not find an appropriate bicycle when reaching a bicycle station or cannot find a parking spot to return the bike (European Cyclist's Federation, 2014). Being bound to stations limits the flexibility of a user (Bloomberg BusinessWeek, 2013 b). So, public bike sharing services try to address modern urban transportation needs, but so far has not leveraged its potential. One possible argument is that urban inhabitants want to remain flexible. Flexibility as a value concept in urban life means to decide where to go, when to get there, and how to get there. Applied in the context of urban transportation, this entails to be not narrowed into a certain location and bounded to certain time slots.

#### 2.4 Private bike sharing as an alternative approach

One possible approach to address the problems that public bike sharing does not cover is Social Bicycles, or SoBi. SoBi is a collaborative bike sharing approach from the U.S. which offers municipalities and communities special designed bicycles with a GPS lock that allows consumers to track, to unlock and lock bikes anywhere and anytime with their mobile device. With such a solution, SoBi "unleashes" public bicycles from docking stations and kiosks (SoBi, 2014).

Yet, if one go one step further, bike sharing can also be realized in a more private collaborative sharing approach. The concept of the sharing economy, more precisely collaborative consumption, suggests to make use of available or excess resources and turn them into shareable goods.

As urban inhabitants own bikes to travel from destination A to B, after reaching a destination, this mean of transportation sits and rests. This opens up the opportunity to rent out the bike to someone who needs it - in this case we say user Y. The bike becomes for the original owner - user X - an excess resource and for user Y a scarce resource, which makes the bike an object worth sharing.

With the idea of a special GPS-enabled lock, like in the case of Sekhi, private bicycle owners are able to lend their bikes to others via a mobile device anywhere and anytime. This allows both borrower and lender the highest degree of flexibility and the most efficient use of the bike as a resource.

Lock8 also exploits this opportunity of private bike-sharing with its "smart bike lock". The idea of Lock8 is to use smartphones as an e-key to unlock the bikes. It is also possible to track the bikes with a GPS function if necessary. Moreover, they provide a platform for private people and companies to rent out and sell bikes and they make it possible for customers, such as universities, cities or a group of friends to set up their own bike sharing schemes (Lock8, 2014).

The promising development of Lock8 proves the potential of private bike-sharing services (Venture Village, 2013). In the case of Sekhi, however, the idea goes one step further because the platform is scalable to other means of transportation as well, even though this report primarily brings up the bike-sharing aspect.

Therefore, the value proposition of private bike sharing sounds simple and easy, but why has such model not been rolled out on a larger scale? What problems do users perceive with such private sharing? Under which circumstances would people lend out their bicycles? These questions are fundamental to understand. Understanding consumer psychology also helps to properly communicate and design the business model behind Sekhi towards investors and end-users.

## Part Three Bike-Sharing: A Market Analysis for Gothenburg

### 3.1 Bike-sharing as in the case of Gothenburg

Gothenburg wants to become a "greener" area (Transportstyrelsen, 2012). In Gothenburg's City Environmental Program for 2013, many future investments to improve the biking infrastructure are brought up (Goteborgs stad, 2013). These initiatives indicate there is an increasing opportunity for promoting and marketing biking. In order to evaluate the potential of private bike sharing specifically in Gothenburg, one needs to consider alternative transportation and mobility options.

First, due to the comfortable size of the city, Gothenburg is pedestrian-friendly (Goteborg&Co, 2014). Second, Gothenburg has a widespread public transportation system, Vasttrafik, which includes busses, trams, ferries, and trains. Third, Gothenburg offers Styr & Stall - a public bike-sharing service with 1000 bikes and over 60 docking stations located predominantly in the city center.

Users of Styr & Stall can choose from different price plans: either 75 SEK per season or 25 SEK for a three-day card under the conditions that the same bike is not used for more than 30 minutes at a time. If someone uses the bike for longer, an additional fee for every 30 minutes will be withdrawn from the credit card used. There is, however, no time-limit if changing to another bike within every half hour (Styr & Stall, 2014).

The model of Styr & Stall is present in different major cities such as New York (Citi

bikes) and Paris (Velib). The service is primarily managed and run by JCDecaux, which partners with city authorities (JCDecaux, 2014). JCDecaux benefits from the advertising space it rents out and the sustainable values it promotes, yet, it is unclear if the service generates any significant profits (Bloomberg Business Week, 2013 b). Styr & Stall is a very attractive way for tourists to get around Gothenburg. Although, as Styr & Stall's stations are focused in the city center, the people in the suburban areas that still live in a "bike able" distance, are not reached. The following map shows the different docking stations of Styr & Stall in Gothenburg. To state an example, it would take around 25-30 minutes to get from Hogsbo, in the west, to Lunden, in the east.

In order to overcome this issue, Styr & Stall has a partnership with Vasttrafik to promote the concept of inter-modality. This allows for connections between different modes of transportation to reach a wider geographic area.

### 3.2 The potential for Sekhi in Gothenburg

In addition to the already existing public alternatives in Gothenburg, Sekhi suggests a private bike sharing option. Unlike public bike sharing, Sekhi will not require adding any infrastructure by using available resources. Therefore, we conducted research to identify and analyze the customer's perspective. Are these concepts and methods applicable to Gothenburg? Under what premises a bike sharing solution work could and what obstacles exist in order to bring the solution to the market?

We have analyzed 36 in-depth interviews where citizens of Gothenburg discuss what they think of the solution, under what premises they could use the service and what obstacles they foresee in using it. The interviews were made in Gothenburg with a random sample of people. We asked the participants of their age, occupation, if they own a bike, if they are or have been customers of Styr & Stall, their preferences on sharing their bike with a friend, a friend's friend and/or a random participant in the Sekhi community. Based on these questions we also had a discussion on the subject that we will present separately. The discussion contains ideas of under what premises the solution will or won't work and what Sekhi needs to take into consideration in order to penetrate the market efficiently.

