

ELECTRIC VEHICLE COLLABORATIVE CONSUMPT IMPACTS IN THE CITY OF SÃO PAULO

Regina Ornellas

Faculdade de Economia, Administração e Contabilidade
Universidade de São Paulo
reginaornellas@usp.br

ABSTRACT

The growth of cities and populations has promoted the increase of income and consequently that of consumption. Some perceive growth in consumption as sign of a society's development. However, upon analysis of the results arising from the increase of such consumption, it becomes apparent that it does spring both good and poor results, some of which might be irreversible. This consumption has been noted for expanding in both an unbridled and unsustainable manner, giving rise to damaging effects, particularly to the planet. An example of such rampant growth is that of the fleet of vehicles, which leads to increased traffic jams in the City that in turn generates pollutant gas emissions. Given this scenario, Collaborative Consumption - which in earlier days was solely perceived as a regular sharing mode (barter, loan, lease and exchange between people) - is currently being established and disseminated through social networks, mobile devices and geolocation systems, technologies which enable anyone to find available and globally shareable locations, products and services. This movement, which is ever gaining strength and character, alongside electric vehicle technologies, is capable of transforming businesses and the way a society lives and consumes, bringing to light the philosophy of cost reduction and the incentive for passive consumers to become active contributors of a sustainable technology. This study's purpose is to understand the dynamics of

Collaborative Consumption and the impact of adherence to this new movement, on Electric Vehicles.

Key-words: Collaborative Consumption; Electric Vehicles; Impact Assessment; Scenarios.

RESUMO

O crescimento das cidades e das populações tem promovido o aumento de renda e conseqüentemente o aumento do consumo. Alguns interpretam o crescimento do consumo como sinais de desenvolvimento de uma sociedade. Porém ao analisar os resultados decorrentes do aumento desse consumo, é percebido que ele traz bons resultados, juntamente com maus e que podem ser irreversíveis. Esse consumo tem se caracterizado por ser descontrolado e insustentável, trazendo malefícios, especialmente ao planeta. Um exemplo desse crescimento é a frota de veículos, que traz junto com ela o aumento do congestionamento na Cidade, que gera a emissão de gases poluentes. Em vista desse cenário, o Consumo Colaborativo, que antigamente era notado apenas como forma usual de compartilhamento (escambo, empréstimo, troca e aluguel entre pessoas), está sendo estabelecido e disseminado pelas redes sociais, dispositivos móveis e geolocalização, que são tecnologias que permitem a qualquer pessoa encontrar locais, produtos e serviços disponíveis e compartilháveis ao redor do mundo. Esse movimento que está ganhando caráter e força, juntamente com a tecnologia para Veículos Elétricos, tem capacidade de transformar os negócios e o modo de uma sociedade consumir e viver, enfatizando a filosofia da redução de gastos e o incentivo a que consumidores passivos passem a ser colaboradores ativos de uma tecnologia sustentável. O objetivo desse

estudo é compreender o funcionamento do Consumo Colaborativo e o impacto de aderência á esse novo movimento em Veículos Elétricos.

Palavras-chave: Consumo Colaborativo; Veículos Elétricos; Avaliação de Impacto; Cenários.

1 INTRODUCTION

The constant growth of populations has brought about major environmental issues since, as human populations rise, the greater is both food and resource consumption. Furthermore, excessive consumption leads to a considerable quantity of solid residues which do not present a defined destination, giving rise to garbage dump sites and landfills that do not present adequate storage conditions. The excessive demand for food, housing, power, industrial production and transportation poses significant environmental impact, which might be defined as a shock caused by human works or even one of nature which drives environmental disharmony and unbalance. One of modern, industrial and technological civilization's greatest clashes rests in the fact that this civilization still depends, even if only in global terms, on nature. (Branco, 1997).

One might state that rapid global population growth causes great need for consumption goods and that at on a per minute basis, new models, new technologies and new products arise, increasing consumerism. In turn, excessive consumption leads to waste. For illustrative purposes, consider a mobile phone which primarily was devised to make and receive calls, for instance. Nevertheless, there is a variety of models which on a day to day basis become increasingly modern, more advanced and which not only feature the primary function but also, numerous others. By teaming up with the media and publicity, companies "generate the need" for these goods, inducing citizens to often unnecessary consumption.

Excessive consumism when added to global population increase drives the ever increasing number of industries which in turn, consume a large amount of electric power and raw materials, producing large volumes of waste and causing major environmental impacts. Furthermore, depletion of non renewable resources arises given that once these are consumed, they cannot be replaced, such as those of petroleum and minerals.

1.1 CONSUMERISM X CONSUMISM

Society consumerist habits continuously increase, whereby consumerism may be understood as the purchase of something that one does not need, with Money one does not have, which leads to the so-called "indebtedness". However, and considering all the factors that influence or attempt to influence the consumer, one cannot place the burden of blame concerning a consumism centered society, on publicity or marketing that promotes such behaviour. These habits are acquired given the very shape and values of the society itself, which presents the characteristics of a culture oriented towards tireless consumption.

Given this scenario, consumerism – a term that defines the consumer defence movement in a more ample sense which relates to the improvement of the quality of life, particularly as to consumption - spruces. It is further deemed as a marketing macro environmental force given that the manifestations of people and allies, in defence of consumer interests, generate threats and opportunities for both companies and institutions: much like the State that by means of the regular issuance of laws and rulings, shapes the consumerist panorama (Filho, 2003). In sum, consumerism can be thought of as being responsible consumption, whereby producers, consumers and distributors operate in perfect balance. Consumerist groups seek to alert the population as to the consumption of that which is needed, without indulging in extravagance as to each other's possessions, without exceeding "acceptable" levels of indebtedness, so as to always remain in a savings position to preventively deal with the rise of unexpected events.

1.2 SUSTAINABLE CONSUMPT

One of the most discussed issues concerning the environment is that of sustainable development, a mode of economic development that preaches the mission of addressing today's needs without impairing future generations. (Inmetro/IDEC, 2002)

Sustainable development is not about setting consumption aside so as to preserve natural resources – which would be entirely unfeasible in today's society – but rather, about changing consumption and production habits and standards to address the needs of the population, such as those of housing,

education, health and food, but also reduce waste and unbridled consumism. This type of development's greatest challenge is the quest for the balance between environmental preservation and a country's economy. Sustainability exists to ensure a better quality of life for all future generations, combining ecological and social interests, offering business opportunities to companies that might improve the life of people and that of the world. (Gomes, 2006).

1.3 FLEET OF VEHICLES IN THE CITY OF SÃO PAULO

An example of non-sustainable consumption is the rise in São Paulo's vehicle fleet. In Brazil, there are on average 4,4 vehicles per km², but in the states of São Paulo and Rio de Janeiro, the ratio is approximately twelve times greater. High concentrations of vehicles combined with scarce roadway infrastructure comprise a potentially strong formula for the generation of traffic jams. (Borba, 2008).

An article, published in the "Folha de São Paulo" newspaper, emphasizes that the Brazilian investment rate is amongst the lowest in the emerging world and far short of that deemed necessary to ensure a growth of 5,5% per annum. (Folha de São Paulo, Mar 2011). Investments in logistics infrastructure are required to ensure sound flow of the productive system and avoid losses caused by waiting lines and traffic jams, reducing the emission of pollutants and unnecessary and premature vehicle wear out.

The modal division of trips is the greatest cause of transportation and traffic problems in the Metropolitan Region of São Paulo and of the existing circulation difficulties.

The chart picturing the evolution of modal division of motorized trips presents the continuous growth of the proportion of trips undertaken in the individual mode in comparison to those taken in a collective manner. In 1967, the relation was 31,9% for the individual mode and 68,1% for the collective option; and in 2002, of 53% and 47%, when the inversion of the situation verified in 1967, takes place, with the current prevalence of individual trips.

The existing deficiencies of the Municipality and of São Paulo's Metropolitan Region became challenging given the demand for trips that the

system addresses, as well as in light of the role the same plays in the country's economy.

The consequences are the negative externalities generated by traffic. This represents an additional cost on the transport of products and raw materials which places a direct burden on production, further to increasing the entire population's displacement costs and furthermore leads to setbacks in the quality of life as a result of traffic jams and reduction of average speeds (which also represents an increase in pollutant gases).

Given that the average trip time has consistently been greater for displacements involving collective modes as opposed to those by car, this fact reinforces the population's favourable perception of the same and contributes with the worsening of trip modal divisions.

The economic aspect might go unnoticed, but efficient traffic enables faster displacement of employees to their workplace, increasing their productivity in addition to significantly reducing the costs of operational logistics. As a result, there is an improvement in the quality of the population's life, a greater economic productivity and less pollution.

On the other hand, more efficient traffic has positive impacts on the economies of countries and of cities. A recent study undertaken in the United Kingdom demonstrated that a 5% reduction in displacement times on highways might result in a cost reduction of 2,5 billion pounds or approximately 0,2% of the GNP.

Efficient and safer traffic not only reduces jams but improves the population's health given the reduction of carbon dioxide emissions and that of the number of accidents. This implies in a greater productivity of the economy and unveils opportunities for the setting up of new businesses, such as those of the entertainment industry.

2 COLLABORATIVE CONSUMPT

Consumism in the 20th. Century was characterized by the opening of credit lines and by advertising. In the last 50 years, more products and services were consumed than all past generations together. This incident arises given the

growth of cities and income which automatically has led to the increase of consumption.

As of 1980, one third of the planet's resources – forests, fish, natural minerals, metals and other raw materials have been consumed. In addition to consumption in itself generating product enjoyment, economic productivity demands that products be consumed according to lifestyle, which is churned to the purchase and use of products in rituals that promote satisfaction both of the spirit and of the ego and consequently, the economy needs products to be purchased, used, substituted and disposed of until the next increase in price.

On an individual basis, when unbridled and unnecessary consumption is continuous, a type of unconscious behaviour is tolerated which brings about undesired catastrophic consequences which one does not pursue for himself neither for society.

Economists describe this emotional consumption phenomenon as "hedonic hard work" whereby the consumer always works to own more – but is never satisfied with what he already has (Babin, Darden & Griffin, 1994). The economist and sociologist Thorstein Veblen, coined the term "conscious consumption" in 1899 and used it to describe the class that until then had emerged during the 19th and 20th Centuries.

This generation was characterized by highlighting its health and social power by using clothes that made their prosperity visible and differentiated from the mass public. Most interesting however, is the excess consumption that ramped shortly after this stage, in and around the 50's, in the United States, known as hyper consumption - characterized by unbridled consumption – and that which is most amazing, the line that separates this consumption between what is truly necessary, what is convenient and what is an endless list that might be called a "wish list". Some economists believe that changes will come concerning a new concept or economic balance, however, the solution seems to be closer than one perceives, arising from the consumers themselves.

2.1 CHANGES TRIGGERED BY COLLABORATIVE CONSUMPT

The consumption scenario that till then seemed to have settled, indicates changes that sprung from the 21st. Century, with a consumption that has been

driven by reputation, communities and by what is sought, donated and shared on the internet.

Upon analysing behaviours, personal histories, social theories and business cases, the optimization of Cooperatives, Collectivism and Communities gives rise to Collaborative Consumption, whereby people are sharing products and services with their communities throughout offices, neighbourhoods, condominiums, schools or through *Facebook*. However, this very same sharing and collaboration is taking place in different manners which have never taken place, giving rise to a culture and an economy of "that which is mine, is yours" (Botsman & Rogers, 2010).

The theory of Collaboration has found defence in the academic environment. Elinor Ostrom, a University of California researcher, won the Nobel Prize in Economy in 2009, together with the likewise researcher Oliver Williamson, for defending the Economic Governance theory which states that there is efficiency of peoples/societies that work in a cooperative manner in institutional arrangements. Their studies have proven that once within capitalist societies, if simple rules are applied, organizations can work and individuals can cooperate to operate on matters in common.(Williamson, 1979)

People have been practicing Collaborative Consumption on a daily basis and at the same time, Collaborative Consumption has enabled people to obtain benefits beyond that of simply accessing products and services, whilst at the same time save on resources, space and time, but also enables social contact.