### 3.3 Results

From our survey, we received thirty-six answers. The participants' ages ranged from sixteen to forty-nine, with a dominant pattern of thirty-two people being younger than thirty. Except for five people, the participants were consequently students enrolled in college or university. Out of all people asked, only one person subscribed to the similar sharing-service "Styr & Stall" and almost all (thirty-one) had their own bikes. On the questions regarding their willingness to share, thirty-two said that they would share with a friend, and a slightly less twenty-two said that they would also share with

a friend's friend. When confronted with the question on sharing with a total stranger, only sixteen people confirmed that they would.

### 3.4 Discussion

When analyzing the data and the answers (see app 1.1), some patterns become very clear while some variables are very fragmented. Some participants were initially concerned with the security of the service. When some kind of assurance (insurance and refund) was guaranteed, they all reacted positively to the sharing service. When analyzing the willingness to share further, an apparent decrease is prominent the further one moves away from his or her "inner circle". Some of the participants who replied yes to sharing highlighted the importance of some kind of incentive, such as payment or ability to rent another bike in return. Many of the people who replied no on sharing motivated that answer with the potential inconvenience of having your bike arrive late or in bad shape.

Since we received an above ninety-five percent consequential yes-answer on the question "Do you own a bike?" and the same amount no-answer on "Do you subscribe to Styr & Stall?" as well as an eighty-eight percent positive answer on "willingness to share with a friend", we can conclude that our study points to an existing target group (young people with their own bikes), that have market acceptance (willingness to share) and a gap in that market (low usage of the largest complementary and competitive service).

### 3.5 Recommendations

We base our recommendations on gathered and analyzed data, discussions with our idea provider and our survey.

After reviewing various similar trends, technologies and services worldwide and applying them to the case of sharing in Gothenburg, we have identified that there's both means (technologies and bikes) and market (people and needs) to realize this service. Moreover, when reviewing the survey answers, patterns points to Gothenburg having a positive mindset and culture towards sharing. During our analysis, both issues and opportunities regarding the competitive or complementary service Styr & Stall has risen. We have concluded that one major issue in order to successfully employ the idea of Sekhi is the differentiation from Styr & Stall. We would suggest that Sekhi go about this by either focusing on customers who live or commute from the suburbs (outside Styr & Stall's reach) or identifying special segments such as mountain bikes, racing bikes, universities and companies. Furthermore, there are services identical to Sekhi that already exists, hence the founder has to focus his efforts on creating a community in order to offer something novel. We would recommend Sekhi to move forward with this idea if he, based on the

recommendations above, sees an opportunity in doing so. We would also recommend caution and careful planning before initiating any kind of venture.

So on the final question, is Gothenburg a feasible city for a collaborative bike sharing such as Sekhi?

Our answer is yes. However, whether this service will become successful or not solely rests on the planning, quality, timing and appropriate marketing of it. We offer our suggestions for a marketing mix based on the 4C's model below.

### 3.6 4C's Marketing Mix

**Customer Needs & Wants:** In a bike-sharing system, customers value sustainability, quality and convenience, and financial benefit over permanently owning a product (Bockmann, M. 2013). Bike owners may already reap the benefits of a lower environmental footprint and saving money, but not all would be willing to join a bike-sharing community like Sekhi if it isn't convenient or if they lack trust in the quality of experience. In order to encourage greater involvement, there should be the option to share only when it's convenient for the owner and within a trusted circle. Owners may also be reluctant to trade their higher-end bike for one of a lower quality in a free swap situation. Thus, the bikes would have to be of a similar condition, or the borrower must pay/receive some sort of financial redress to make up for imbalances in quality standards.

**Cost:** As the most influential factor for participation, customers should see bike-sharing as a means for saving or earning money. People that prefer not to purchase a bike can gain access to one when needed, and those who own a bike that isn't being regularly used can seize this opportunity to make a profit. For those that use their bike often, however, the likelihood that they would utilize Sekhi depends on the opportunity cost of traveling without the bike and making money. Since bike owners can't participate without the lock, making it "free" through a deposit that is refunded after the discontinuation of service would be a way to gain more customers. Riders that started out only looking to secure their bikes may begin to consider making extra cash when their bike is sitting idle. More research would have to be done to determine an appropriate pricing model for Sekhi, but it could be based on a number of factors such as rental length, distance traveling, or the quality of the bike.

**Convenience:** Aside from cost, convenience is the second largest factor affecting participation. Limiting the time in which a bike may be used or requiring it to be returned to a small radius from which it was borrowed from might make it more convenient to the renter, but it may not suit the needs of the borrower. Therefore, Sekhi must understand the different needs of the customer and adapt to them. A cloud network that tracks the mobility patterns of bikers and even potential bikers can then

suggest paths that take people where they need to go conveniently, all the while eventually returning the bike to the original owner when he or she needs it. The platform must also be convenient in terms of searching for information, geo-location of bikes, and electronic payments.

**Communication:** When promoting Sekhi, establishing a sense of community where customers can easily connect and engage with others is important. Social network integration, user reviews, recommendations, and other Web 2.0 services are a way to encourage this type of dialogue. Bike users get to know the people they borrow or loan from, creating a higher level of trust, openness, and loyalty. Sekhi can also use this information to create a better quality experience for the customer, who will in turn become word-of-mouth advertisers that can grow the bike-sharing community.

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## APPENDIX III – Challenge Lab Reference List

<b>Challenge Lab Reference List</b>		
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