When a society's expenditures increases, it is a sign of greater consumption – which is not in itself a sustainable or healthy act (Botsman & Rogers, 2010). According to Thomas Friedman, year 2000, marked by the attack of the great recession in United States, might be viewed upon as being a time when "Mother Nature" and the Market ordered a blockage on consumption.

Collaborative Consumption is not sharing within a box. On the contrary, it's about placing a system in a location where people can freely share resources without being penalized or having to sacrifice their lives, for doing so. The concept of not being an owner or having ownership is not recent. In the world of business this is largely employed as a form of reducing costs. On behalf of consumers, likewise this is not a recently coined concept. The difference lies in the fact that with Web 2.0 an opportunity shaped of sharing products and

services in a convenient and reasonably priced manner, according to one's own demand and which is different from the traditional modes of lease or rent.

Many people own objects they have never used or that they simply have only once used. This generates two issues: a piling up of items and an increase of urban garbage. This does not only hold true for physical products but also to as to information which is collected and simply stored – remaining unused. In some countries, there are warehouses that people rent to store items.

In the United States, 30% of these warehouses are devoted to businesses and the remaining 70% is used by people who own products but do not have enough space in their homes for storage purposes. Furthermore, as time goes by, the amount of money invested in the rental of these deposits becomes higher than the value of products stored.

According to Botsman & Rogers (2010), there are four major forces that have acted as a rule of consumption manipulation and thus greatly influenced the growth of hyper consumption, namely:

1- The power of persuasion applied to advertising;

2- "Buy Now, Pay Later". This force may refer to the ease of payment, whereby the expenditure may seem to be smaller given distribution over a period of months or years).

3- Life Cycle Laws. These determine obsolescence at a faster pace than in the earlier days.

4- "Just One More". The increase in the population's income conveys a feeling of superior purchasing power which translates into the purchase of items in greater quantities, in an unnecessary manner and that in a short period of time shall be destined to the accumulation of garbage.

Today's generation has proven to be different from the previous ones and does not allow forces such as those mentioned by Botsman & Rogers, shape their lifestyles. This generation feels the urge to share opinions with other people, photographs, chores etc., and this finds grounding in the dissemination of a social network tool known as *Facebook*.

Statistics show that this generation is more competitive, commercial and ambitious than any other – however, it has dropped the values of past generations and has developed its own set. It has developed a world that shares and that brings down hierarchical barriers as well as those of elitism, to promote

a world of participation, which shares and connects itself with people who have interests in common.

2.2 COLLABORATIVE CONSUMPT SYSTEMS

Collaborative Consumption is based on the ideas conveyed by three systems:

1- Products and Services Systems: this system enables the sharing of a company's multiple products or private products which might be shared or rented on a one to one basis. This system's key benefits include: the users do not have to buy the product on a fixed basis and in the event there is an increase in product or service usage requirements, consumption can be increased. For instance: Zipcar, Zazcar and so forth.

2- Market Redistribution: this system encourages the reuse and redistribution of old items or of those no longer in use and makes a significant contribution towards the reduction of garbage. Redistribution contributes with 5 Rs: reduction, recycling, reuse, repair and redistribution (which can also be deemed as a sustainable form of commerce).

3- Collaborative Life Styles: this system consists in the interaction of people with similar interests and who can and wish to share their knowledge, resources, space and money, with others. Here, a high level of trust is required given that this is not a physical product but rather a physical and social interaction.

Sustainability is considered one of the consequences of Collaborative Consumption. The power Collaborative Consumption holds to change behaviours and life styles can for instance be measured in an experiment conducted by Zipcar known as the "Low Car Diet Challenge". Zipcar is a company that operates with the largest vehicle sharing system in the world whereby members can book a car for 20 hours per day, 7 days per week, via the internet, by using Iphone applications or the telephone, or even for periods shorter than 1 hour in any one of the 49 cities the company operates in the US and in some cities in Canada and England.

On July 15, 2009, 250 participants of 13 cities were invited not to use their car during 1 month and instead they had to use public transportation,

bicycles, walk or use a Zipcar vehicle in the event of extreme necessity. The result of the experiment demonstrated that the event generated a positive financial, physical and communitarian impact.

Zipcar promoted a 98% increase in the use of public transportation, reduced the mileage of their cars by 66% and over half of participants claimed to have reduced 67% of vehicle related costs. Walking kilometres increased by 93% and those cycled, in over 132%, which resulted in weight loss for 47% of participants (413 pounds lost). The most relevant result of the experiment was that 61% of participants planned to remain without their own exclusive car and 31% is considering the possibility. Thus, 100 of these 250 people, did not want their keys back.

Thanks to the new generation – characterized by a connection with technology – a significant portion of freedom is being shaped by means of what we “have” and an identity by means of what we “do”. This generation is triggering a rupture in mindsets and has ideated new, up and coming channels that do not require the user to have anything other than a computer or a telephone where one: shares what they are doing over Twitter, what they are reading over Shelfari, what matters over Digg, groups followed over LinkedIn and who are his friends, over Facebook and consequently which Online Brand Names, defining the person one is and what one likes.

3 TECHNOLOGY: ELECTRIC VEHICLE

The continuous consumption of vehicles has entailed severe climatic problems. According to the Intergovernmental Panel on Climate Changes, 75% of CO₂ emissions over the last 20 years derive from the burning of fossil fuels. The Electric Vehicle's intent is to promote the substitution of petroleum for renewable and non pollutant sources of power, which would offer cities quality of life.

The entire world has combined efforts to this effect. In Denmark, 20% of electricity is generated using wind. Brazil and Paraguay are countries which detain natural resources, primarily hydro, with a vocation for hydraulic power and bio-fuels.

One of the alternative sources of clean and renewable power to that of petroleum, is hydroelectricity. This solution makes use of the force of flowing waters, without reducing its quantity and without giving rise to toxic by-products. Although only 33% of hydroelectric potential has been used, this percentage avoids the emission of gases equivalent to the burning of 4,4 million oil barrels/day.

The Electric Vehicle is a kind of vehicle that uses propulsion by means of electric engines to transport or conduct people, objects or a specific type of load. It is composed of a primary power system, one or more electric machines and a starting and speed control (or binary) system. Electric vehicles are part of the group of vehicles known as Zero-Emission, which given the fact they offer a non pollutant means of locomotion, do not emit gases that pose hazard to the environment nor do they emit considerable noise since they are quite silent.

The advantages of using Electric Vehicles can be listed as follows:

- Reduction of environmental pollution
- Reduction of sound pollution
- Savings in fuels.

4 RESEARCH ISSUE MATTER

The city of São Paulo experiences the effect of unbridled consumption, especially as to the vehicle segment and this has entailed nasty consequences which can be summarized into those relative to the increase of air pollution and constant dislocation issues.

One of the projects that might be deemed amongst those concerning "urban improvements" might be that concerning the implementation of Electric Vehicle technology in the Collaborative Vehicle Consumption movement, by means of the sharing of cars initially within the São Paulo's Metropolitan Region.

However, before implementing a project that at first sight might only bring benefits to the city, recommendations pose one must first analyse the possible impacts deriving from such an implementation. Therefore, given this analysis, this study's proposed issue matter is: What are the impacts of Collaborative Electric Vehicle Consumption in the city of São Paulo in 2040?

5 RESEARCH METHOD

To address its objectives, this research was conducted in two stages: the first, of a qualitative nature, posed to understand the unbridled increase of consumption, its consequences and Collaborative Consumption, as a trend that in some countries already holds true but which is not as yet widespread in Brazil and specifically in the city of São Paulo. This qualitative study was conducted by means of mapping secondary sources. The second stage shall be conducted by means of the building of scenarios, according to the Wright and Spers (Wright & Spers, 2006) methodology.

5.1 IMPACT EVALUATION

Impact Evaluation may be defined as a set of steps that support the evaluation of economic, social and environmental impacts before the proposition of new initiatives (Cunningham, Banks, Roper, Mason, Rossini, 2011). Literature does not unveil a single methodology which might be applied for the purpose of Impact Evaluation. Scanning, Brainstorming, Delphi, Scenarios, Relevance Trees and others are employed.

Irrespective of the technique employed, it is worth emphasizing that impacts ought to be divided accordingly: technological, economic, environmental, social, institutional, political, legal, behavioural, cultural and those value-related.

5.2 SCENARIO BUILDING

This study applies the construction of scenarios methodology. Decisions taken today and which shape the future, are based on the extension of current knowledge, which is uncertain. The future is unknown and cannot be precisely foreseen since there is no such thing as a perfect technique or "crystal ball". (Porter et al.(1991))

According to Wright and Spers (2006), there are three future vision possibilities: the extrapolative, exploratory and normative vision. Extrapolative vision seeks to project the future as of what took place in the past. In the exploratory vision, one acknowledges that the future may be different from the past and the quest is to foresee different scenarios concerning what may come

about. Finally, normative envisioning poses to project what the organization desires to happen in the future. Thus, it would be the best possible scenario.

According to Porter (1986), scenarios are partial drafts of some aspects of the future whose structuring may consist of purely narrative formats or even detailed models picturing quantitative data. Scenarios, as a decision making support tool might be viewed upon as not being a prediction exercise, but rather an activity that poses to provide plausible and consistent descriptions concerning possible future situations.(Wright & Spers, 2006)

The scenario elaboration method utilized in this research follows eight steps, namely:

1- Definition of scenarios scope and objectives.

2- Identification of the fundamental variables, trends and events. Once having defined the scope, fundamental variables must be defined considering elements such as the five forces proposed by Porter (1986), which impact an entity's strategy.

3- Structuring of the scenarios' variables, identifying strong trends and non variable factors, uncertain events and future holding facts. One must also identify the cause and effect relations between variables, identifying causal, intermediate and resulting variables.

4- Projection of variable future states, which comprises quantitative and qualitative projections of 2 to 4 variable future conditions, per variable. The techniques most often employed in this stage are quantitative trend extrapolations and the Delphi technique.

5- Identification of scenario driving themes, classified as: (1) trend setting, but probable; (2) exploratory: takes theme development or environment directing events, into account (3) normative or desired.

6- Compilation of a morphological scenario matrix, comprising a consistency analysis of directing themes, non variants and uncertain events containing future states of causal, intermediate and finally, resulting variables.

7- Scenario description and validation. This step calls for the detailing of the scenarios, with a description of their evolution and the clarification of relations and cause and effect sequences amongst those variables taken into account.

8- Preparation of the transition or planning scenarios.

6 SCENARIO ELABORATION

Based on the model and steps herein presented, scenarios were prepared envisioning Collaborative Vehicle Consumption in the city of São Paulo.

Stage 1: Definition of Scenario Scope and Objectives

As far as time is concerned, a horizon up to 2040 was taken into consideration so as to enable the projection of medium and long term strategic alternatives, by the many players involved and to guide immediate, short term actions. As to the main target audience of the scenarios, the following groups are deemed of relevance: (1) Population of the City of São Paulo; (2) Users of Vehicles in the City of São Paulo; (3) Vehicle manufacturers or assemblers; (4) Vehicle resale companies; (5) Power suppliers; (6) The Government of the State of São Paulo (particularly entities such as the Traffic Department); (7) Conventional Vehicle rental companies; (8) Collaborative System Vehicle rental companies and (9) Parking companies in the City of São Paulo.

In as much as competitors are concerned, there are large companies in the conventional car rental market such as Avis, Unidas, Hertz, Rentacar, Localiza and others. Within the Collaborative Consumption movement, in the City of São Paulo, there is only one company: Zazcar – but much like conventional rental companies, it operates with combustion propelled Vehicles.

The rental segment experiences continued growth. In 2010, its gross revenues totalled R\$ 5,11 billion, a 17% increase in relation to the previous year. It was only in 2010 that the segment's share in the sale and purchase of vehicles reached 9,4%, which represents almost 0,5% more than 2009 figures.

Thus, considering the sector's context, stakeholders and decisions to support, scenarios shall comprise the following subject matters: Vehicle Sharing: an alternative to traditional ownership and rent of Vehicles; Mobility: the use of displacement alternatives which do not however generate or contribute with jams; Economy: cost reductions resulting from owning the Vehicle; Convenience: ease of retrieving the Shared Vehicle at locations which are convenient to the user; Sustainability: reduction of the number of vehicles (contributing with the

reduction of urban traffic jams); reduction of waste (due to the accumulation of materials after depreciation generated by privately owned vehicles); reduction of the emission of gases (given the electric technology); fuel savings and reduction of sound pollution; Quality of Life: with the reduction of traffic jams and number of hours spent in the City's traffic, Quality of Life tends to be maximized; Productivity: with an improved quality of life, the population's productivity might come to be greater and consequently that of the City of São Paulo may increase, which in turn directly influences the City's GNP.

Stage 2 . Fundamental variables, trends and events identification

Once the scope and objectives of the scenarios of Collaborative Vehicle Consumption in the city of São Paulo are defined and, upon analysis of the sector's current panorama, one was able to identify a list of the main scenario variables: (1) Population income; (2) Credit Lines; (3) São Paulo City's Pollution; (4) Traffic jams; (5) Availability of Power Recharge; (6) Power Recharge Cost; (7) Unemployment at Combustion Propelled Vehicles Manufacturing Companies.

Stage 3 . Scenario variable structuring

To this effect, one was able to identify relevant non variable factors concerning Collaborative Vehicle Consumption in the city of São Paulo, such as population growth and profile (aging of the population), as well as income distribution which is expected to improve in all the scenarios analysed, thus being considered a strong trend. These variables were organized using the Five Competitive Forces Model, as per Fig.1. (Porter, 1986)

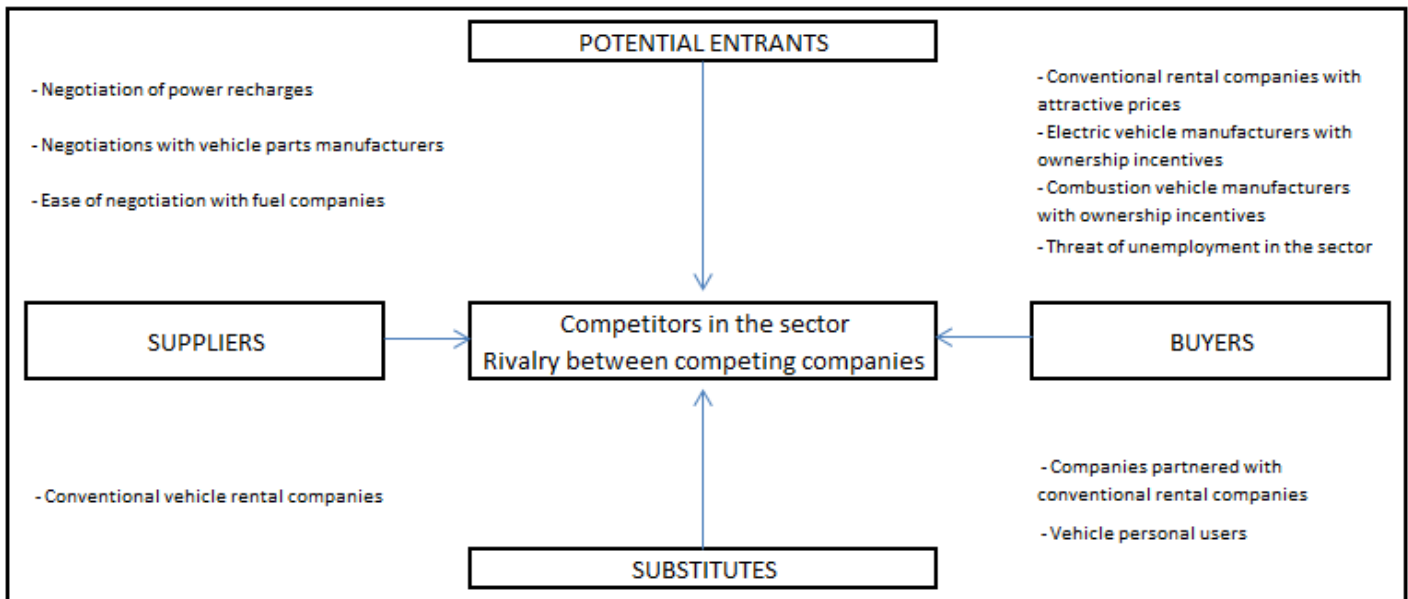


Figure 1: Collaborative Electric Vehicle Consumption Five Forces Matrix

Source: Adapted by authors based on Porter's Five Forces Matrix

Relations between variables were manually identified and given analysis conducted by the authors with views to identifying those which shall determine scenarios. Based on the Model Analysis and Structuring technique (Wright, 1993) variables were categorized, as follows:

- Resulting variables: urban traffic disorder, evolution of substituting Technologies, innovation in consumption and sustainability modes.

- Intermediate variables: numbers of the fleet of vehicles, car rentals, number of people and vehicle professionals, intense traffic, generation of residues, pollutant gases emission and depletion of natural sources for combustion.

- Causal variables: need for urban mobility, economic factors and incentives to own automobiles (media and economic scenario).

The relation between variables, combined with the results of projections as to future variable states, enabled the preparation of the variables matrix of the scenarios.

Stage 4 . Projection of variable future states

The technique employed in this stage is that known as Delphi. Round 1 counted on eight detailed questions, as of which one was able to characterize the

future states of variables which compose the scenarios. During the first round, 20 people participated and were qualified as being vehicle users and residents at the City of São Paulo. As of Round 1's results, one was able to identify one most probable, and two contrasting scenarios for Electric Vehicle consumption in São Paulo, by 2040, utilizing the future states of variables. These scenarios were presented in Round 2, posing to refine Round 1 opinions and to generate data for the preparation of a desired scenario to thus complete the scenario matrix.

Round 2 counted on 15 people who were allowed to contrast opinions presented in Round 1. As of Round 2 results, one was able to prepare a structure of the scenario variables and a complete scenario matrix, comprising a most probable, a desired and two contrasting or exploratory scenarios. As of this matrix the scenario descriptions were developed.

Stage 5 . Identification of scenario driving themes

As of the first and second Delphi rounds, the following scenarios were defined using data as well as the justifications for replies and qualitative data:

- Most probable scenario: City in danger.
- Contrasting scenario 1: City in re-structuring.
- Contrasting scenario 2: Responsible, yet lacking resources, City.
- Desired scenario: Intelligent City

Stage 6 . Preparation of the morphological matrix of scenarios

An analysis was conducted, with a consistent combination between all scenario variables, generating a scenario matrix, which served as base for the description of the scenarios concerning Collaborative Electric Vehicle Consumption in 2040, as pictured in Fig. 2.

Stage 7 . Description of the 2040 scenarios

During this stage, scenarios were detailed, describing their evolution and pinpointing relations between variables.

The methodology presented in this study enabled the structured participation of vehicle users of the City of São Paulo, promoting a reflection as to the future of the City, which shall improve the quality of their actions given

comprehension of scenario implications on São Paulo City's current and future. The description of the scenarios is presented as of Page 23 of this study.

8- Prepare transition or planning scenarios

The preparation of scenarios was conducted according to the development stages which enabled the construction of short and medium term scenarios, in alignment and consistent with those identified for the long term.

2040 Morphological Matrix

Variables	Scenario 1 Most Probable City in Danger	Scenario 2 Contrasting City in Re-structuring	Scenario 3 Contrasting II Responsible and Lacking Resources City	Scenario 4 Desired Intelligent City
Population Income	Shall remain balanced, with slow readjustments and therefore it shall evaluate change in consumption habits as long as it promotes cost and maintenance savings.	It shall continue to be one of the City's difficulties however, the rise of environmental concerns might promote changes in consumption habits.	Income shall not increase and thus people shall be more prone to the moment of value and habit re-assessment. The adoption of new technologies that promote sustainability shall be considered.	Income shall be deemed as compensation received for work, which ought to be invested in actions that aim at preserving current and forthcoming generations. To this effect, innovative actions and technologies shall be adopted.
Credit Lines	Credit lines shall ease the acquisition of products, particularly vehicles, which shall to some enable the demonstration of success in life.	Credit lines shall be available with special interest rates for projects and products that pose environmental action.	Credit lines shall be scarce, given that the City's economic situation shall be in decline. This shall generate difficulties in terms of availability and high interest rates practiced by retaining entities.	A large number of incentives to access credit lines, inclusively for the acquisition of products that target sustainability.

<p>São Paulo City Pollution</p>	<p>Pollution continues to prevail at high levels in the City.</p>	<p>Pollution shall remain high however there will be governmental actions so as to control de generation of pollution, particularly in combustion propelled vehicles.</p>	<p>Pollution in the City shall decline but not as a result of government action but rather given the City´s economic situation which shall not be prone to expenses involving Vehicles.</p>	<p>Pollution in the City shall be under control as a result of both governmental action and fiscal, economic and environmental incentives for the acquisition of alternative technologies that target the planet´s air resource.</p>
<p>Traffic Jams</p>	<p>Traffic jams shall remain extensive given the absence of investments in public transportation and therefore City residents shall not have another alternative for displacements.</p>	<p>Traffic jams in the City shall remain extensive but prone to reductions since the City shall promote the use of collective transport and provide infrastructure to this effect.</p>	<p>Traffic jams shall be balanced since the City shall be more prone to the use of collective transport even if the same does not support the population and enough infrastructure is provided for.</p>	<p>Traffic jams shall remain without reductions but prone to improvements given incentives concerning the adoption of alternative transport such as Shared Vehicles, Cycling lanes, etc.</p>

<p>Power Recharge Availability</p>	<p>Given this is still a technology in study, electric recharge availability shall still remain restricted. This shall act as a driver towards the adoption of the technology in the City.</p>	<p>There will be sufficient electric recharge availability despite the fact that Electric Vehicle adoption is still at an early stage.</p>	<p>Given the City's economic situation, investments in research and development shall be scarce. Thus, power recharge availability shall be restricted and privately owned.</p>	<p>The City shall be supplied with enough power for the initial adoption of the Electric Vehicle however, continuous studies investigating new sustainable power modalities shall be required.</p>
<p>Power Recharge Cost</p>	<p>Recharge costs shall be high. Given that this is a technology that is still undergoing development, with a high maintenance cost, users shall not be prone to immediate adoption.</p>	<p>Although costs are undergoing studies with views to improvement, it shall still remain high for private users. Thus, initial adoption shall be governmental and applied to collective transportation and taxi fleets.</p>	<p>Cost shall be balanced for adoption purposes given this concerns private ownership that seeks to develop an array of users whose prime intent is to negotiate cost to promote the adoption of the product. If lower than that of Combustion propelled Vehicles, adoption shall be immediate.</p>	<p>Recharge cost shall be improved since with advances in studies, reductions given innovation and improvements in the development of the system shall be possible.</p>

<p>Unemployment at Combustion Propelled Vehicle Manufacturing Companies</p>	<p>Unemployment at the Vehicle sector shall remain balanced, as long as electric recharge availability and cost remain constant.</p>	<p>Unemployment in the Vehicle sector shall be balanced, given that adoption of a new technology is still in course and is still deemed as an uncertainty.</p>	<p>Given that the adoption of the Electric technology shall be undergoing development, unemployment in sectors solely driven by combustion shall experience an increase – but still deemed as being minor.</p>	<p>Unemployment shall be balanced. However, there will be a search for people with research and development skills with aptitude for new technologies and sustainable discoveries.</p>
--	--	--	--	--

Figure 2: 2040 Scenario Morphologic Matrix

Source: prepared by the authors.

7 SCENARIO 1 (MOST PROBABLE) – CITY IN DANGER

This scenario results in the continuity of action of current forces, as of favourable perspectives concerning São Paulo's Vehicle sector and the adoption of the Electric Vehicle under Collaborative Consumption in the City of São Paulo.

From an economic analysis perspective, population income tends to not be subject to considerable increases and thus, a change in consumption habits might be assessed as long as it promotes costs and maintenance savings. Facilitated credit lines usually tend to generate economic spins and therefore, jointly with the permission to extend terms (even if at interest rates deemed as being high) shall contribute with the acquisition of products, particularly vehicles, which shall for some people serve the purpose of demonstrating success in life.

With the continuous increase of the number of vehicles in the City, several results come about. One of these relates to pollution which continues to be in force at high levels, harming the environment and the population's health. Traffic jams, as a second result, shall continue at high rates given the fact that the population shall not be supplied with quality public transport and thus, vehicle users perceive this as a factor that promotes the continuous acquisition of vehicles as a feasible alternative for locomotion, even if the same implies in harm to their generation and particularly those to come.

Initially, given that Electric Vehicle technology is deemed as a novelty that shall bring about changes in consumption habits, possibly including a higher cost as compared to that incurred in by a Combustion propelled Vehicle owner, the adoption of the technology shall be somewhat impaired, particularly when associated with electric recharge availability, which shall still be deemed insufficient.

A second driving force of concerning the adoption of the technology in the City shall be the cost of recharge. Given this is a technology undergoing

development, at a high maintenance cost, users shall not be prone to immediate adoption.

Based on the Collaborative Consumption system that comprises concerns involving unemployment at combustion propelled vehicle manufacturers, the same shall remain balanced, as long as availability and electric recharge variables remain Constant. Should these be subject to change, it is probable that unemployment shall likewise change.

8 SCENARIO 2 (CONTRASTING) – CITY UNDERGOING RE-STRUCTURING

Income shall continue to be one of the difficulties in the City, however there are indications of change in mindsets which might come to promote changes in attitudes, particularly as to consumption habits.

Credit lines shall continue to be available however, the difference lies in the ideation of special interest rates for projects and products that target environment improvement actions. Na example of incentive is the investment in innovative segments such as that of Shared Electric Vehicles.

Pollution shall remain at high indexes however, there will be governmental actions so as to control the generation of pollution, particularly as to combustion propelled vehicles.

Traffic jams in the City shall remain at high levels however, prone to reductions since the City shall promote the use of collective transport and shall promote infrastructure to this effect, with the extension of subway lines and provisioning of collective electrical bus fleets.

Although the adoption of the Electric Vehicle is not fully established, there will be enough availability for power recharge.

With studies involving improvements in recharge costs and power, users will still pose limits to adoption. Given this fact, initial adoption shall be effected by the government and private companies, applied to collective transportation, taxi cab fleets and Shared Vehicle systems.

Unemployment in the Vehicle sector shall be in balance given that the adoption of a new technology is still in progress and is deemed an uncertainty.

9 SCENARIO 3 (CONTRASTING II) – RESPONSIBLE AND LACKING RESOURCES CITY

Much like in previous scenarios, income is not subject to increase and thus this moment shall be more suitable for the reassessment of values and consumption habits. The adoption of new technologies so as to promote sustainability shall be taken into account.

Credit lines shall be scarce given that the City's economic situation shall be in decline. This shall bring about availability issues and shall give rise to high interest rates demanded by retaining entities.

Pollution in the City shall decline but not given to governmental actions but rather due to the economic situation of the City which shall not be favourable to costs with Vehicles and thus, the trend shall rest in expenses involving Vehicles remaining balanced, without considerable increases.

Traffic jams shall remain balanced given that the City will be more inclined to use collective transport even if the same does not address the population nor bring about enough infrastructure. This shall directly influence the population's Quality of Life, which, given the fact that it shall not live in pleasant conditions, shall not produce for industries in a constant manner and this shall lead to falls in sectors, that consequently shall directly influence the population's income.

Given the economic situation in the City, investments in research and development shall be scarce. Thus, the availability of power recharge shall be restricted and privately owned. The cost of adoption shall be balanced since it pertains to private property which intends to develop an array of users, who shall have as prime intent the negotiation of product adoption costs. Should the same promote a lower cost than that of Combustion propelled Vehicles, adoption shall be immediate.

Since the adoption of the Electric technology shall be undergoing development, unemployment in sectors solely driven by combustion shall

experience an increase – however still deemed minor. Unemployment may increase not only within the automotive industry but in all sectors given the conditions mentioned relative to the fall in Quality of Life and Economic Production.

10 SCENARIO 4 (DESIRABLE) – INTELLIGENT CITY

In light of advances in the country's economy, the City of São Paulo, as prime business centre, shall be positively impacted with increases in income, which shall be deemed as being the compensation received for work produced by the population. Posing the City's growth as a Sustainable Business Centre for the country, investments shall focus in actions which seek to preserve the current and forthcoming generations. To this effect, innovative actions and Technologies shall be adopted.

Credit Line and Interest Rate Negotiation actions shall continue to benefit people and companies that propose sustainable objectives in favour of the City and its Population.

Pollution in the City shall remain under control, as a result of both governmental actions and fiscal, economic and environmental incentives concerning the acquisition of alternative technologies that address the planet's air, such as that of the Electric Vehicle. One of the actions shall be the governmental support and incentive as to the use of Alternative Transport such as Shared Vehicles.

Traffic jams shall remain without reductions but prone to improvements given incentives to adopt alternative transport modalities and schemes, such as Shared Vehicles, Cycling lanes, etc.

The City shall be supplied with enough power for the initial adoption of the Electric Vehicle, however, continuous study will be in force, concerning the investigation of new forms of sustainable power, financed by the government and by private associations who shall share common interests and objectives, in favour of the City.

Recharge costs shall improve since, given the advance in studies, reductions shall be enabled by innovations and improvements in the development of the system.

Unemployment shall be balanced. This shall take place given that companies of the automotive sector shall understand that they must re-evaluate their strategies and product portfolio. Given that consumers shall be more conscious of their consumption, sales in this sector (combustion propelled vehicles) shall be experiencing falls and thus the sector shall be seeking professionals with research and development skills, with aptitude in new sustainable technologies and discoveries.

11 CONCLUSION

Upon analysing the Desired or "Intelligent City" Scenario, it becomes evident that this perspective comprises all that the City needs to continue to be considered the country's major Business Centre and nevertheless preserve the environment and foster Life Quality for the population. This quality is represented by health, employment, purchasing power and quality, sustainable and efficient urban mobility.

However, one also identified the extreme difference between the Most Probable "City in Danger" Scenario and that of the "Intelligent City". So that the needed changes which transform today's City of São Paulo into an Intelligent City may come about, first, the population must shape a new culture which drives City inhabitants to perceiving the Current Scenario and the consequences deriving from personal and industrial behaviour as absorbed by the environment and which shall greatly impact the population over the next few years.

The adoption of the Electric technology by the City of São Paulo may bring about benefits not only of the environmental kind but also in an economic manner. It is understood that a transformation such as that developed in the Intelligent City scenario calls for several actions which go far beyond a change in the population and that shall certainly require a more pragmatic attitude from the government. It is true that this might be achieved in a gradual manner but it

is also our understanding that it could be the start which transforms a "City in Danger" into an "Intelligent City".

BIBLIOGRAPHY

BABIN, B. J.; DARDEN, W. R.; GRIFFIN, M. (1994) Work and/or Fun: Measuring Hedonic and Utilitarian Shopping Value. *The Journal of Consumer Research*, v. 20, n. 4, p. 644-656.

BOOTSMAN, Rachel.; ROGERS, Roo. (2010). *What's mine is yours*. New York: HarperCollins Publishers

BRANCO, Samuel Murgel. (1997). *O meio ambiente em debate*. 26 ed. São Paulo: Editora Moderna. Coleção Polêmica, São Paulo.

FILHO, Gino Giacomini. (2003). *Revista Imes.*, São Paulo, p. 61 e 62, jul./dez.

GODET, M. (1993). *Manual de Prospectiva Estratégica: da antecipação à ação*. Lisboa: Dom Quixote, 399 p.

GOMES, Daniela Vasconcellos. (2006). Educação para o consumo ético e sustentável. *Rev. Eletrônica. Mest. Educ. Ambient.*, Porto Alegre, v.16, p.18-31.

INOVAÇÃO UNICAMP. (2009). International Energy Agency [IEA].

INSTITUTO NACIONAL DE METROLOGIA, NORMALIZAÇÃO E QUALIDADE INDUSTRIAL e INSTITUTO BRASILEIRO DE DEFESA DO CONSUMIDOR – IDEC.(2002). *Direitos do Consumidor/Ética no Consumo*. Brasília: INMETRO/IDEC. (Coleção educação para o consumo sustentável).

INSTITUTO NACIONAL DE METROLOGIA, NORMALIZAÇÃO E QUALIDADE INDUSTRIAL e INSTITUTO BRASILEIRO DE DEFESA DO CONSUMIDOR – IDEC.

(2002). Meio ambiente e consumo. Brasília: INMETRO/IDEC. (Coleção educação para o consumo sustentável).

MASON, D. H. (1994). Scenario-based Planning: Decision Model for the Learning Organization. *Planning Review*, v. 3, p. 6-11.

PORTER, A. et al. (1991). *Forecasting and Management of Technology*. New York: John Wiley & Sons, 464 p.

PORTER, M. E. (1986). *Estratégia Competitiva*. Rio de Janeiro: Campus.

PORTER, A.L.; CUNNINGHAM, S.W.; BANKS, J.; ROPER, A.T.; MASON, T.W.; ROSSINI, F.A. (2011). *Forecasting and Management of Technology*. New York: John Wiley & Sons.

RINGLAND, G. (1998). *Scenario Planning: managing for the future*. New York: Willey.

SCHOEMAKER, P. J. H. Scenario Planning: a tool for strategic thinking. *Sloan Management Review*, v. 36, n. 2, p. 25-40, 1995. Disponível em: <http://zeus.bke.hu/ktatas/szakirany/smm/files2006/Schoemaker_scenario_planning_SMR_1995.pdf>. Acessado em Dezembro de 2011.

WILLIAMSON, O. E. (1979). Transaction-cost economics: the governance of contractual relations. *Journal of Law and Economics*, v. 22, p. 223-261, 1979.

WILLIAMSON, Oliver E. (1985). *The Economic Institutions of Capitalism*. New York, The Free Press, 1985.

WRIGHT, J. T. C. (1991). Contribuição à técnica de análise e estruturação de modelos (ISM) para o planejamento em grupo: uma abordagem de inferência lógica. 204 f. Tese (Doutorado em Administração de Empresas). Faculdade de Economia, Administração e Contabilidade, USP, São Paulo.

WRIGHT, J. T. C.; GIOVINAZZO, R. A. (2004). A Política Industrial e a Estratégia da Nação. In: FLEURY, M. T.; FLEURY, A. Política Industrial 2. São Paulo. Publifolha.

WRIGHT, J. T. C.; SPERS, R. G. (2006). O País no futuro: aspectos metodológicos e cenários. Revista Estudos Avançados, São Paulo, v. 20, n. 56, p. 13-28.

WIKIPÉDIA. http://pt.wikipedia.org/wiki/Ve%C3%ADculo_el%C3%A9trico (acessado em Dezembro de 2011)

ASSOCIAÇÃO BRASILEIRA DE LOCADORAS DE AUTOMÓVEIS (ABLA). Anuário ABLA 2010 disponível em <http://www.abla.com.br/> (acessado em Dezembro de 2011)

ESTADO DE SÃO PAULO. A evolução da Frota. Disponível em <http://www.estadao.com.br/noticias/impresso,frota-de-sp-chega-neste-mes-a-7-milhoes,686964,0.htm>. (Acessado em Dezembro de 2011).